Analysis of the Market Potential of Syrian Organic Fruit and Vegetables for Exports to Germany

Irwa Issa

Dissertation at the University of Kassel
Faculty of Organic Agricultural Sciences
Dissertation an der Universität Kassel

Fachbereich Ökologische Agrarwissenschaften

Dissertation zur Erlangung des akademischen Grades eines Doktors der Agrarwissenschaften (Dr. agr.)


1. Gutachter: Prof. Dr. Ulrich Hamm, Fachgebiet Agrar- und Lebensmittelmarketing

2. Gutachter: Prof. Dr. Stephan von Cramon-Taubadel, Department für Agrarökonomie und Rurale Entwicklung (Georg-August-Universität Göttingen)
Summary

Syria has been a major producer and exporter of various agricultural products in the Arabic region. With presence of a relatively warm Mediterranean climate in this country, different varieties of fresh fruit and vegetables (FFV) have been produced, and a considerable amount has been exported. Prior to 2011, Syrian FFV were mainly exported to the neighbouring countries, the Gulf States and Northern Africa as well as to Eastern European countries. Although the EU is potentially one of the most profitable markets of high quality FFV (such as organic ones) in the world, Syrian exports of FFV to Western European countries like Germany have been small.

Within the EU, Germany is by far the largest market for organic products accounting for one third of the EU organic market and 13% of the aggregate international market of these products in 2014. The German consumption of organic FFV is much higher than organic domestic production. This gap in supply is mainly filled by imports from other EU Member States. Considerable amounts of organic FFV are also imported from Non-EU countries. It could be a lucrative opportunity for Syrian growers and exporters of FFV to export organic products to markets such as Germany, where national production is limited to a few months due to climatic conditions. Yet, the organic sector in Syria is comparatively young and only a very small area of FFV is certified according to EU organic regulations. Up to the author’s knowledge, little was known about Syrian farmers’ attitudes towards organic FFV production. There was also no study so far that explored and analysed the determining factors for organic FFV adoption among Syrian farmers as well as the exports of these products to the EU markets.

The overarching aim of the present dissertation focused on exploring and identifying the market potential of Syrian exports of organic FFV to Germany. The present dissertation was therefore concerned with three main objectives. These objectives were to (i) explore if German importers and wholesalers of organic FFV see market opportunities for Syrian organic products and what requirements in terms of quality and quantity they have, (ii) determine the obstacles Syrian producers and exporters face when exporting agricultural products to Germany, and (iii) investigate whether Syrian farmers of FFV can imagine converting their farms to organic production as well as the underlying reasons why they do so or not. A twofold methodological approach with expert interviews and a farmer survey were
used in this dissertation to address the abovementioned objectives. While expert interviews were conducted with German and Syrian wholesalers of (organic) FFV in 2011 (9 interviews each), the farmer survey was administrated with 266 Syrian farmers of FFV in the main region for the production of FFV (i.e. the coastal region) from November 2012 till May 2013. For modelling farmers’ decisions to adopt organic farming, the Theory of Planned Behaviour (TPB) as theoretical framework and Partial Least Squares Structural Equation Modelling (PLS-SEM) as the main method for data analysis were used in this study.

Regarding the first objective, based on secondary data and expert interviews with 9 German import companies of organic FFV, a detailed analysis of German imports of organic FFV was illustrated. Findings from the interviewed German companies show that Germany mainly imported fresh (organic) vegetables and large amounts of fresh (organic) fruit from the EU neighbouring countries. Some of the organic FFV were imported from the Mediterranean Non-EU countries, particularly in the off-season of the EU Member States. Round, bush and cherry tomatoes, capsicum, citrus fruit, seedless grapes, and pomegranates were the most important organic FFV being exported to Germany from the Mediterranean Non-EU countries. Among those countries were Israel, Egypt, Turkey, and Morocco as the main suppliers for organic FFV in 2010. None of the interviewed companies reported any import activity of organic FFV from Syria between 2008 and 2011. Regarding the import potential of organic FFV from Syria, the interviewed importers mentioned specific requirements concerning the import potential for some fruit and vegetables. Besides the EU compulsory minimum standards for organic produce, they were also concerned about qualitative and logistics issues. According to those interviewees, fresh produce in the off-season (mainly winter time in Germany) has the best chances for market access. During periods when there is a shortage in German supply, lower import duties and higher import quotas are set for different fruit and vegetable species. Best market opportunities are seen for some organic vegetables that are sold in Germany all year round like tomatoes, sweet peppers, cucumbers and spring vegetables, and additionally some organic fruit like citrus fruit, white and seedless grapes. Furthermore, most of the interviewees expected a positive development in the market for organic vegetables during the upcoming years after 2011. This trend was also expected for organic fruit, but to a lesser degree.

Regarding the second objective, based on secondary data and expert interviews with 9 Syrian export companies of FFV, a detailed analysis of Syrian exports of (organic) FFV was
conducted. Findings show that all interviewed companies had mainly exported conventional FFV to the traditional markets in the Arabic region, the majority of which being sourced from the traditional wholesale markets in Syria rather than from farmers. However, few of the interviewees also exported relatively small amounts of FFV to the European markets by sourcing directly from farmers. By the time of the interviews, Syrian exports of certified organic FFV were still novel and the destination markets of those products were mainly the emerging niche outlets in the Gulf States and a few Western EU markets. No concrete data exist about the exported volume of organic FFV; however, it can be assumed that their volume was relatively small compared to the scale of Syrian exports of FFV. Few of the interviewed companies (under Syrian exporters’ association of agricultural products: SAPEA) had already a long experience of exporting organic olives and olive oil to Italy, Spain, France and Greece. With respect to SAPEA’s exports of organic FFV to the EU markets, only small quantities of organic figs and table grapes had been exported to Germany and England so far. However, by the time of the interviews, SAPEA planned to export organic potatoes, carrots, tomatoes, strawberries and citrus fruit to EU countries over the next years (after 2011). Likewise, SAPEA had also good experience of exporting substantial amounts of organic mushrooms, tomatoes, and citrus fruit to Lebanon, Kuwait, United Arab Emirates and Saudi Arabia over the previous years (before 2011).

Regarding the third objective, results of the farmer survey indicated that farmers mainly sold their FFV in the traditional wholesale markets and only few of them marketed their produce to the warehouses of exporters who then sold it to the Arabic region and European markets. With respect to organic farming, many of the interviewed farmers had heard about the term ‘organic farming’ through different sources. The vast majority of farmers indicated that they use ‘low chemical inputs’ on their farms, and that their current practices for maintaining soil fertility and for pest control includes at least one of the practices that are part of certified organic production. For instance, 89% of the farmers indicated the application of livestock manure for maintaining the soil fertility. For the purpose of pest control, many farmers also used biological enemies (60% of farmers) and physical and pheromone traps (68% of farmers). These practices can be considered as good pre-conditions for the adoption of certified organic FFV production among Syrian farmers.

The majority of interviewed farmers demonstrated favourable attitudes towards organic farming aspects. In this respect, farmers rated many statements regarding the environmental,
health and economic aspects of organic agriculture positively. Interestingly, attitudes about protecting the environment and providing healthy food for family members were rated higher than attitudes towards economic and profitability aspects of organic farming. The results of PLS-SEM estimation of the adopted TPB model provided further confirmation that farmers’ positive attitudes and perceived behavioural control towards a conversion to organic FFV production had a positive influence on the behavioural intention to convert. Interviewed farmers perceived social pressure towards a conversion to organic FFV production to play only a minor role in forming their behavioural intention in this study. These findings are in line with the TPB assumptions, as the path coefficients linking the TPB components are highly significant and the total effect coefficients that demonstrate the chain of causal effects from the set of salient beliefs to behaviour (adoption of organic FFV production) in the TPB are highly significant. These results give evidence that the TPB was an appropriate and satisfactory theoretical framework for modelling the conversion to certified organic farming among Syrian farmers of FFV. Furthermore, the farmer and farm characteristics (mainly the educational levels of farmers, their income from FFV cultivation, farmers’ current practices on their farms and their general attitudes about organic farming) were found to have indirect effects on the behavioural intention to adopt organic FFV production. In accordance with the TPB assumptions, these variables served as background factors that had direct influences on the set of accessible beliefs from which the attitudes, perceived behavioural control, subjective norms, and behavioural intentions were derived.

Overall this dissertation shows that apart from the high competition of EU suppliers in the Mediterranean Non-EU region, Syria would have the opportunity to expand the export volume of organic FFV to the EU markets. That is particularly in the periods ahead or after the production season in the Southern EU countries, since these periods come along with low EU tariffs and entry prices. Organic FFV can also contribute to enhance Syrian exports of these products on the Gulf States market in the summer time, where the imports of FFV to the EU markets are hampered by high tariffs and entry prices. By active participations in organic fairs (such as Biofach in Germany), Syrian exporters of organic FFV would be able to exploit the aforementioned windows in the EU markets. Consequently, the exporters would also have the potential to spread the benefits to farmers who have shown the willingness and capability to join in organic FFV production dedicated for export to the high value EU markets.
The findings of this dissertation yield implications for the different stakeholders (governmental institutions and NGOs, farmers, exporters, wholesalers, etc.) who are interested in prompting the Syrian export of organic products. Based on the present findings and a literature review, an action plan to promote Syrian production and export of organic products was developed which can help in the post-war period in Syria at improving the organic sector. This action plan includes recommendations for (i) strengthening the position of organic farming in general agricultural policy, (ii) implementing the national legislation on organic agriculture to strengthen the credibility of the sector, (iii) facilitating the process of certification and accreditation, (iv) initiating programmes for research and extension training, (v) expanding the domestic demand by governmental and NGOs initiatives, (vi) improving the access to foreign markets, and (vii) expanding the conversion to organic farming.

In the pre-war period, Syrian agricultural sector had been a significant source of income for many Syrian families who were engaged in producing, processing, trading and/or exporting of agricultural products. The agricultural sector is likely the easiest sector to recover after the war in Syria reaches an end. Thus, once Syria is stabilised and the economic relationships with the EU are resumed, exporting organic FFV to the high value EU markets (including Germany) under the EU Mediterranean Association Agreement, will indispensably offer great chances for Syria at gaining foreign currency needed to help in rebuilding the country in the post-war.
Zusammenfassung


Nach Wissen des Autors war bisher wenig bekannt über die Einstellungen syrischer Bauern gegenüber dem Öko-Anbau von Obst und Gemüse. Auch gab es noch keine Studie, die die bestimmdenen Faktoren für die Umstellung auf eine Öko-Produktion von Obst und Gemüse unter syrischen Bauern sowie die Ausfuhr dieser Produkte in die EU-Märkte untersucht und analysiert. Das übergeordnete Ziel der vorliegenden Dissertation ist die Erforschung und Identifizierung des Marktpotenzials der syrischen Exporte von Öko-Obst und -Gemüse nach Deutschland. Diese Arbeit hat sich daher die folgenden drei Hauptziele gesetzt: (i) zu untersuchen, ob und für welche syrischen Öko-Produkte deutsche Importeure und Großhändler von Öko-Obst und -Gemüse Marktchancen sehen und welche Anforderungen sie in Bezug auf Qualität und Quantität haben, (ii) zu ermitteln, welchen Herausforderungen syrische Bauern und Exporteure gegenüberstehen, wenn sie landwirtschaftliche Produkte nach Deutschland exportieren, und (iii) zu erforschen, welches Potenzial die syrischen Obst- und

Zusammenfassung


In Bezug auf das dritte Ziel ergab die Befragung der Landwirte, dass diese ihr Obst und Gemüse hauptsächlich auf den herkömmlichen Großmärkten verkauften. Nur wenige Landwirte vermarkteten ihre Produkte direkt an die Lagerhäuser von Exporteuren, die sie dann in den arabischen und europäischen Märkten verkauften. Im Hinblick auf die ökologische Wirtschaftsweise wurde festgestellt, dass viele der befragten Landwirte den Begriff „ökologischer Landbau“ bereits aus unterschiedlichen Quellen gehört hatten. Die überwiegende Mehrheit der Landwirte gab an, nur „geringe Mengen chemischer Mittel“ in der Produktion einzusetzen und in ihrer aktuellen Produktionsweise zum Erhalt der
Zusammenfassung


Acknowledgements

Foremost, I thank the Ministry of Higher Education and Al-Baath University in Syria for providing this scholarship. I would also like to thank the University of Kassel and the German Academic Exchange Service (DAAD) for providing short term scholarships to accomplish this dissertation. I extend my thanks to the Syrian Chamber of agriculture, the Syrian Ministry of Agriculture and Agrarian Reform and the Citrus Fruit Board, Tartous, Syria for their enormous and valuable support in data collection.

There are a number of people who provided advice, support and encouragement during the course of my PhD and who I would like to acknowledge.

I sincerely thank my supervisor Prof. Dr. Ulrich Hamm who provided the opportunity to join his team. I am grateful for his support, intellectual guidance and encouragement from inception of the project until this submission. I would also like to express my gratitude to my second supervisor Prof. Dr. Stephan von Cramon-Taubadel (University of Göttingen) who accepted to evaluate my dissertation.

I extend my regards to my current and former colleagues at the department of Agricultural and Food Marketing. Many of them supported me through constructive discussion, feedback and constant reinforcement, which were helpful to accomplish my dissertation: Tobias, Meike, Katrin, Denise, Salome, Rosa, Manika, Antje and Corinna. Thank you especially! An extra thank also goes to Dr. Christina Bantle for her magnificent time and efforts at proofreading the manuscript of this dissertation.

Many cheers also go to my friends in Syria and Germany. I appreciate the good time I spent with Reman, Enad, Qutaiba, Sami, Ali, Samer, Manuella, Skender, Tapiwa, Olga, Chrissie, Raja, Franciscka, Evans, Mike, Torsten, Daniel, Kathi, Annika, Alber, Adil, Raid, Jamil, Reem, Angelo, Aditya, Tobi & Ferdauss.

Finally, special thanks to my parents: Bahija Moussa and Ramiz Issa for their tender and endless love and to my siblings: Kais, Ahmad, Amer, Nahed, and Reema who give me their support throughout my life (I wish them all the best). Special thanks also go to my dearest Joana Albrecht for her love and endless support in the course of my study.
# Table of contents

Summary.......................................................................................................................... i

Zusammenfassung ........................................................................................................... vi

Acknowledgements ........................................................................................................ xi

Table of contents ........................................................................................................... xii

List of tables ................................................................................................................... xviii

List of figures ................................................................................................................ xx

List of abbreviations ................................................................................................... xxii

List of acronyms .......................................................................................................... xxiv

1 Introduction .................................................................................................................. 1

1.1 Overview over organic market trends ...................................................................... 1

1.2 Overview over the organic sector in Syria ............................................................... 3

1.3 Research problem ................................................................................................... 6

1.4 Research objectives ................................................................................................. 8

1.5 Procedure and structure of the dissertation ............................................................ 9

2 Motivations and barriers to adopt organic agriculture: A literature review ............ 12

2.1 Introduction .............................................................................................................. 12

2.2 Factors influencing farmers’ decision towards organic production in developed countries .................................................................................................................. 12

3 Analysis of German imports of (organic) fresh fruit and vegetables .................... 22

3.1 Introduction .............................................................................................................. 22

3.2 EU production and imports of fresh fruit and vegetables ......................................... 22

3.3 German production and imports of fresh fruit and vegetables ................................ 22

3.3.1 German imports of fresh fruit and vegetables from the Mediterranean Non-EU countries ........................................................................................................... 29

3.4 German imports of organic fruit and vegetables ..................................................... 32

3.5 Interviews with German importers of organic fruit and vegetables ....................... 34

3.5.1 German imports of organic fruit and vegetables from Mediterranean Non-EU countries ........................................................................................................... 34
3.5.2 German requirements for organic fruit and vegetables .............................................. 37
   3.5.2.1 Legislative requirements ....................................................................................... 37
   3.5.2.2 Quality requirements ............................................................................................. 41
   3.5.2.3 Appropriate logistics and transport ....................................................................... 42
3.5.3 Future trends of organic fruit and vegetables imports from the Mediterranean Non-EU countries .............................................................................. 43
3.5.4 Potential opportunities for exporting Syrian fresh organic fruit and vegetables into the German market: German importers’ perspectives ........................................... 44
3.5.5 Recommendations for better access for Syrian fruit and vegetables into Germany ......................................................................................................................... 44
3.5.6 Recommendations for supporting the production of organic fruit and vegetables in Syria .............................................................................................................. 45

4 Analysis of Syrian exports of (organic) fresh fruit and vegetables ................................. 46
   4.1 Introduction ...................................................................................................................... 46
   4.2 Syrian production and export of fresh fruit and vegetables ............................................. 48
      4.2.1 Syrian production of fresh fruit and vegetables .......................................................... 48
      4.2.2 Syrian export of fresh fruit and vegetables .................................................................. 54
   4.3 Interviews with Syrian exporters of FFV ......................................................................... 59
      4.3.1 Syrian value chain of fresh fruit and vegetables .......................................................... 60
         4.3.1.1 Literature overview of Syrian value chain of fresh fruit and vegetables .............. 60
         4.3.1.2 Exporters’ perceptions of the Syrian value chain of fresh fruit and vegetables .......................................................... 61
            4.3.1.2.1 Traditional export value chain of fresh fruit and vegetables ......................... 65
            4.3.1.2.2 Export value chain of fresh fruit and vegetables with direct sourcing from farmers ......................................................................................................................... 66
      4.3.2 Export destinations of Syrian fresh fruit and vegetables ............................................ 67
         4.3.2.1 Arabic markets of Syrian fresh fruit and vegetables ............................................. 68
            4.3.2.1.1 Neighbouring Arabic markets ................................................................. 68
            4.3.2.1.2 Arabic Gulf States markets ............................................................................ 72
            4.3.2.1.3 Northern African markets .............................................................................. 74
            4.3.2.1.4 Interviewed exporters’ experiences in the Arabic markets of fresh fruit and vegetables ......................................................................................................................... 75
         4.3.2.2 Syrian exports of fresh fruit and vegetables to Europe: Eastern Europe and EU ................................................................................................................................. 76
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3.2.2.1 Perspectives of Syrian exporters of fresh fruit and vegetables toward European markets</td>
<td>77</td>
</tr>
<tr>
<td>4.3.2.2.2 Exporters’ perspectives about the main barriers regarding Syrian exports of fresh fruit and vegetables to the EU markets</td>
<td>79</td>
</tr>
<tr>
<td>4.3.2.2.3 Exporters’ perspectives towards an improvement of the existing value chain of fresh fruit and vegetables</td>
<td>81</td>
</tr>
<tr>
<td>4.3.2.2.4 Case study: SAPEA experience in the EU market of fresh fruit and vegetables</td>
<td>83</td>
</tr>
<tr>
<td>5 Theoretical framework: The reasoned action approach</td>
<td>85</td>
</tr>
<tr>
<td>5.1 Introduction</td>
<td>85</td>
</tr>
<tr>
<td>5.2 Theory of Reasoned Action</td>
<td>86</td>
</tr>
<tr>
<td>5.3 Theory of Planned Behaviour</td>
<td>89</td>
</tr>
<tr>
<td>5.3.1 Components of the Theory of Planned Behaviour</td>
<td>91</td>
</tr>
<tr>
<td>5.3.2 Expectancy-value model</td>
<td>97</td>
</tr>
<tr>
<td>5.3.3 Literature review on applications of the Theory of Planned Behaviour</td>
<td>99</td>
</tr>
<tr>
<td>5.3.3.1 Applications of the Theory of Planned Behaviour in important social behaviours</td>
<td>99</td>
</tr>
<tr>
<td>5.3.3.2 Applications of the Theory of Planned Behaviour in important agricultural contexts</td>
<td>100</td>
</tr>
<tr>
<td>5.3.3.3 Applications of the Theory of Planned Behaviour in understanding farmers’ intentions to adopt organic farming</td>
<td>102</td>
</tr>
<tr>
<td>5.4 Farmers’ survey design</td>
<td>105</td>
</tr>
<tr>
<td>5.4.1 Formulating items for measuring components of the TPB</td>
<td>107</td>
</tr>
<tr>
<td>5.4.1.1 Intention and behaviour measurements</td>
<td>108</td>
</tr>
<tr>
<td>5.4.1.2 Attitudes measurement</td>
<td>108</td>
</tr>
<tr>
<td>5.4.1.3 Subjective norm measurement</td>
<td>109</td>
</tr>
<tr>
<td>5.4.1.4 Perceived behavioural control measurement</td>
<td>109</td>
</tr>
<tr>
<td>5.4.2 Hypotheses</td>
<td>110</td>
</tr>
<tr>
<td>6 Methodology: Data collection</td>
<td>112</td>
</tr>
<tr>
<td>6.1 Introduction</td>
<td>112</td>
</tr>
<tr>
<td>6.2 Case study and location</td>
<td>112</td>
</tr>
<tr>
<td>6.2.1 Geographic location and agro-climatic zones in Syria</td>
<td>112</td>
</tr>
<tr>
<td>6.2.2 Study area and sampling</td>
<td>115</td>
</tr>
</tbody>
</table>
6.3 Method of data collection .............................................................................................. 117
6.4 Sampling procedure ....................................................................................................... 119
6.5 Questionnaire design and structure ................................................................................ 120
6.6 Procedures of data collection ......................................................................................... 123
   6.6.1 Pre-test ...................................................................................................................... 123
   6.6.2 Conduction of face-to-face interviews ..................................................................... 124

7 Methodology: Data analysis ............................................................................................. 126

   7.1 Introduction .................................................................................................................... 126
   7.2 Factor analysis ............................................................................................................... 126
   7.3 Multiple regression analysis ........................................................................................ 129
   7.4 Structural equation modelling........................................................................................ 131
      7.4.1 Covariance-based structural equation modelling ..................................................... 134
      7.4.2 Variance-based structural equation modelling: Partial least squares
          structural equation modelling................................................................................... 136
          7.4.2.1 PLS-SEM specification ....................................................................................... 139
             7.4.2.1.1 Measurement model of PLS-SEM............................................................... 139
             7.4.2.1.2 Structural model of PLS-SEM ..................................................................... 144
             7.4.2.1.3 Algorithm of PLS-SEM ............................................................................... 149
             7.4.2.1.4 Bootstrapping procedure of PLS-SEM ........................................................ 154
          7.4.2.2 Evaluation criteria of PLS-SEM ......................................................................... 155
             7.4.2.2.1 Assessment of the PLS-SEM measurement model ..................................... 155
                7.4.2.2.1.1 Assessment of the reflective measurement model ............................. 156
                7.4.2.2.1.2 Assessment of the formative measurement model ............................. 159
             7.4.2.2.2 Assessment of the PLS structural model ..................................................... 162

8 Farmer survey: Descriptive analysis ............................................................................... 169

   8.1 Introduction .................................................................................................................... 169
   8.2 Farmers and farm characteristics ................................................................................... 169
   8.3 Farmers’ current practices for maintaining soil fertility and pest control ..................... 176
   8.4 Farmers’ general attitudes about organic agriculture..................................................... 179

9 Farmer survey: TPB model results.................................................................................... 184
Table of contents

9.1 Introduction .................................................................................................................... 184
9.2 TPB model of FFV farmers ........................................................................................... 184
  9.2.1 Belief-based measures of behavioural intention: Expectancy-value model ............. 188
    9.2.1.1 Expectancy-value model of behavioural beliefs .................................................. 188
    9.2.1.2 Expectancy-value model of control beliefs ........................................................... 190
    9.2.1.3 Expectancy-value model of normative beliefs ...................................................... 191
  9.2.2 Direct measures of behavioural intention and behaviour ......................................... 196
    9.2.2.1 Separate effects of direct measures of behavioural intention and behaviour ..... 196
      9.2.2.1.1 Separate effects of attitudes on behavioural intention ...................................... 196
      9.2.2.1.2 Separate effects of subjective norms on behavioural intention .................... 198
      9.2.2.1.3 Separate effects of perceived behavioural control on behavioural intention and behaviour ............................................................. 200
      9.2.2.1.4 Separate effects of behavioural intention on behaviour .................................. 203
    9.2.2.2 Combined effects of direct measures on behavioural intention and behaviour .......... 204
      9.2.2.2.1 Combined effects of direct measures on behavioural intention ....................... 204
      9.2.2.2.2 Combined effects of direct measures on behaviour ........................................ 205
  9.3 Assessing PLS-SEM results of the entire TPB model ................................................... 207
    9.3.1 PLS-SEM estimation ............................................................................................... 207
    9.3.2 Assessment of PLS-SEM results of the measurement model ................................... 211
      9.3.2.1 Composite reliability and convergent validity ...................................................... 211
      9.3.2.2 Discriminant validity .......................................................................................... 213
    9.3.3 Assessment of PLS-SEM results of the structural model ......................................... 217
      9.3.3.1 Path coefficients of PLS-SEM structural model ................................................... 218
      9.3.3.2 Predictive accuracy and predictive relevance of PLS-SEM structural model .............. 221

10 Discussion and conclusions ............................................................................................. 224
10.1 Discussion .................................................................................................................... 224
  10.1.1 Composition of the thesis findings ........................................................................ 224
    10.1.1.1 Perspectives of German importers regarding the import potential of organic FFV from Syria ........................................................... 224
    10.1.1.2 Perspectives of Syrian exporters regarding the export potential of organic FFV ........................................................... 225
    10.1.1.3 Perspectives of Syrian farmers towards organic FFV production ...................... 227
10.1.1.4 The role of different stakeholders in improving the Syrian export value chain of organic FFV .............................................................. 231
10.1.2 Merits and limitations of the study ................................................................. 232
10.2 Conclusions ........................................................................................................ 235
10.2.1 Recommendations for stakeholders to develop organic agriculture in Syria .... 235
  10.2.1.1 General recommendations for an intervention policy for organic agriculture .......................................................... 235
  10.2.1.2 Suggestions for a national organic action plan ............................................. 237
    10.2.1.2.1 Strengthening the position of organic farming in general agricultural policy ......................................................... 237
    10.2.1.2.2 Implementing the national legislation on organic agriculture ............... 238
    10.2.1.2.3 Facilitating the process of certification and accreditation ....................... 239
    10.2.1.2.4 Initiating programmes for research, extension training and dissemination of knowledge ............................................ 240
    10.2.1.2.5 Expanding the domestic demand by governmental and NGOs initiatives ................................................................. 242
    10.2.1.2.6 Improving the access to foreign markets .................................................. 242
    10.2.1.2.7 Expanding the conversion to organic farming ........................................... 243
  10.2.2 Suggestions for future research ....................................................................... 246
References ...................................................................................................................... 249
Appendices ..................................................................................................................... 289
Affidavit .......................................................................................................................... 321
List of tables

Table 1.1: Development of Syrian organic agriculture .............................................................. 5
Table 4.1: Evolution of Syrian exports of selected important fresh vegetables since 2002..... 57
Table 4.2: Evolution of Syrian exports of selected important fresh fruit since 2002.............. 58
Table 8.1: Socio-demographic characteristics of farmers and farm attributes....................... 171
Table 8.2: Channels for marketing FFV.................................................................................. 175
Table 8.3: Farmers’ current agricultural practices on their farm ............................................. 178
Table 8.4: Farmers’ general attitudes about organic farming ................................................. 182
Table 9.1: Cronbach’s alpha for the TPB survey results........................................................ 187
Table 9.2: Expectancy-value model of behavioural beliefs of farmers towards producing organic fruit and vegetables within the next five years on their own farms................................................................. 193
Table 9.3: Expectancy-value model of control beliefs of farmers towards producing organic fruit and vegetables within the next five years ................................................................. 194
Table 9.4: Expectancy-value model of normative beliefs of farmers towards producing organic fruit and vegetables within the next five years ................................................................. 195
Table 9.5: Direct measures of farmers’ attitudes towards producing organic fruit and vegetables within the next five years on their own farms ....................................................... 197
Table 9.6: Direct measures of farmers’ subjective norms towards producing organic fruit and vegetables within the next five years on their own farms ....................................................... 199
Table 9.7: Direct measures of farmers’ perceived behavioural control towards producing organic fruit and vegetables within the next five years on their own farms....................................................... 202
Table 9.8: Direct measures of farmers’ behavioural intention to produce organic fruit and vegetables within the next five years on their own farms....................................................... 203
Table 9.9: Prediction of behavioural intention from attitudes, subjective norms, and perceived behavioural control: regression coefficients and R-squares...................... 205
Table 9.10: Prediction of behaviour from behavioural intention, attitudes, subjective norms, and perceived behavioural control: regression coefficients and R-squares.......................... 206
Table 9.11: Reliability and convergent validity tests of the TPB model of Syrian farmers to adopt organic FFV production within the next five years............... 212

Table 9.12: Discriminant validity of the TPB model: Fornell-Larcker criterion; comparisons among four PLS-SEM solutions of the TPB model....................... 215

Table 9.13: Collinearity assessment of PLS-SEM structural model............................... 218

Table 9.14: Total effect coefficients of TPB constructs on behavioural intention to adopt organic FFV production (BI) and adoption decision (CONV) within the next five years ................................................................. 219

Table 9.15: Predictive accuracy and predictive relevance of the TPB model of Syrian farmers of FFV ................................................................. 222
List of figures

Figure 3.1: Development of German imports of fresh fruit and vegetables (potatoes are excluded) since 2001 ................................................................. 25

Figure 3.2: Structure and evolution of German imports of fresh fruit since 2001 .............. 27

Figure 3.3: Structure and evolution of German imports of fresh vegetables (including potatoes) since 2001 ................................................................. 28

Figure 3.4: Development of German imports of fresh fruit from the leading suppliers in Mediterranean Non-EU countries ......................................................... 30

Figure 3.5: Development of German imports of fresh vegetables (including potatoes) from the leading suppliers in Mediterranean Non-EU countries ......................... 30

Figure 3.6: German imports of fresh fruit from the leading suppliers in Mediterranean Non-EU countries in 2015 ........................................................ 31

Figure 3.7: German imports of fresh vegetables (including potatoes) from the leading suppliers in Mediterranean non-EU countries 2015 .............................................. 31

Figure 4.1: Syrian production of fresh fruit and vegetables since 2000............................ 50

Figure 4.2: Syrian governorates production of fresh fruit and vegetables in 2009 ............. 51

Figure 4.3: Syrian governorates production of fresh fruit and vegetables in 2013 ............. 51

Figure 4.4: Production development of main fresh fruit cultivated in Syria since 2000 ....... 53

Figure 4.5: Production development of main fresh vegetables cultivated in Syria since 2000 ................................................................................................. 53

Figure 4.6: Export development of Syrian fresh fruit and vegetables since 2002 ............... 55

Figure 4.7: Export development of fruit and vegetables in Syria since 2002 ...................... 56

Figure 4.8: Syrian value chain of fresh fruit and vegetables (domestic and export markets) ........................................................................................................... 64

Figure 4.9: Regional distribution of Syrian fresh fruit and vegetable exports in 2011 .......... 68

Figure 4.10: Main destinations of Syrian fresh fruit and vegetable exports in the Arabic region in 2009 ................................................................................. 70

Figure 4.11: Main destinations of Syrian fresh fruit and vegetable exports in the Arabic region in 2011 ................................................................................. 70
List of figures

Figure 4.12: Structure of Syrian exports of fresh fruit and vegetables to Iraq in 2011 ................................................................. 71
Figure 4.13: Structure of Syrian exports of fresh fruit and vegetables to Saudi Arabia in 2011 ................................................................. 73
Figure 4.14: Syrian fresh fruit and vegetable exports to Europe in 2011 ................................................................. 77
Figure 5.1: Theory of Reasoned Action ................................................................................................................................. 87
Figure 5.2: The Theory of Planned Behaviour (after Fishbein and Ajzen 2010: 22) ................................................................. 90
Figure 6.1: Map of Syria with agro-ecological zones and water basins ................................................................................................. 114
Figure 6.2: Map of coastal region in Syria ................................................................................................................................. 117
Figure 7.1: Simple structural equation model ................................................................................................................................. 133
Figure 7.2: Measurement model in PLS-SEM: An illustrative example ................................................................................................. 141
Figure 7.3: PLS structural model of the Theory of Planned Behaviour ................................................................................................. 146
Figure 7.4: Simplified PLS-SEM of behavioural intention to convert to organic farming with its direct predictor constructs within the TPB framework ................................................................................................. 168
Figure 9.1: Model of the theory of planned behaviour for the adoption of organic fruit and vegetables by Syrian farmers within the next five years ................................................................................................. 186
Figure 9.2: Visualisation of PLS-SEM algorithm of the TPB model of Syrian farmers to adopt organic FFV production within the next five years ................................................................................................. 209
Figure 9.3: Visualisation of PLS-SEM bootstrapping of the TPB model of Syrian farmers to adopt organic FFV production within the next five years: T-test of parameters’ significance levels ................................................................................................. 210
# List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>European Mediterranean Association Agreement</td>
</tr>
<tr>
<td>AMI</td>
<td>Agrarmarkt Informations-Gesellschaft mbH (Germany)</td>
</tr>
<tr>
<td>BLE</td>
<td>Bundesanstalt für Landwirtschaft und Ernährung (Germany)</td>
</tr>
<tr>
<td>BLW</td>
<td>Bundesamt für Landwirtschaft (Switzerland)</td>
</tr>
<tr>
<td>BÖLW</td>
<td>Bund Ökologische Lebensmittelwirtschaft e. V. (Germany)</td>
</tr>
<tr>
<td>CBS</td>
<td>Central Bureau of Statistics (Syria)</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EUREPGAP</td>
<td>Good Agricultural Practice of the Euro-Retailer Produce Working Group</td>
</tr>
<tr>
<td>Euromed</td>
<td>Euro-Mediterranean Partnership</td>
</tr>
<tr>
<td>GAFTA</td>
<td>Greater Arab Free Trade Agreement</td>
</tr>
<tr>
<td>GCSAR</td>
<td>General Commission for Scientific Agricultural Research (Syria)</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit (Germany)</td>
</tr>
<tr>
<td>GLOBALGAP</td>
<td>Global Good Agricultural Practice</td>
</tr>
<tr>
<td>IFAD</td>
<td>International Fund for Agricultural Development</td>
</tr>
<tr>
<td>IFOAM</td>
<td>International Federation of Organic Agriculture Movements</td>
</tr>
<tr>
<td>IOAS</td>
<td>International Organic Accreditation Service</td>
</tr>
<tr>
<td>ITC</td>
<td>International Trade Centre</td>
</tr>
<tr>
<td>EDPA</td>
<td>Export Development and Promotion Agency (Syria)</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation</td>
</tr>
<tr>
<td>FFV</td>
<td>Fresh Fruit and Vegetables</td>
</tr>
<tr>
<td>FiBL</td>
<td>Research Institute for Organic Farming</td>
</tr>
<tr>
<td>Freshfel</td>
<td>European Fresh Produce Association</td>
</tr>
<tr>
<td>GEMAAP</td>
<td>General Establishment for Storing and Marketing of Agricultural and Animal Products (Syria)</td>
</tr>
<tr>
<td>MAAR</td>
<td>Ministry of Agriculture and Agrarian Reform (Syria)</td>
</tr>
<tr>
<td>MOAN</td>
<td>Mediterranean Organic Agriculture Network</td>
</tr>
<tr>
<td>NAPC</td>
<td>National Agricultural Policy Center (Syria)</td>
</tr>
<tr>
<td>NRDC</td>
<td>Natural Resources Defense Council</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>NGOs</td>
<td>Non-Governmental Organisations</td>
</tr>
<tr>
<td>PGS</td>
<td>Participatory Guarantee Systems</td>
</tr>
<tr>
<td>PUF</td>
<td>Peasants’ Unions Federation (Syria)</td>
</tr>
<tr>
<td>SAPEA</td>
<td>Syrian Agricultural Products Exporters Association</td>
</tr>
<tr>
<td>SBOA</td>
<td>Syrian Bureau of Organic Agriculture</td>
</tr>
<tr>
<td>SOEL (SÖL)</td>
<td>Stiftung Ökologie und Landbau (Germany)</td>
</tr>
<tr>
<td>SOFA</td>
<td>Saudi Organic Farming Association</td>
</tr>
<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade And Development</td>
</tr>
<tr>
<td>WTO</td>
<td>World Trade Organisation</td>
</tr>
</tbody>
</table>
List of acronyms

AVE  Average Variance Extracted
CBSEM  Covariance-based Structural Equation Modelling
CFA  Confirmatory Factor Analysis
EFA  Exploratory Factor Analysis
GLS  Generalised Least Squares
ha  Hectare
LISREL  Statistical software package for Linear Structural Relations
MT  Metric Tons
ML  Maximum Likelihood
OLS  Ordinary Least Squares
PLS  Partial Least Squares
PLS-PM  Partial Least Squares Path Modelling
PLS-SEM  Partial Least Squares Structural Equation Modelling
Q^2  Stone-Geisser’s criterion: Coefficient of predictive relevance
R^2  Coefficient of determination
SEM  Structural Equation Modelling
SmartPLS  Statistical software package for Partial Least Squares Structural Equation Modelling
SPSS  Statistical Package for the Social Sciences
TPB  Theory of Planned Behaviour
TRA  Theory of Reasoned Action
VBSEM  Variance-based Structural Equation Modelling
VIF  Variance Inflation Factor
US$  United States Dollar
€  Euro
1 Introduction

1.1 Overview over organic market trends

Organic production has become a well-known way to mitigate some of the major global problems, which have occurred over the last century. It is known that organic farming has the potential to preserve environmental resources from degradation, to reduce the rate of climate change, to alleviate socio-economic challenges in rural development and ultimately to provide healthy and environmental friendly food products for the final consumers. In this respect, there are plenty of studies that support the role of organic agriculture in both developed and developing countries (e.g. Darnhofer 2005, Devi et al. 2007, Kilcher 2007, Santucci 2008, Lobley et al. 2009, Mahmoudi et al. 2009, Sarker and Itohara 2011, Halberg and Muller 2013, Bennett and Franzel 2013, Moeskops and Cuoco 2014, Ayuya et al. 2015). According to Lernoud and Willer (2015: 43ff), the organic agricultural land worldwide has significantly expanded over the recent past. While only about 11 million ha were certified organically in 1999, this value reached 43 million ha in 2013. Almost two million producers in the world were reported growing according to organic principles in 2013, and the majority of them were located in developing countries (Lernoud and Willer 2015: 56f).

In line with the expansion of certified organic areas, the international demand for organic produce has been booming. While the global market for organic food and drink was about US$ 15 billion in 1999, this value has reached US$ 80 billion in 2014 (Sahota 2016: 134). This substantial increase was mainly driven by modern value chains in the developed countries, wherein large food companies and leading retail chains are the main players in this respect. Europe and North America have been by far the main markets for organic products; they represented more than 90% of the global markets for these goods over the last two decades (Sahota 2016: 135). This growth was accompanied by growing organic imports from developing countries (Raynolds 2004, Willer and Kilcher 2011, Kledal et al. 2013, Hermansen et al. 2013).

Though the market of organic products represents only a tiny share of the global food market (less than 1% of global food sales were organic in 2013) (Gould 2015: 137, Sahota 2015: 122), it has the potential for further development. This development can be stimulated by broadening of existing groups of organic consumers within developed countries on the one
hand (AMI 2015: 186f), and by the increasing awareness for organic produce among consumers in developing countries and countries in transition on the other hand (Kledal et al. 2013: 153, Sahota 2016: 136f). The emerging trend in developing countries to consume organic products can be seen as a consequence of the growing concerns of consumers in these countries for healthy diets after several food scandals in recent past (Hoi et al. 2009, Burger and Warner 2012, Asadollahpour et al. 2013, Kledal et al. 2013, He et al. 2015, Lewis et al. 2015, Wai 2015, Sahota 2016). Moreover, the growing segment of urban middle class consumers in many of the developing countries together with the rapid growth of supermarket chains and emerging specialised organic outlets may further contribute to expand the domestic demand for organic products in the developing countries (Reardon et al. 2003, Dung and Ngan 2012, Asadollahpour et al. 2013, Kledal et al. 2013).

Among organic products, the market for organic fresh fruit and vegetables (FFV) has grown in the recent past in many developed countries. Within the European Union (EU) for instance, organic FFV are the forerunner within the organic segment, and they represented about 20% of many national organic markets in 2013. That is particularly true in the cases of Germany, Italy, Ireland, Norway, Sweden and Switzerland (Willer and Schaack 2015: 202f). Concerning the German market of organic FFV, the German consumption of these products almost tripled between 2000 and 2014. While the shares of organic fresh vegetables, organic fresh fruit, and organic fresh potatoes were only about 2.1%, 1.2%, and 1.5% of the respective total German consumption of these products in 2000 (Hamm et al. 2002: 36), these values in 2014 have reached 5.8%, 4.9%, and 4.8%, respectively (AMI 2015: 10). This substantial increase in the consumption of organic FFV between 2000 and 2014 reflects the growing importance of these products in the consumption pattern in Germany. Like many northern European countries, the largest part of organic FFV consumed in Germany is imported. Most of German imports of FFV are from the neighbouring EU Member States. Yet, a substantial part of organic FFV is also imported from out the EU boarders. That is particularly true for exotic and out-of-season (organic) FFV due to climatic conditions (e.g. Hattam 2006a, Kleemann 2014, Willer and Schaaack 2015). Against this background, it can reasonably be assumed that exporting organic FFV to the German market could offer great opportunities to countries like Syria to fill the supply deficits for such products in Germany. With such market data in mind, this dissertation will investigate the market potential of exporting Syrian organic FFV to the German market.
1.2 Overview over the organic sector in Syria

The concept of organic agriculture is relatively new in Syria, for producers and consumers equally (NAPC 2008). Organic agriculture was first introduced to Syria in the mid-1990s through a pioneer company producing olives. At the beginning of the last decade, some scientists at Syrian universities, officials in the Ministry of Agriculture and Agrarian Reform (MAAR) and leader farmers have shown interests in organic farming as an alternative option to conventional agriculture. For this purpose, seminars were held at the University of Aleppo and at the headquarter of MAAR in Damascus in 2002 and 2003, and since then this sector has been strengthened by the involvement of an increasing number of producers, institutions and foreign donors (Al-Bitar 2005: 150f, Santucci 2010: 47). Most notably, the FAO and the EU (Italy) have been supporting the development of the organic farming sector since 2005 through a project titled Institutional Development of Organic Agriculture in Syria (GCP/SYR/011/ITA). This project was launched in September 2005 and ran until the end of 2012. The objectives of this project were helping Syria to elaborate a national legal framework of organic farming, elaborating a proposal for the organisation of a national certification body, and training of technicians, researchers and leader farmers (Al-Bitar 2008: 155f, NAPC 2015a: 139ff).

Yet, the main achievement of this project was drafting a law to govern and promote organic farming in Syria, which was finally issued as a Legislative Decree 12 on January 2012 related to organic farming in Syria (MAAR 2012a). This legislative framework was adopted after a long time of preparation, taking into account international standards of organic produce such as EU and IFOAM regulations as benchmarks. The operational instructions of this law were then issued in October 2012 with Resolution No. /247/T. Subsequently, two Resolutions (No. /66/ and No. /151/T) pertaining to the technical annexes of Syrian organic law were released in March 2013 and in June 2013, respectively (MAAR 2015a). The aim of Syrian organic law and its related resolutions were to lay down the regulations and legislations needed for the development of organic sector in Syria. These include an institutional framework for organic production, principles and rules of organic production, certification of organic products, assessment of the matching of certified organic products to Syrian organic regulation, use of indicators and labels that refer to products organically produced, and finally marketing of organic products (MAAR 2012a, NAPC 2015a). Under the Legislative Decree of Syrian organic law, the Syrian Bureau of Organic Agriculture (SBOA) was also founded at the
MAAR in 2012, as the competent and responsible authority, which is eligible to provide control service over the implementation of Syrian organic regulation as well as the supervision of certification bodies that operate in Syria (MAAR 2012a).

Table 1.1 depicts the development of the certified organic area in Syria from 2000 onwards. Syria has witnessed a rapid increase in the total area of organic produce that is certified by foreign certification bodies from only 74 ha in 2000 to 35,400 ha in 2009. This value however sharply decreased in the following years. This decline can be explained by the drops of Syrian exports of organic cotton to the global markets due to the international economic crisis, followed by the deleterious consequences of Syrian war-crisis on this sector from the beginning of 2012.

Among the crops, which have been certified organically in Syria until 2012, cotton had by far the largest share (> 60%) followed by olives and grapes. Small areas of tobacco, coriander, cumin, lentils, medical plants, citrus fruit, tomatoes, garlics, onions and sweet peppers were also organically certified in 2011 (GCSAR 2012, NAPC 2015a: 142f). The majority of these products were destined for export while no data are available for the domestic consumption of organic products in Syria (NAPC 2015a: 142f). In 2012, the MAAR, represented by the SBOA and the General Commission of Syrian Agricultural Research (GCSAR), launched a project to build a detailed database for all Syrian certified organic products. So far, no official data has been published about organic production of FFV in Syria. The best available estimates of certified organic FFV indicated areas smaller than 1000 ha in most of the observed years. Yet, the availability of such data and details about the development of organic area are currently rearmost, and the statistics of MAAR provide only roughly estimations for the arable areas in the relatively safe regions of Syria, while such data are not available for the rest regions due to the current war. Nevertheless, according to the EC 2015a and BLW 2015, there are recently at least five European organic certification bodies, which have been active again in the inspection and certification process of organic products in Syria. This could be a good indicator for reviving the organic sector in Syria.
### Table 1.1: Development of Syrian organic agriculture

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of organic operators</th>
<th>Organic area (ha)</th>
<th>% of total agricultural area</th>
<th>Certification bodies</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1</td>
<td>74</td>
<td>0.001%</td>
<td>Soil Association Certification Ltd.</td>
<td>SOEL Survey 2002 (Yussefi and Willer 2002)</td>
</tr>
<tr>
<td>2001</td>
<td>1</td>
<td>74</td>
<td>0.001%</td>
<td>Soil Association Certification Ltd.</td>
<td>SOEL Survey 2003 (Yussefi and Willer 2003)</td>
</tr>
<tr>
<td>2002</td>
<td>1</td>
<td>74</td>
<td>0.001%</td>
<td>Soil Association Certification Ltd.</td>
<td>SOEL Survey 2004 (Willer and Yussefi 2004)</td>
</tr>
<tr>
<td>2003</td>
<td>2</td>
<td>260</td>
<td>0.002%</td>
<td>Soil Association Certification Ltd.</td>
<td>SOEL Survey 2005 (Willer and Yussefi 2005), Al-Bitar 2005</td>
</tr>
<tr>
<td>2004*</td>
<td>26</td>
<td>12,500</td>
<td>0.09%</td>
<td>Soil Association Certification Ltd.</td>
<td>FiBL Survey 2005/2006 (Willer and Yussefi 2006)</td>
</tr>
<tr>
<td>2005</td>
<td>n.a.</td>
<td>20,500</td>
<td>0.15%</td>
<td>Soil Association Certification Ltd.</td>
<td>Santucci 2008</td>
</tr>
<tr>
<td>2006</td>
<td>3256</td>
<td>30,493</td>
<td>0.22%</td>
<td>Soil Association Certification Ltd.; SGS S.A.</td>
<td>FiBL Survey 2008 (Willer et al. 2008), MOAN Survey 2007 (Al-Bitar 2008)</td>
</tr>
<tr>
<td>2007</td>
<td>n.a.</td>
<td>28,461 (+1,931 in conversion)</td>
<td>0.20%</td>
<td>n.a.</td>
<td>FiBL-IFOAM Survey 2009 (Willer and Kilcher 2009)</td>
</tr>
<tr>
<td>2008</td>
<td>n.a.</td>
<td>25,660 (+8,000 wild collection)</td>
<td>0.18%</td>
<td>n.a.</td>
<td>FiBL Survey 2010 (Willer and Kilcher 2010)</td>
</tr>
<tr>
<td>2009</td>
<td>n.a.</td>
<td>35,439</td>
<td>0.25%</td>
<td>n.a.</td>
<td>FiBL-IFOAM Survey 2011 (Willer and Kilcher 2011)</td>
</tr>
<tr>
<td>2010</td>
<td>2458</td>
<td>19,987 (+8,000 wild collection)</td>
<td>0.14%</td>
<td>n.a.</td>
<td>FiBL-IFOAM Survey 2012 (Willer and Kilcher 2012)</td>
</tr>
<tr>
<td>2011</td>
<td>n.a.</td>
<td>25,614</td>
<td>0.18%</td>
<td>ICEA; SGS S.A.</td>
<td>GCSAR 2012, NAPC 2015a, Syrian Bureau of Organic Agriculture (SBOA)</td>
</tr>
<tr>
<td>2012</td>
<td>&gt; 1100</td>
<td>&gt; 1,000 ha</td>
<td>&gt; 0.01%</td>
<td>IMC</td>
<td>NAPC 2015a, Syrian Bureau of Organic Agriculture (SBOA 2015)</td>
</tr>
<tr>
<td>2013</td>
<td>n.a.</td>
<td>19,987 n.a.</td>
<td>n.a.</td>
<td>Control Union Certifications B.V.; ECOCERT SA; IMO Germany; IMO Switzerland; CCPB Srl. (Source: EC (2015a, 2016) and BLW 2015)</td>
<td>Pugliese et al. 2015</td>
</tr>
</tbody>
</table>

n.a.: No data available.

Notes: 1. Number of organic operators may include organic producers, processors, certifiers and exporters. There is no concrete data available about each stakeholder group.
2. According to the available sources, the fifth column of this table shows the European certification bodies are working in Syria; however, this list might be not complete.
3. The data available in 2004 includes fully converted land as well as “in conversion” land.

Source: Own elaboration based on multiple information sources.
1.3 Research problem

Market demand is the key driver for the development of certified organic farming in Syria. Development of organic farming in Syria is export-geared like in many developing countries in the Mediterranean region. The local market of organic products is just dawning and is affected by the modest purchasing power of consumers, poor coordination among the different stakeholders, as well as the scarcity of governmental aids to support the demand side of the organic development by public relation campaigns, etc. (Pugliese 2007: 93, Malorgio 2008: 2, Santucci 2010: 50).

The presence of temperate climatic conditions in the Mediterranean region makes it easy for many countries in this region (including Syria) to cultivate a wide range of agricultural crops including FFV. Many of these crops are still produced under traditional production systems, which rely upon using low chemical inputs, frequent use of manual work, and using animal manure to enhance soil fertility. Thus, many Southern Mediterranean countries were inspired by the benefits that can be obtained from the adoption of an organic production system (Malorgio 2008: 2f, Santucci 2010: 49f, Pugliese et al. 2015: 216ff). Exporting organic FFV to the western and northern European markets could offer a high added value for producers and exporters of organic products (Pugliese et al. 2015: 217ff). Due to this reason, Southern Mediterranean countries started developing certification procedures for the recognition of their organic produce in the EU markets (Malorgio 2008: 2f, Pugliese et al. 2015: 217).

Though policy makers in Syria considered organic agriculture as a small move into a niche export market, a growing number of Syrian farmers and scientists as well as experts, who had been working in Syria before 2012, believed that organic farming could represent an alternative approach to traditional farming systems (Santucci 2010: 47f).

With retail sales estimated at 23.9 billion € in 2014, the EU is the second biggest market for organic product in the world after the United States of America (Willer and Schaack 2016: 199). Within the EU, Germany is by far the largest market for organic products accounting for one third of the EU organic market and 13% of the aggregate international market of these products in 2014 (AMI 2015, Willer and Schaack 2016). According to AMI reports (2011 and 2015), the retail sales of organic food products in Germany have approximately increased by fourfold from 2.0 billion € in 2000 to 7.9 billion € in 2014. The substantial growth of the organic market in the EU in general and Germany in particular can be perceived as a
reflection of the increase in consumers’ awareness related to health concerns, environmental consciousness and animal welfare issues (e.g. Hamm et al. 2002, Wier and Calverley 2002, Aschemann et al. 2007, Juárez Hernández 2010, Bravo et al. 2013, von Meyer-Höfer et al. 2013). Yet, the German consumption of organic products is much higher than the organic domestic production. This gap in supply is mainly filled by the import from other EU Member States. With respect to German imports of organic FFV, considerable amounts are also imported from the outside of the EU boarders; this principally includes tropical and out-of-season organic FFV (AMI 2015, BÖLW 2016). Therefore, southern Mediterranean countries including Syria have good opportunities to cover the needs of the German market of (organic) FFV, especially outside of the main harvesting season in Central Europe. Yet, the opportunities of introducing Syrian organic FFV into the German market can be hypothesised to face some of difficulties as e.g.:

1) The organic sector in Syria is relatively young and as a result, most of the Syrian farmers have a little experience or may be not aware of organic agriculture at all.

2) To produce FFV organically, farmers and other stakeholders in the value chain should fully understand the market prospects of their goods and formulate the relevant sales strategy. Accordingly, producing FFV organically would require an overall plan covering the value chain from the farm level to the final market.

3) German importers of organic FFV have certain requirements of the quality standards and expectations on minimum quantities that are hard to achieve for the young and scattered organic sector in Syria. Moreover, Syrian farmers and exporters of organic FFV must also be subject to the EU certification bodies of organic produce in order to export their potential organic produce of FFV to the German market.

4) Issues of logistics and delivery performance of (organic) FFV would be decisive factors for the success of any potential value chain of fresh produce from Syria to the German market, since FFV are sensitive and perishable products starting from the farm up to the final consumer.

5) Many farmers in Syria would expect governmental support or direct support from international institutions to lower the financial risks of converting their farms to
organic agriculture. The governmental support can be given in different forms, such as, direct area-based aid for farmers converting their farms to organic agriculture, subsidies for the certification costs, and/or governmental extension programmes, which would provide special consulting services on organic farming and its importance.

6) A guaranteed price premium would be an important motivation for Syrian farmers of FFV to go organic, however, yield risk and marketing risk would be major concerns of the Syrian farmers when they consider converting their farms to organic.

7) Finally, many farmers may not accept the organic production system in general as they see it is a step back in technological development or they have a fear of yield losses through weed and pest proliferations if they are not allowed to use chemical pesticides.

1.4 Research objectives

An essential pillar for the modernisation of the Syrian agricultural sector depends on further promotion of Syrian exports of high value added products such as organic FFV products. Regardless of the growing importance of the organic agricultural sector in Syria over the past few years (pre-war in Syria), up to the author’s knowledge, there was no study in Syria so far that explored and analysed the determining factors for organic FFV adoption among Syrian farmers as well as the export of these products to the EU market. The overarching aim of the present dissertation therefore focuses on exploring and identifying the market potential of Syrian exports of organic FFV to Germany. To fulfil this aim, the main objectives of the present study are the following:

I. To explore if German importers and wholesalers of organic FFV see market opportunities for Syrian organic products and what requirements in terms of quality and quantity they have. For this purpose, the perspectives of German wholesalers of organic products who are importing organic FFV from the Mediterranean Non-EU countries have to be investigated. Their recommendations to Syrian stakeholders are also explored regarding how to strengthen the Syrian export of organic FFV to the high value markets in the EU.
II. To determine the obstacles Syrian producers and exporters face when exporting agricultural products to Germany. For this purpose, the perspectives of Syrian exporters of (organic) FFV have to be explored. Syrian exporters’ opinions have also to be investigated about how to overcome these existing barriers, which have been hurdles the exports of Syrian (organic) FFV to the EU markets in general and to Germany in particular, alongside with their perceptions of what is needed to exploit available trade opportunities of the organic FFV in these markets.

III. To investigate whether Syrian farmers of FFV can imagine converting their farms to organic production, as well as the underlying reasons why they do so or not. For this purpose, attitudes and intentions of Syrian farmers of FFV towards conversion of their farms to organic farming have to be investigated. That is together with an in-depth investigation of the factors that influence farmers’ decision to adopt organic FFV.

1.5 Procedure and structure of the dissertation

The objectives of this research were addressed by a twofold methodological approach combining expert interviews and a farmer survey. While expert interviews were conducted with German and Syrian wholesalers of (organic) FFV in 2011, the farmer survey was administrated with Syrian farmers of FFV from November 2012 till May 2013. This dissertation consists of 10 chapters and is organised as follows:

Chapter 2 “Motivations and barriers to adopt organic agriculture: Literature review” provides a comprehensive overview of the principal factors that have been found relevant in farmers’ decisions to adopt organic agriculture. In this respect, especially studies from developing countries have been reviewed.

Chapter 3 “Analysis of German imports of (organic) fresh fruit and vegetables” provides a comprehensive overview of the current status of FFV imports to the EU in general and to Germany in particular. Emphasis is given to the present situation of the German consumption and imports of organic FFV. By means of qualitative expert interview, the main section of this chapter investigates the opinions and perspectives of interviewed German importers regarding the import of organic FFV originating from Syria. The key results from these interviews are then presented. These include first, the quantities of organic FFV imported by the interviewed
companies from the Mediterranean Non-EU countries. Second, the qualitative requirements of organic FFV, the future trends of organic FFV imports from the Mediterranean Non-EU countries. Third, the potential opportunities for Syrian organic FFV export to the German market. Finally, the recommendations for Syrian exporters and farmers in order to get better access for their organic FFV to the German market.

Chapter 4 “Analysis of Syrian exports of (organic) fresh fruit and vegetables” gives a detailed description about the development of fruit and vegetable production in Syria. An in-depth analysis of the situation of the Syrian export value chain of (organic) FFV and its destination markets is then given. Through qualitative expert interviews, the opinions and perspectives of interviewed Syrian exporters towards the exports of organic FFV to the EU markets have been explored. The results obtained from these interviews provide further information about the Syrian export value chain of FFV with an emphasis on the export barriers in general and to the EU in particular. Finally, solutions suggested by the interviewed exporters are presented regarding how to overcome existing barriers of exporting (organic) FFV to the EU markets as well as how to exploit available trade opportunities of the high value FFV to Germany.

Chapter (5) “Theoretical framework: The reasoned action approach” introduces the social-psychological framework which is used in this dissertation for modelling farmers’ decisions to produce organic FFV within the next five years. In this context, the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the expectancy-value model are presented. A particular focus in this chapter is set on providing a detailed explanation of the TPB and its components: behaviour, behavioural intention, attitudes, subjective norms, perceived behavioural control, salient beliefs and background factors. The literature review on the application of the TPB in an agricultural context is then highlighted. The final part of this chapter is dedicated to elicit and design the part of farmer survey regarding the application of the TPB in the present dissertation.

Chapter 6 “Methodology: Data collection” and Chapter 7 “Methodology: Data analysis” elucidate the methods and procedures which have been used for the farmer survey in this dissertation. Chapter 6 provides a justification for the choice of the coastal region in Syria as the study area and vindicates the choice of FFV farming system within this area as the sampling frame for conducting the farmer survey. The methods of data collection and sampling procedure are then justified and finally, questionnaire design and procedures of data
Chapter 7 provides an overview of the statistical tools and analysis methods which have been used to analyse the data of the farmer survey. For this purpose, different univariate, bivariate and multivariate analysis methods have been performed by means of two statistical packages SPSS 20 and SmartPLS 2.0. Particular attention in this chapter is given to Partial Least Squares Structural Equation Modelling (PLS-SEM) as the main analysis method for examining and estimating the parameters of the adopted TPB model in the present research.

Chapter 8 “Farmer survey: Descriptive analysis” and Chapter 9 “Farmer survey: TPB model results” present the results of farmer survey. Chapter 8 outlines farmers’ and farm characteristics, highlights farmers’ practices for maintaining soil fertility and pest control, and finally, explores the general attitudes of farmers about the different aspects of organic farming. The results of this chapter serve as background factors for deepening the understanding of farmers’ decisions to convert their farms to organic FFV production within the next five years. Accordingly, Chapter 9 provides the results of the adopted TPB model. In this vein, the results of expectancy-value models of belief-based measures of behavioural intention are provided. Then, the separate and combined effects of attitudes, subjective norms, and perceived behavioural control on the behavioural intention and associated behaviour (i.e. conversion to organic FFV production within the next five years) are presented. Finally, this chapter is dedicated to present the key findings obtained from the PLS-SEM estimation of the adopted TPB model, wherein a comprehensive examination of the set of salient beliefs, attitudes, subjective norms, and perceived behavioural control, behavioural intention and behaviour is provided.

Chapter 10 “Discussion and conclusions” discusses the key findings of the present dissertation and synthesises the main issues arising from the investigation of research questions and study objectives. Merits and limitations of the current study are then highlighted and discussed. Subsequently conclusions are drawn and recommendations are given to promote the Syrian organic sector. Directions and areas of potential future research regarding the adoption of organic farming among Syrian farmers are then suggested at the end of this dissertation.
2 Motivations and barriers to adopt organic agriculture: A literature review

2.1 Introduction

In many developed countries, organic farming is recognised as a good alternative to conventional agriculture as the former ensures sustainable food production and consumption (e.g. Tuomisto et al. 2012, Lee et al. 2015). On the other hand, the essential driver of many developing countries to produce organic products is often to find market opportunities in developed countries (e.g. Djokoto 2015, Reganold and Wachter 2016). Though economic aspects are very important factors for the adoption, there are other factors that might determine farmers’ willingness to adopt organic farming in developing countries. These factors may include: socio-economic development, decreasing soil degradation, natural resources conservation, food self-sufficiency, and ultimately sustainable rural development (e.g. Scialabba and Hattam 2002, Lee 2005, Badgley et al. 2007, UNCTAD 2008, Buerkert and Schlecht 2012, Santacoloma 2012, Schoonbeek et al. 2013, Wollni and Andersson 2014, Ayuya et al. 2015, Halberg et al. 2015).

Based on empirical research, a broad range of factors have been identified as relevant in influencing farmers’ decision to adopt organic production. These factors include socio-economic characteristics of the farmers, farm characteristics, farmers’ attitudes and perceptions of risk, sources of information, national agricultural policies, governmental and NGOs initiatives, membership in a farmer association, etc. In the following two sub-sections of this chapter, the factors that motivate or/and hinder farmers to adopt organic agriculture are reviewed. While in the first sub-section, evidence from developed countries is given, the second sub-section provides a detailed review of several studies from the developing world. At the end of this chapter, particular attention is given to review studies relating to the adoption of organic FFV production among farmers in developing countries.

2.2 Factors influencing farmers’ decision towards organic production in developed countries

There are many studies from the developed countries that have reviewed and documented the factors, determinants, motivations and/or barriers to adopt organic farming (e.g. Fairweather 1999 in New Zealand; Darnhofer et al. 2005 in Austria; Kallas et al. 2010 in Spain; Khaledi et al. 2010 in Canada; Läpple 2010 in Irland; Illiopoulou et al. 2011 in Greece; Stolze and Jahrl
2011 in the EU; Kings and Ilbery 2012 in England; Latruffe et al. 2013 in France; Delbridge 2014 in the United States). Though there is a general agreement that market demand is the main driver of organic development in developed countries, there are differences in approaches that have been adopted to promote organic production in those countries. While in many developed countries (such as many of the EU countries), organic agriculture has appealed substantial government support, in other countries such as the United States and Australia, government support has played a comparative smaller role (Paull 2011).

Over the last decades, the positive development of organic agriculture in Europe has been driven by three key factors: market access and consumer demand, legislation development and legal protection, and public agricultural policy (e.g. Stolze and Lampkin 2009, Sanders et al. 2011, Sahm et al. 2013, Willer and Meredith 2015). Foremost, subsidies and area payments dedicated for organic production were the most important factors, especially in the EU and in Switzerland (Padel 2001, Hamm and Gronefeld 2004, Zander et al. 2008, Offermann et al. 2009, Daugbjerg et al. 2011, Stolze and Jahrl 2011). The relative difference between the payments received by organic agriculture and its non-organic counterparts also showed a significance influence in farmers’ decisions towards organic agriculture. The reliability and the continuity of governmental support together with governmental commitment about the role of organic farming in the agricultural policy were also found to be substantial for an organic adoption (Stolze and Jahrl 2011, Sanders et al. 2011, Muller 2014). Other important incentives in developed countries were market access and consumer demand (Hamm and Gronefeld 2004, Lamine and Bellon, 2009, Veldstra et al. 2014) or just higher profits with organic farming practices (De Cock 2005, Nemes 2009, Peterson et al. 2012). Functioning of the organic supply chain and growing consumer demand for organic products were essential factors for the further development of organic farming in many European countries (Stolze and Jahrl 2011, Sanders et al. 2011), together with the development of private organic standards and labelling schemes (Janssen and Hamm 2014, Willer and Meredith 2015). National action plans also demonstrated a strong positive contribution on the farmers’ decision to convert to organic farming in many European countries (Dabbert et al. 2004, Stolze and Jahrl 2011, Sanders et al. 2011). Furthermore, farm and farmer characteristics together with technical efficiency played an important role for the decision to adopt organic farming (Lobley et al. 2009, Geniaux et al. 2011). Non-economic factors of an adoption of organic farming were also important, such as health or environmental aspects (Padel 2001, Koesling et al. 2008, Best 2010, Cranfield et al. 2010, Läpple 2010), spatial
distribution of organic farming and neighbourhood influences on further adoption (Geniaux et al. 2011, Lewis et al. 2011, Läpple and van Rensburg 2011, Schmidtner et al. 2012, Bjorkhaug and Blekesaune 2013), and organic farming as a lifestyle (Peterson et al. 2012). Farmers’ attitudes and their knowledge about organic production also contributed positively to some extent in influencing the development of organic farming (Stolze and Jahrl 2011, Muller 2014). In other studies, ethics in the organic movement (Freyer et al. 2015), moral and social concerns in addition to economic factors played a significant role in influencing farmer decisions to adopt organic farming (Koesling et al. 2008, Mzoughi 2011), but there are fewer studies from developed countries determining these factors as important ones.

Though many of the abovementioned studies indicated that opportunities may exist in organic farming as a good alternative of its conventional counterpart, the decision to adopt organic farming is perceived as complex and many conventional farmers are reluctant to convert their farms. Many conventional farmers were sceptic about the sustainability of organic returns and that organic markets were unreliable as farmers were risk-averse and believed that the prices of organic produce could fall in the long term, eroding the attractiveness of an organic farming system (Constance and Choi 2010, Sahm et al. 2013, Delbridge 2014, Nelson et al. 2015). Multiple studies showed that conventional farmers may have negative perceptions of organic farming systems, and may also be confronted by institutional and production challenges during the transitional periods (e.g. pest control without chemical pesticides, low yield, lack of familiarity with technical aspects, etc.) and thus establishing organic farms will be a difficult option (Fairweather 1999, Cranfield et al. 2010, Khaledi et al. 2010, Constance and Choi 2010, Flaten et al. 2010, Ponti et al. 2012, Delbridge 2014). Barriers by organic certifications and its associated bureaucratic requirements also represented a serious challenge for many conventional farmers (Strochlic and Sierra 2007, Cranfield et al. 2010, Delbridge 2014, Nelson et al. 2015). Perceived differences in institutional support for organic production and its conventional counterpart also acted as a further barrier for organic adoption. This mainly refers to governmental policies which restrict the types of technical and financial support needed for ameliorating the awkward features of the adoption process (Constance and Choi 2010, Nelson et al. 2015). Other barriers to adopt organic farming were lack of organic crop insurance policies, lack of database for organic produce, lack of accessible organic network, lack of policy implications for improving the organic sector, and scarcity of research support dedicated to organic farming compared to that in the conventional agricultural system (Delbridge 2014). Several studies stated that many conventional farmers disagreed about the
philosophy of organic farming, arguing that organic farming is not the solution to feed the growing world population (Constance and Choi 2010, Ponti et al. 2012, Sutherland 2013, Delbridge 2014). Further studies even showed that many organic farmers in different developed countries reversed their farms back to conventional farming. Reasons for the abandonment of organic farming were mainly due to economic motives, which were better in conventional farming than those in organic farming. Problems with certification and control, difficulties regarding organic production techniques as well as the farms’ macro environment were other important factors to relinquish organic practices (Kaltoft and Risgaard 2006, Harris et al. 2008, Reissig et al. 2009, Flaten et al. 2010, Sahm et al. 2013).

2.3 Adoption of organic farming in developing countries: An overview

2.3.1 Factors influencing the decision towards organic production in developing countries

Over the last decade, a growing number of researchers have explored the adoption of organic farming in the developing world (e.g. Salame 2004 in Lebanon; Bello 2008 in developing countries; Sarker and Itohara 2008 in Bangladesh; Sotwa et al. 2009 in Zimbabwe; Sharifi 2010 in Iran; Karki et al. 2011 in Nepal; Radwan et al. 2011 in Egypt; Pornpratansombat et al. 2011 in Thailand; Panneerselvam et al. 2013 in India; Cukur 2015 in Turkey; Olabisi et al. 2015 in Philippines; Shaban 2015 in Palestinian territories; Ullah et al. 2015 in Pakistan; Bravo-Monroy et al. 2016 in Colombia). According to Thamaga-Chitja and Hendriks (2008), the conditions that support an adoption of organic farming among farmers in the developing world were generally dissimilar to those in developed countries. That is particularly true regarding the national policy settings (especially those concerning financial support for an adoption of organic farming), farmers’ financial resources, access to markets, presence of strong domestic demand for organic products, access to extension and consulting services as well as appropriate training facilities (Thamaga-Chitja and Hendriks 2008). Similarly, other studies from developing nations also stated that the conditions favouring organic farming in different developing countries are substantially different from those in developed countries (e.g. Scialabba 2000, Karki et al. 2011, Buerkert and Schlecht 2012, Schoonbeek et al. 2013).

Most of the research studies on important factors for the adoption of organic farming in developing countries had a focus on farmers and farm characteristics as determinants of

On the other hand, many conventional farmers in different developing countries perceived organic farming as a risky option and specified different barriers that can hamper the adoption of organic production. The most frequently named barriers to adopt organic farming were lack of a reliable market for organic produce (Hattam et al. 2012, Asadollahpour et al. 2013, Soltani et al. 2014, Altarawneh 2015, Bett and Ayieko 2016), absence of a price premium for organic produce (Rattanasuteerakul and Thapa 2012), and organic farming had high inspection and certification costs (Asadollahpour et al. 2013, Hattam et al. 2012). Other important barriers were lack of national policy to support organic farming (Seufert 2013,
Motivations and barriers to adopt organic agriculture: A literature review


Hereafter, few studies from developing countries are briefly reviewed with particular attention at the motivations and barriers that influence the decision of farmers regarding the conversion to organic production. The study of Demiryürek et al. (2012) elicited the risk attitudes of organic and conventional farmers in Turkey, and determined additional barriers that are important for the conversion to organic production. The study identified farmers’ risk perceptions as critical barriers for conversion to organic production. Findings also showed that organic farmers were less risk-averse than conventional farmers. Farm and farmer characteristics were also found to play a role in farmer’s decision toward organic farming, especially the education level of the farmer, farm income, off-farm jobs, farm size and its location. The study further indicated that through providing farmers with appropriate extension services, training programmes related to organic practices and raising their education level can facilitate the conversion process among conventional farmers to a large extent. Comparable results have been found in another study from Turkey on the factors determining the conversion to organic dairy production (Cukur 2015) and in two studies on the determinants of organic agriculture in Egypt (Radwan et al. 2011, Guesmi et al. 2014).

The studies of Asadollahpour et al. (2014a) and Soltani et al. (2014) investigated the status of organic farming in Iran and farmers’ motivations and barriers to adopt organic production. Though the adoption rate of organic production in Iran is still relatively low, farmers perceived organic farming positively and many of them demonstrated a high motivation to convert. Farmers mentioned economic, health, environmental, and ideational motivations as relevant factors in their decision to convert to organic production. Nevertheless, major constraints were still remaining. Many farmers, who had positive attitudes towards organic farming, were confronted with economic, technical and institutional barriers. These barriers were multifaceted and can be summarised as follows: (i) challenges by the certification
process due to the lack of national certification bodies together with limited international cooperation in this area, and difficulties in marketing the organic produce (ii) risk factors in production including low organic yields, problems regarding maintaining soil fertility and intensive pest infection, and (iii) lack of governmental support, lack of access to credits, lack of expertise extension services and reliable technical support sources needed for guiding farmers in the conversion process (Asadollahpour et al. 2014a, Soltani et al. 2014).

The study of Tashi (2015) on the prospects of organic agriculture in Bhutan showed that many farmers had positive attitudes towards organic practices, since many farms are scattered in remote areas and still cultivating traditionally without using chemical inputs. However, there were barriers which impeded the adoption. Farmers were mainly confronted with the certification process which was often perceived long lasting, expensive and arduous, since it was performed by foreign certification bodies. Additionally, there were acute labour shortages as many young people between 15-29 years moved to urban areas. This exodus is mainly driven by people beliefs that the chances to finding a better paid job and/or study purpose in the urban areas are far higher than those available in the rural areas. The study of Tashi (2015) also compared the potential performance and prospects of organic farming with its conventional counterpart in Bhutan. By using paddy rice as a model crop, this study investigated the differences between organic and conventional systems in terms of yield difference, soil fertility and profitability. Findings indicated that there were no significant differences regarding the soil fertility and yields between both systems in most of the investigated regions of Bhutan. Furthermore, farmers and experts perceived the economic performance of organic farming to be superior to conventional farming as long as farmers receive a price premium (Tashi 2015: 114f).

2.3.2 Factors influencing the decision towards organic FFV in developing countries

Over the past few years, a growing number of studies have been identified with respect to the adoption of organic FFV in developing countries (e.g. Dung and Ngan 2012, Oluwasusi 2014, Binta and Barbier 2015, Ghadimi et al. 2015, Patidar and Patidar 2015, Vidyarthi 2015, Bett and Ayieko 2016). In the following paragraphs, the key findings of these studies are briefly reviewed regarding the factors that may influence the decision towards organic FFV production.
Dung and Ngan (2012) found that Vietnamese farmers, who were cultivating vegetables organically, were mainly driven by the financial and technical supports of donors and international development agencies as well as by the expectation of a price premium for their produce on international and emerging domestic markets. The continuity of aids and support was reported to be a decisive factor for those farmers to continue with organic practices. To expand the organic vegetable production, further initiatives are still required to establishing a close collaboration between farmers and other stakeholders (wholesalers, traders, exporters) in the value chain of organic vegetables (Dung and Ngan 2012: 1f).

Oluwasusi (2014) explored perceptions and attitudes of vegetable farmers in South West of Nigeria towards organic agriculture practices. The study generally revealed that the majority of farmers had overwhelming positive attitudes towards different aspects of organic farming. Farmers perceived that organic farming improves soil fertility and soil structure of their vegetable farms, strengthens the use of indigenous knowledge, and increases farmer income by reducing the costs of external inputs. Furthermore, Oluwasusi (2014) found that different socio-demographic variables (farming experience, farm size, household size, membership of organisation, and sources of information) were positively correlated with farmers’ attitudes towards organic farming practices. Yet, for increasing the adoption level among farmers, this study suggested the importance of further integration of research based extension services on relevant organic practices as an auxiliary factor to traditional farming, adaptable and sustainable to local situations of vegetable farmers (Oluwasusi 2014: 223f). Similar results were found in a previous study from Nigeria (Oyesola and Obabire 2011).

The study of Binta and Barbier (2015) in Senegal compared the economic and environmental performances of organic and conventional farming. The study stated that organic agriculture is superior to conventional agriculture in terms of mitigating the environmental problems and the economic performance whenever local markets are present. The study findings further indicated that horticultural farmers are motivated to convert to organic production systems as a result of the negative impacts of the intensive use of chemical inputs which have led to negative consequences on the health of the farmers as well as the surrounding environment. Furthermore, the study demonstrated that many farmers would be motivated to convert to an organic production system when they obtain a price premium, in order to deal with the risk derived from the expected low yields during and after the conversion process (Binta and Barbier 2015: 17f).
Patidar and Patidar (2015) found that the majority of Indian farmers (in Madhya Pradesh) generally had positive perceptions and attitudes towards organic farming. Socio-demographic variables such as farmer’s age, educational attainment, farm size, benefits (yield and profits), and social aspects were found to have significant relationships with farmers’ attitudes towards organic farming. Unexpectedly, the costs associated with organic farming had no influence on their attitudes to adopt, since farmers in this study perceived the benefits that can be obtained from organic farming much higher than the associated costs (Patidar and Patidar 2015: 269f).

Vidyarthi (2015) identified the factors that influence the decisions of Thai vegetable farmers for converting or not converting to organic farming. Findings showed that development projects such as government supported projects had been important to support farmers to overcome the initial constraints at the adoption process of organic vegetable production. Thus, such projects played an indispensable role by providing the direct assistance in the conversion process (e.g. organised training and on-site experiments), providing farmers with the organic inputs (e.g. organic seeds) as well as by marketing initiatives for farmer’s organic produce. The economic aspects (profitability of organic farming and price stability of organic produce) were also critical factors in farmers’ decisions to convert to organic farming alongside with the continuity of farmers’ participation in governmental development projects. Conventional farmers within the same project area were more risk-averse than farmers who converted to organic farming. They demonstrated that conventional farming is more economically viable than organic farming and they also perceived that there are only little opportunities for organic produce to be marketed with a price premium. They indicated further that many farmers, who converted to organic farming, may abandon organic practices once the governmental project is over (Vidyarthi 2015: 8f).

The study of Ghadimi et al. (2015) investigated the factors influencing farmers’ decision to adopt organic potato production in Freidan/Iran. The results showed that the majority of farmers applied intensive chemical inputs (both fertilisers and pesticides) on their farms, since maintaining soil fertility and combating pest are serious challenges. The study revealed that farmers were unwilling to convert their farms to organic management in the short term; nevertheless this option was not excluded in the long term. Like in other studies, this study showed that the adoption of organic potato production was determined by the availability of
technical training and supervision, certification, and marketing initiatives of organic produce as well as the availability of organic inputs (Ghadimi et al. 2015: 273f).

Bett and Ayieko (2016) investigated the economic potential for a conversion to organic farming among vegetable farmers in Kenya. Findings indicated that the absence of clear information about the economic viability of organic farming was a major reason to hamper the further adoption by farmers in this region. Moreover, the low yields of organic farming during the transition period and following years after the adoption accompanied by the lack of a price premium were found as barriers for conversion. The study also showed that organic farming has a good potential in the long term. That is particularly due to the continuous increase in the prices of external inputs (fossil-based agrochemicals) on the one hand and the low economic returns to conventional agricultural production alongside with high transaction costs and existing market risks, on other hand. Thus, this study suggested that organic farming can represent a good alternative option for the existing crop patterns as it can reduce the dependence of farmers on the expensive external inputs and contribute to food diversification (by cultivating vegetables, maize and beans in crop rotation system) in addition to its role at mitigating the negative effects on the environment (Bett and Ayieko 2016: 1f). Similarly, Ayuya et al. (2015) found that certified organic farming can mitigate poverty among small-scale farmers in Kenya (Ayuya et al. 2015).
3 Analysis of German imports of (organic) fresh fruit and vegetables

3.1 Introduction

The international value chain of FFV plays a significant role for meeting the increased demand of these products in the EU markets. This is particularly true for exotic and out of season FFV, in addition to those FFV produced in the EU for which the demand in this market exceeds the local supply (Kleemann 2014, CBI Market Intelligence 2015a). Such demand can offer lucrative export opportunities for growers and exporters in third countries, where they can fill niches in high value markets like Germany (Chevalley 2015, CBI Market Intelligence 2015b). Nevertheless, high value market entry is strongly restricted for many FFV. The major challenge faced by many exporters of these products, particularly in the developing countries, is to meet the sanitary, phytosanitary and technical requirements of the importing countries (WTO 1998, Freshfel 2015, CBI Market Intelligence 2015c). Moreover, rising consumer’s consciousness in the developed countries over the quality criteria of fresh produce increases the challenge for suppliers in the developing countries to meet higher levels of quality requirements (CBI Market Intelligence 2012, Chevalley 2015). Therefore, implementing food quality and safety programmes is a necessary step for both growers and exporters in the developing countries in order to strengthen their ability to compete and access the EU markets (Hart et al. 2005, UNCTAD 2007, FAO 2010, Malorgio and Felice 2014, Ben Zid 2014, CBI Market Intelligence 2015d).

Based on interviews with German importers of organic FFV, the intention of this chapter was to shed light on the German requirements for the import of organic FFV from the Mediterranean Non-EU countries. A particular focus was to explore the German import potential for organic FFV originating from Syria and the respective requirements. For a better understanding of the current situation of the German import of organic FFV from the Mediterranean Non-EU countries, it was initially important to provide more information on the current trends of the EU and German markets of (organic) FFV.

This chapter is structured as follows; first, the current status of imports of FFV to the EU and Germany is presented. Particular attention is given to German imports of FFV from the Mediterranean Non-EU countries. Second, the present situation of German consumption and import of organic FFV is given. Third, countries of origin of imported organic FFV to
Germany are stated. Finally, results from interviews with German importers, containing further information on these companies’ imports from the Mediterranean Non-EU countries, and their requirements on imports from Syria, are presented.

3.2 EU production and imports of fresh fruit and vegetables

The EU is one of the world’s major producers of FFV and one of the leading markets of these goods (EC 2014, CBI Market Intelligence 2015a: 1, Eurostat 2016: 87). While apples and citrus fruit are the leading fruit produced in the EU, potatoes and tomatoes are the most important among the vegetable varieties. Statistically speaking, the EU production of FFV has been relatively stable over the previous few years (CBI Market Intelligence 2015a: 1). By checking the Eurostat database of FFV from 2001 onwards, it shows that the EU production of FFV was not consistently available for some Member States, which makes it difficult to calculate the aggregate production at the EU level. However, the best available estimates show that the EU in 2010 produced about 36.6 million tons of fresh fruit, 40.4 million tons of fresh vegetables and 56.3 million tons of potatoes (Freshfel 2012, Eurostat database). At the EU Member States’ level, the available Eurostat data show that FFV production in many of these countries was more or less steady from 2001 to 2014, though there were some fluctuations in production of certain FFV varieties in few of the observed years (Eurostat database). This variation in production was mainly due to adverse climatic conditions in the main regions of production, which led to lower harvests (CBI Market Intelligence 2015a: 4).

Almost all of FFV produced in the EU is internally consumed. Southern EU Member States (Italy, Spain and France) are the major producers and consumers of FFV in the EU. While the Netherlands are also an important producer of fresh vegetables, Germany is a large consumer of FFV in the EU just after Italy, Spain and France (CBI Market Intelligence 2015a: 1f).

Besides being the third major producer of FFV after China and India, the EU is the world’s largest importer of FFV (EC 2014, Chevalley 2015, CBI Market Intelligence 2015a). The EU imports of FFV were relatively stable over the past few years. In 2014, about 11 million tons of fresh fruit and 2.1 million tons of fresh vegetables were imported from Extra-EU countries, accounting for 42% and 14% of the EU imports\(^1\) of these goods, respectively. This can be attributed to the fact that the EU imports of fresh vegetables are rather characterised by Intra-

\(^1\) The EU imports of FFV in the present dissertation refer to both Extra-EU imports and Intra-EU imports. While Extra-EU stands for the imports from outside of the EU boarders, Intra-EU imports refer to trade activities among the EU Member States.
EU trade than are fruit imports. Furthermore, more than 90% of EU imports of FFV from Extra-EU countries were sourced from developing countries. While Costa Rica, Ecuador, Colombia, South Africa, and Turkey were the major suppliers of fresh fruit into the EU in 2014, Mediterranean Non-EU countries accounted for the vast majority of EU imports of fresh vegetables (Eurostat database, ITC database, CBI Market Intelligence 2015a).

In 2014, bananas were, with 4.8 million tons, by far the most important fresh fruit imported to the EU from Extra-EU countries. Citrus fruit imports from the Extra-EU countries also accounted for a significant share, amounting to roughly 1.6 million tons. Approximately 750 thousand tons of the EU imports of citrus fruit varieties originated from the Mediterranean Non-EU countries, of which Turkey, Egypt, Morocco and Israel were the most important exporters. Grapes were the third most important fruit imported from the Extra-EU into the EU market; more than 900 thousand tons were imported in 2014. Roughly 30% of the EU import of grapes was originating from the Mediterranean Non-EU countries; again, among these Turkey, Egypt, Morocco and Israel were the most significant suppliers (Eurostat database, CBI Market Intelligence 2015a).

Among fresh vegetable assortments, tomatoes were the most important vegetables imported to the EU market from the Extra-EU countries. Approximately 500 thousand tons of tomatoes were imported in 2014. The Mediterranean Non-EU countries were the main partners for the EU, providing more than 90% of the EU import of tomatoes from Extra-EU countries (mainly Morocco, Turkey, Israel, Tunisia and Jordan). About 400 thousand tons of onions, garlic and leeks were imported to the EU in 2014. Among the Extra-EU countries, the Mediterranean Non-EU countries constituted 24% of the EU import of onions, garlic and leeks from Extra-EU. Among 210 thousand tons of leguminous vegetables (beans and peas) which were imported into the EU from Extra-EU countries in 2014, about 70% were originating from the Mediterranean Non-EU countries (particularly Morocco and Egypt) (Eurostat database, ITC database).

### 3.3 German production and imports of fresh fruit and vegetables

According to Statistisches Bundesamt (2016), Germany produced about 1.12 million tons of fresh fruit, 3.4 million tons of fresh vegetables, and about 7.5 million tons of potatoes in 2015. Eurostat database shows that German production of FFV was relatively stable over the last
decade, though some variations in production can still be observed. Apples represented the most important fruit produced in Germany (0.97 million tons in 2015) together with considerable amounts of pears, cherries, plums and different berries. Germany also cultivated wide assortments of vegetables (outdoors and greenhouses), however, cabbages, carrots, onions and asparagus were the most important in terms of quantities in 2015 (Statistisches Bundesamt 2016).

German production of FFV (excluding potatoes) only covered a small part of the domestic consumption of these products. Within the EU, Germany is the leading importer of FFV. Figure 3.1 shows the development of German imports of FFV (excluding potatoes) from 2001 onwards. German imports of FFV considerably increased over the last years, where the import volume reached 8.55 million tons in 2015, increasing by 2% over the previous year, and almost by 10% over the year 2010. About 88% of German imports of FFV were from other EU Member States. Throughout the observed years, Figure 3.1 shows that Germany imported more fresh fruit than fresh vegetables by volume. Spain, the Netherlands, Italy and Belgium were the main suppliers of FFV to the German market (Eurostat database, CBI Market Intelligence 2015a). However, it should be noted that the Netherlands and Belgium are large importers of FFV from the Extra-EU countries, and they then re-export substantial amounts of these products to other EU Member States, including Germany (ITC database, CBI Market Intelligence 2015a).

Figure 3.1: Development of German imports of fresh fruit and vegetables (potatoes are excluded) since 2001

Source: Own elaboration based on ITC calculations based on UN Comtrade statistics.
3 Analysis of German imports of (organic) fresh fruit and vegetables

Figure 3.2 depicts the structure and evolution of German imports of fresh fruit since 2001. Throughout the observed years, the vast majority of German imports of fresh fruit were bananas and plantains, citrus fruit, pome fruit, melons, stone fruit, and grapes.

- Bananas and plantains: They were by far the most important fruit imported into the German market; in 2015, roughly 1.4 million tons were mainly imported from Extra-EU countries (Ecuador, Colombia and Costa Rica were the key suppliers).

- Citrus fruit: imports of citrus fruit also had a significant share of German imports of fresh fruit; almost 1.1 million tons were imported in 2015, Spain, Italy and the Netherlands were the main suppliers. Only 148 thousand tons of the German import of citrus fruit were imported from Extra-EU countries in 2015, 36 thousand tons of which were originating from the Mediterranean Non-EU countries (among these, Israel, Turkey, Morocco, and Egypt were the main exporters of citrus fruit into Germany, as it is illustrated in Figure 3.6).

- Pome fruit: More than 810 thousand tons of different assortments of pome fruit (e.g. apples) were exported to Germany in 2015, and Italy, the Netherlands and France were the main exporters of these goods. Roughly 110 thousand tons of the German imports of pome fruit were sourced from Extra-EU countries in 2015, only 10 thousand tons of which were originating from the Mediterranean Non-EU countries (among these, Serbia, Turkey and Bosnia and Herzegovina were the most important suppliers) (see Figure 3.6).

- Stone fruit: About 470 thousand tons of stone fruit were exported into Germany in 2015; the majority of these came from Spain and Italy. Extra-EU countries accounted only for 40 thousand tons of German imports of stone fruit in 2015, of which three-fourth came from the Mediterranean Non-EU countries. Turkey, Bosnia and Herzegovina, Macedonia and Serbia were the most important suppliers (see Figure 3.6).

- Melons: Germany also imported significant amounts of melons, reaching 500 thousand tons in 2015. Spain and Italy were the main exporters of melons into the German market. About 65 thousand tons of melons were from Extra-EU countries in 2015, only about 9 thousand tons of which came from the Mediterranean Non-EU countries, mainly from Turkey, Morocco and Serbia (see Figure 3.6).

- Grapes: Germany imported 405 thousand tons of grapes in 2015. Italy was the leading supplier of grapes into German market. 50% of German imports of grapes came from
Extra-EU countries in 2015 including 62 thousand tons imported from the Mediterranean Non-EU countries, mainly from Turkey and Egypt (see Figure 3.6).

- Additionally, Germany imported considerable amounts of tropical and sub-tropical fruit (such as papayas, figs, pineapples, avocados, guavas, passion fruit), mainly from overseas.

**Figure 3.2: Structure and evolution of German imports of fresh fruit since 2001**

Source: Own elaboration based on ITC calculations based on UN Comtrade statistics.

Notes: Pome fruit are apples, pears and quinces. Stone fruit are apricots, cherries, peaches, nectarines, plums and sloes. Citrus fruit are oranges, mandarins and clementines, lemons and limes, grapefruit and other citrus fruit, and other fruit refers to varieties of fresh fruit that are not classified elsewhere.

Figure 3.3 illustrates the structure and evolution of German imports of fresh vegetables (including potatoes) since 2001. Tomatoes were by far the most important assortment of fresh vegetables imported to the German market, amounting to almost 750 thousand tons in 2015. The Netherlands, Spain and Belgium were the major exporters of tomatoes to Germany. Only 48 thousand tons of tomatoes were from Extra-EU countries, of which 46 thousand tons were from the Mediterranean Non-EU region. More than 510 thousand tons of cucumbers and gherkins were also imported into Germany in 2015, only 8 thousand tons of which were from Extra-EU countries.
3 Analysis of German imports of (organic) fresh fruit and vegetables

Extra-EU countries. This amount was mainly from the Mediterranean Non-EU countries. Of these, Bosnia and Herzegovina, and Turkey were the main suppliers while Egypt and Jordan provided relatively small quantities (see Figure 3.7). Though Germany is a key producer of potatoes in the EU, large quantities were exported to this market throughout the observed years. In 2015, Germany imported roughly 470 thousand tons of potatoes, mainly from the Netherlands, France and Spain. From Extra-EU, Germany imported about 70 thousand tons of potatoes, mainly from Egypt and Israel. Among 310 of carrots and turnips were imported to Germany in 2015, about 20 thousand tons were from Extra-EU countries, mainly from Israel. Among 40 thousand tons of German import of leguminous vegetables (beans and peas), about the half were imported from Extra-EU countries in 2015, including 9 thousand tons from Egypt and Morocco. Moreover, Germany also imported significant amounts of other fresh vegetables (lettuce, onions, cabbages, and other vegetables, etc.) from the Intra-EU and Extra-EU countries, including the Mediterranean countries.

Figure 3.3: Structure and evolution of German imports of fresh vegetables (including potatoes) since 2001

Source: Own elaboration based on ITC calculations based on UN Comtrade statistics.
Note: Other vegetables includes peppers (capsicum), aubergines, asparagus, celeries, spinach, mushrooms, truffles, globe artichokes, pumpkins, squashes, guards, and other fresh vegetables which have not been classified elsewhere.
3 Analysis of German imports of (organic) fresh fruit and vegetables

3.3.1 German imports of fresh fruit and vegetables from the Mediterranean Non-EU countries

Figure 3.4 and Figure 3.5 exhibit the development of German imports of fresh fruit and fresh vegetables (including potatoes) from the leading suppliers in the Mediterranean Non-EU countries, respectively. Throughout the observed years, Germany imported significant amounts of FFV from this region. From 2010 onwards, about 200±30 thousand tons of fresh fruit and 220±20 thousand tons of fresh vegetables were exported to Germany by the leading suppliers in this region. Figure 3.4 indicates that Turkey was by far the most important exporter of fresh fruit into German market followed by Israel, Egypt, Morocco, Tunisia, Serbia, Bosnia and Herzegovina, and Macedonia. Figure 3.5 also shows that Morocco, Israel, Egypt and Turkey were the main suppliers of fresh vegetables into Germany from 2001 onwards. In few of the observed years, other countries in this region (including Syria) also exported some small quantities of FFV (less than 500 tons) into the German market. It was thus difficult to display it in the figures designed to illuminate German imports of FFV from this region. Nevertheless, an overview of Syrian exports of FFV to the EU is given in Chapter 4.

Figures 3.6 and 3.7 depict the structure of German imports of fresh fruit and fresh vegetables (including potatoes) from the leading suppliers in the Mediterranean Non-EU countries in 2015, respectively. Among these countries, Turkey was the principal exporter of different assortments of fresh fruit (such as grapes, stone fruit, citrus fruit, melons), accounting alone for more than 60% of German imports from this region in 2015. Israel, Egypt and Morocco also exported significant amounts of fresh fruit (mainly citrus fruit and grapes) to the German market. Regarding German imports of fresh vegetables from this region, Figure 3.7 shows that Morocco and Egypt were the most important suppliers in 2015, followed by Israel and Turkey. Potatoes, tomatoes, carrots and cucumbers were by far the most important fresh vegetables imported to Germany in 2015 (see Figure 3.7).

Furthermore, under the bilateral association between Mediterranean Non-EU countries and the AA (EU-Med. Association Agreement), further market liberalisation and customs reduction for FFV in the next years will provide new opportunities for Non-EU Mediterranean countries to increase their exports of FFV into the EU markets, including Germany.
Figure 3.4: Development of German imports of fresh fruit from the leading suppliers in Mediterranean Non-EU countries

Source: Own elaboration based on ITC calculations based on UN Comtrade statistics.

Figure 3.5: Development of German imports of fresh vegetables (including potatoes) from the leading suppliers in Mediterranean Non-EU countries

Source: Own elaboration based on ITC calculations based on UN Comtrade statistics.
Figure 3.6: German imports of fresh fruit from the leading suppliers in Mediterranean Non-EU countries in 2015

Source: Own elaboration based on ITC calculations based on UN Comtrade statistics.

Figure 3.7: German imports of fresh vegetables (including potatoes) from the leading suppliers in Mediterranean non-EU countries 2015

Source: Own elaboration based on ITC calculations based on UN Comtrade statistics.

Note: Other vegetables includes peppers (capsicum), aubergines, asparagus, celeries, spinach, mushrooms, truffles, globe artichokes, pumpkins, squashes, guards, and other fresh vegetables which have not been classified elsewhere.
3.4 German imports of organic fruit and vegetables

According to the Bund Ökologische Lebensmittelwirtschaft (BÖLW 2016), the German market of organic products is by far the largest within the EU. Over the past years, Germany witnessed a gradual increase in the overall sales of organic products. While the turnover of the organic market in Germany was 5.90 billion in 2010 (BÖLW 2011), this value reached 7.91 billion € in 2014 (AMI 2015), and is estimated at 8.62 billion € in 2015, representing an increase of 46% compared to 2010 and 9% over the previous year (BÖLW 2016). The engine of this growth was the increase of organic food trade by 7.2%, which is significantly higher than the growth of the overall organic market in 2014 compared to the previous year. Respectively, about 4.8%, 4.9% and 5.8% of the total sales of fresh potatoes, fresh fruit, and fresh vegetables (excluding fresh potatoes) sold in Germany in 2014 were organic (AMI 2015: 10). The sales volume of organic fresh fruit reached 166 thousand tons in 2014, representing an increase by 1% compared to the previous year and by 8% compared to 2010. Like organic fresh fruit, the sales volume of organic fresh vegetables in Germany also increased over the past few years, reaching 164 thousand tons in 2014, an increase of 5% compared to its volume in 2010. Unlike organic FFV trends, the German consumption of organic fresh potatoes witnessed fluctuations over the last few years. The sales volume of fresh organic potatoes in 2014 was 68.5 thousand tons, indicating substantial decrease by 12% compared to the previous year and by 9% compared to 2010 (AMI 2015: 160ff).

Organic bananas, apples, lemons, oranges, kiwifruit, grapes and strawberries witnessed significant increases in consumption over the last decade (AMI 2015: 160). Bananas were by far the most important organic fruit consumed in Germany, accounting for 46% of the sales volume of organic fresh fruit in 2014. Organic apples, lemons and oranges also had substantial shares in the German market for organic fresh fruit, reaching 15%, 10.4% and 10.3%, respectively in 2014 (AMI 2015: 13f). Among organic fresh vegetables, carrots were the most important by volume, reaching about 40% of the sales volume of organic fresh vegetables in 2014. Organic tomatoes also had a significant share, accounting for 11% of fresh organic vegetables consumed in Germany in 2014. Organic onions, cucumbers, zucchini, asparagus, and sweet peppers were also important with shares 7.1%, 5.4% and 3.5%, 2.4% and 2.4% respectively of the market for fresh organic vegetables in 2014 (AMI 2015: 14).
Germany was by far the largest European importer of organic FFV in 2014. German demand for these products was much higher than organic production. This gap was filled by importing considerable amounts of organic FFV from both Intra-EU and Extra-EU. Organic fresh fruit have the highest import ratio in comparison to the domestic market. In 2014, half of the organic apples and all organic bananas, oranges, lemons and other citrus varieties consumed in Germany were imported. On the other hand, more than 55% of organic fresh vegetables and 40% of organic fresh potatoes in the German market were imported. Thus, about 95% of sweet peppers, 88% of organic tomatoes and 78% of organic cucumbers and zucchini consumed in the German market were imported. 45% of organic carrots and 47% of organic onions were also imported by Germany in 2014 (AMI 2015: 58).

Germany mainly imported organic FFV from Intra-EU countries. In 2014, the Netherlands supplied Germany with organic tomatoes, sweet peppers, cucumbers, salads, chicory, mushrooms and cabbages. Spain provided the German market with wide assortments of organic citrus fruit, stone fruit, avocados, tomatoes, zucchini and spring vegetables such as carrots, onions, and potatoes. German organic imports from Italy were mainly citrus fruit, stone fruit, apples, grapes, kiwifruit, tomatoes, cauliflower, broccoli, zucchini, spring potatoes, and spring vegetables. France also exported to the German market, a variety of organic vegetables, such as cauliflower, broccoli, salads, onions, herbs, garlics, and organic fruit, such as citrus fruit, stone fruit, grapes and pears. Additionally, Austria provided the German market mainly with organic potatoes (AMI 2015: 58).

Though German imports of organic FFV from Extra-EU countries were less significant compared to those from Intra-EU countries, Germany imported considerable amounts of organic exotic and counter-season fruit from overseas. For instances, Germany imported bananas from Dominican Republic, Ecuador and Peru, mangoes and coconuts from Dominican Republic, kiwifruit and apples from New Zealand, mangos and grapes from Brazil, grapes from South Africa and India, avocados from Mexico, mangos from Brazil, Ecuador, and Peru, citrus fruit from South Africa, pineapples from Costa Rica, and pears, apples, asparagus, onions and garlics from Argentina. German imports of organic FFV from the Mediterranean Non-EU countries are discussed below in the following section of this chapter (AMI 2015, Oral interviews with German importers of Organic FFV).
3 Analysis of German imports of (organic) fresh fruit and vegetables

3.5 Interviews with German importers of organic fruit and vegetables

With means of a semi-structured questionnaire, nine German import companies for organic FFV were interviewed in 2011. Seven of these interviews took place at Biofach fair in February 2011 and the other two were conducted via telephone in March and April 2011. Each of these interviews lasted around 20 minutes. The interviews focused only on the import of organic FFV from Mediterranean Non-EU countries. Thereby, the import companies were asked about their individual import levels for organic FFV originating from the Mediterranean Non-EU countries, the times of import, quality requirements and related logistics. They were also asked to identify which assortments of FFV had been short in supply over the past two years, and to indicate the periods of the year during which such shortage in supply took place. Further, they were asked for an assessment of potential future imports from Syria and their recommendations for Syrian exporters and farmers of (organic) FFV in order to obtain a better access for their goods to the EU in general and to Germany in particular. For a comprehensive overview of interview questions, the questionnaire which had been used to guide the expert interviews are given in Appendix 1.1.

The aim of these interviews was to provide Syrian exporters and farmers of FFV with information on the main development in the organic FFV market in Germany, including the potential for exporting their (organic) FFV into the German market.

In the following results sections, selected verbatim quotations are presented to provide a more detailed insight into the views and opinions of the interviewed German importers. When words or sentences within a quotation were omitted, it is marked with: (…). Directly after the quotation, the ID of the interviewee is provided in brackets. The letter G in the ID stands for a German interviewee.

3.5.1 German imports of organic fruit and vegetables from Mediterranean Non-EU countries

According to the interviewed companies, Germany mainly imported fresh organic vegetables and large amounts of fresh organic fruit from the EU neighbouring countries. Spain and the Netherlands were by far most important, followed by Italy and Belgium. It should be noted

---

2 Biofach is the world largest organic trade fair and is held in Nuremberg (business-to-business only). It is ideally suited to scope the organic market and meeting trade people.
that organic FFV wholesale companies in the Netherlands and Belgium also import from all over the world and redistribute in the EU markets, including Germany. Some of the organic FFV were imported from the Mediterranean Non-EU countries, particularly in the off-season in the EU countries. Few of the interviewed importers indicated that in winter time and early spring, the market usually experiences huge deficits in some assortments of organic FFV; therefore there is constantly a room to be filled from out of the EU borders. “High import duties are imposed on local fruit and vegetables varieties at times of sufficient domestic provision within the EU, (...). However, during periods when there is a shortage in German supply, lower import duties and higher import quotas are set for these fruit and vegetables species” (Interviewee G2). Among the Mediterranean Non-EU countries, the interviewed companies stated Israel, Egypt, Turkey and Morocco as the main suppliers for organic FFV. The following results represent the most important varieties of organic FFV imported in 2010 by the interviewed companies from these countries.

- **Israel**: Most of the interviewed companies had imported organic FFV from Israel. Considerable amounts of early potatoes were imported from there, 3000 tons of which were imported by the interviewed companies during the first half of the year. Round, bush and cherry tomatoes were the most important assortments from there; roughly 1000 tons were imported mainly in winter and spring as well as in periods when the Intra-EU production during the season was not sufficient. Sweet peppers were also imported from Israel in winter and early spring; however, the quota was only about 250 tons. Smaller quantities of carrots, avocados and sweet potatoes were also exported to Germany from January until September and small quantities of Chinese cabbages in winter time. Mangoes, wild tomatoes and spring vegetables were also imported, but only in very small amounts.

- **Egypt**: Most of the interviewed companies indicated import of organic FFV from Egypt. Early potatoes, Citrus fruit, white table grapes and seedless grapes were the main organic fruit. Interviewed companies indicated that they imported about 2500 tons of potatoes during January until May. About 200 tons of oranges and 150 tons of mandarins and clementines were mainly exported at the beginning of summer. 150 tons of white table grapes were imported in April, May and June, and around 150 tons of grapes (seedless) from May until July. Smaller amounts were recorded for fresh vegetables: 100 tons of green beans and peas were exported throughout the year. Dry
Analysis of German imports of (organic) fresh fruit and vegetables

onions and garlics were exported from January until July. Further vegetables exported to Germany in small quantities were artichokes, leeks and green onions, sweet peppers, small cucumbers and some other spring vegetables.

➤ Turkey: Some of the interviewed companies reported imports from Turkey. Pomegranates were the most important organic fruit; 300 tons were imported in the late autumn and at the beginning of winter time. 100 tons of citrus fruits, namely grapefruit and easy peeler citrus fruit, were also imported from December until the middle of February. Cherry tomatoes were imported year round, adding up to 100 tons. Despite Turkey being the leading exporter of conventional FFV into the EU and Germany among other Mediterranean Non-EU countries, the Turkish export of organic FFV was relatively small.

➤ Morocco: Some of the interviewed companies import organic vegetables from Morocco. Tomatoes (round, bush and cherry) were by share the most important organic vegetables, with more than 200 tons imported from there in winter and spring. About 100 tons of citrus fruit (mainly grapefruit and easy peelers) was also imported in April, May and September. Smaller quantities of cucumbers and zucchini (30 and 70 tons, respectively) were also imported during the season in Morocco. Furthermore, sweet peppers, pumpkins, melons, green beans, peas, and fresh herbs (dill, parsley, chives, and corianders) were also imported from Morocco, however with very small quantities.

Despite the rather small quantities of organic FFV which were imported from the Mediterranean Non-EU countries, some of the interviewed importers saw potential for further imports of organic FFV from the region over the next years (after 2011).

• Regarding the organic FFV from the Mediterranean Non-EU countries, which had been short in supply over the past two years (before 2011), the interviewed importers indicated that there were some assortments of organic FFV for which opportunities for higher imports existed. Within organic fruit, the interviewed importers saw citrus fruit, white table grapes and seedless table grapes as most important. Within citrus fruit, lemons experienced a deficit in supply between September and November; grapefruit, mandarins and oranges from February until September. The available quantities of
Among organic vegetables, the interviewed importers stated that tomatoes were the most important vegetables, which had witnessed a deficit in supply in 2009 and 2010. Winter time and early spring were usually the seasons of tomatoes’ shortages in Germany. However, few of the interviewed importers mentioned that they also expected an additional demand for imported organic tomatoes during other periods of the year. Supply deficits also existed for sweet peppers in winter time (from December until April), cucumbers and particularly mini-cucumbers from October until April. Accordingly, higher quantities were required by some of the interviewed importers. All other spring vegetables, particularly spring onions (green onions), which had been very short in supply in 2010, had a potential to be imported by some of the interviewed companies over the next years after 2011. Green beans and peas were also very short in supply and more quantities were required throughout the year. A shortage in avocados and sweet potatoes year round was also mentioned by few importers.

### 3.5.2 German requirements for organic fruit and vegetables

This section provides an overview about the requirements of interviewed German companies for organic FFV imports from Extra-EU countries. This includes the regulatory requirements of organic produce, quality and general food regulations as well as requirements regarding the appropriate logistics and transport issues which need to be met in order to export organic FFV into the German market.

#### 3.5.2.1 Legislative requirements

Accessing the EU and thus the German market requires compliance with a strict regulatory framework of measures established to guarantee food safety and consumer health that sometimes go beyond the international requirements set under the *Codex Alimentarius* (the
agreement on the application of sanitary and phytosanitary measures and the technical barriers to trade) which are administered by the World Trade Organisation (WTO) (Freshfel 2012, EU Export Helpdesk 2016). This is the case with all organic food products, including organic FFV (UNCTAD 2003, Kilcher et al. 2011: 83f, Huber et al. 2013).

The suppliers from Extra-EU countries who are wishing to export organic FFV into Germany must comply, besides the private requirements of the importers, with the EU Regulation No. 543/2011\textsuperscript{3} related to the general standards for marketing fresh and processed fruit and vegetables in the EU Member States as well as the specific marketing standards\textsuperscript{4} of certain varieties of fruit and vegetables (EC 2011). These suppliers also have to fulfil all requirements for organic production specified in the EU Regulation No. 834/2007\textsuperscript{5} on organic production and labelling of organic products as well as the Regulation No. 889/2008\textsuperscript{6} which lays down detailed rules for the implementation of EU Regulation No. 834/2007 with regard to organic production, labelling and control (EC 2007, 2008a). Moreover, organic imports from Non-EU countries are guided by the Regulation No. 1235/2008\textsuperscript{7} that lays down detailed rules for implementation of EU Regulation No. 834/2007 as regards the arrangements for imports of organic products from third countries (EC 2008b). The aforementioned EU regulations explicitly state the minimum rules that regulate the production, processing and imports of organic products, including production inspection, labelling and marketing. They are applied for all organic products which are sold within the EU markets. The importance of these legislations were emphasised by all interviewed companies. For instances, one interviewee stated that “Meeting the EU regulations of organic produce is a mandatory condition for the

\textsuperscript{3} EU Regulation No. 543/2011 was amended 26 times. The last amendment was issued on 04 December 2015. This regulation and its amendments are available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1463140176611&uri=CELEX:02011R0543-20151204 (accessed 02.05.2016).

\textsuperscript{4} There are currently specific marketing standards to the following 10 products: Apples, citrus fruit, kiwifruit, lettuces and curled-leaved and broad-leaved endives, peaches and nectarines, pears, strawberries, sweet peppers, table grapes, and tomatoes. For an overview, readers are referred to check the EC website under http://ec.europa.eu/agriculture/fruit-and-vegetables/marketing-standards/index_en.htm (accessed 02.05.2016).

\textsuperscript{5} EU Regulation No. 834/2007 was amended 2 times. The last amendment was issued on 13 May 2013. This regulation and its amendments are available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1462197681684&uri=CELEX:02007R0834-20130701 (accessed 02.05.2016).

\textsuperscript{6} EU Regulation No. 889/2008 was amended 15 times. The last amendment was issued on 19 December 2014. This regulation and its amendments are available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1462265399973&uri=CELEX:02008R0889-20150101 (accessed 02.05.2016).

\textsuperscript{7} EU Regulation No. 1235/2008 was amended 22 times. The last amendment was issued on 31 March 2016. This regulation and its amendments are available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1462200007304&uri=CELEX:02008R1235-20160407 (accessed 02.05.2016).
import of organic FFV from outside the EU borders” (Interviewee G5). Another interviewee stated that “The legislative requirements of organic produce pose a major challenge for developing countries to meet the EU requirements of organic import, (…), however, we have success stories in different places from different countries” (Interviewee G3).

The Federal Office for Agriculture and Food (BLE) (Bundesanstalt für Landwirtschaft und Ernährung) is the competent authority in Germany that issues the permission for imports of organic products originating from the Non-EU countries. Accordingly, the import company must provide documents which prove that production and inspection measures are equivalent to those stated in the EU Regulation No. 834/2007, and explain any deviations which might have happened. In third countries, an EU-approved control body of the exporting company has to give documentary evidence which confirms these statements. Only an application signed by both, the importer and the control body of the exporter in the third country, will be recognised by the BLE (Richter 2005, Kilcher et al. 2011, BLE 2014). Once the legislative requirements have been fulfilled by the involved parties (i.e. importers, exporters, processors, producers of such organic products), imported organic products into the EU can then be treated as a national product within the EU Member States (BLE 2014: 1). There are currently three procedures to import organic products from Non-EU countries (BLE 2014: 2f). These procedures are summarised as follows:

i. Import from recognised third countries\(^8\) specified under EU Regulation No. 834/2007 as amended, Art. 33 Par. 2: Wherein the EU recognised these countries as being equivalent to the EU regulations of organic produce, though some deviations and restrictions may still exist. For every shipment of organic produce, a certificate\(^9\) of inspection issued by the exporter’s control body is mandatory to be submitted to the component authority of the import country within the EU.

\(^8\)The list of recognised third countries currently includes 12 countries, namely: Argentina, Australia, Costa Rica, India, Israel, Japan, Canada, New Zealand, Switzerland, Tunisia, the USA, and Republic of Korea. More information about the EU recognition of the national organic regulations of these countries can be found in Annex III of the EU Regulation No. 1235/2008. This Annex also indicates the list of recognised control bodies which inspect and certify the activities of organic exporters, processors, retailers and producers in the abovementioned third countries.

\(^9\)Model of the certificate of inspection for import of products from organic production into the EU markets can be found in Annex V of the EU Regulation No. 1235/2008 as amended.
ii. Import of products certified by recognised control bodies specified under EU Regulation No. 834/2007 as amended, Art. 33 Par. 3: This includes recognised control bodies that operate in third countries in accordance with the EU Regulations No. 834/2007 and No. 1235/2008 as amended. A certificate of inspection issued by the exporter’s control body must also be submitted for every shipment of organic produce.

iii. Import with a marketing authorisation according to the EU Regulation No. 1235/2008 as amended, Art. 19: This option applies to countries, control bodies and products not included by the abovementioned two procedures. This procedure however requires further inspection by the competent authority of the import country within the EU (e.g. the BLE in Germany). Prior to any product shipments to Germany, the BLE requests importers to provide an original application form (either initial or renewal form) together with valid certificates and inspection reports for all parties involved in the third country (exporter, processor, retailer, producer, etc.). These documents should be either in German or in English. After their inspection, the BLE makes the decisions whether these parties are fulfilling the EU requirements for organic produce. If the decision has been positively evaluated, the BLE will award importers a marketing authorisation for their products to be sold as organic in Germany. In addition to the certificate of inspection for every shipment, the original document issued by the BLE is required for customs clearance purpose. Only then product shipment can enter the German territories as organic (BLE 2014: 3f).

The fulfilment of the legislative requirements of the EU regulations of organic produce (among others) has played a significant role in the development of organic imports from the third countries to the EU. Few interviewed importers indicated that the EU Regulations (No. 834/2007 and No. 1235/2008), besides their role at regulating the market access for organic food into the EU markets, also served as an indispensable model for other regulatory frameworks of organic produce in the Mediterranean Non-EU countries as the cases of Tunisia and Turkey. Additionally, the bilateral agreements between leading importing countries of organic produce and recognised third countries have paved the way for further

10 The list of control bodies and control authorities recognised by the EU Commission are listed in Annex IV of EU Regulation No. 1235/2008 as amended.

11 Third countries list refers to those countries which have got the recognition by an importing country of organic produce that the third country’s control system and its regulation of organic produce are in line with the domestic requirement of the importing country, and that the products certified in those third countries can be marketed as organic in the importing countries (Huber et al. 2015: 130f).
integration and boosted the position of organic products in the international value chain (IFOAM 2011a, Huber et al. 2015: 130f). That is together with a steady growth of the Participatory Guarantee Systems\textsuperscript{12} (PGS) over the last decade, where many PGS based initiatives were successfully implemented as an alternative to third-party certification. Such initiatives were particularly fruitful in the case of small scale farmers from developing countries (IFOAM 2011b, Hazelman 2014, Whitney et al. 2014, Kirchner 2015: 134 f).

3.5.2 2 Quality requirements

Most FFV in the German market are classified into three classes: class I, class II and extra class. This classification refers to the optimal size and optical appearance of these products. One of the interviewed German importers stated that “Until few years ago (before 2011), most of the imports of organic FFV from the Mediterranean Non-EU countries had only achieved class II quality, and only few of them reached class I standards due to their smaller size, or blemishes in their appearance” (Interviewee G1). Few of the interviewed importers put a stronger focus on importing organic FFV which at least meet class I standards. This implies that the exporters of organic FFV must be aware of these criteria before they access the German market. One of the interviewees concluded “As a general rule, high quality in optical aspects, grading, freedom of contamination and residues, good conditions upon arrival in Germany promotes the imports of organic FFV from this region into Germany” (Interviewee G3).

In order to detect any quality problems which might happen with some organic FFV originating from the Mediterranean Non-EU countries, samples are taken on a random basis in order to check the quality of these products. Further analysis of residues and contamination are also taken into consideration. Accordingly, most of the interviewed German importers were generally satisfied with the quality of those FFV (citrus varieties, grapes, potatoes, tomatoes and sweet peppers) which represent the most important varieties imported from the Mediterranean Non-EU countries. However, they also mentioned some problems which occurred over the past years (before 2011) due to adverse weather conditions, inducing some spots or fungus infections, particularly among grapes, which are more sensitive than other

\textsuperscript{12} According to IFOAM definition 2008, the Participatory Guarantee Systems (PGS) “are locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange” (Kirchner 2015: 134).
fruit. Smaller sizes of sweet peppers occurred. They also referred to some problems due to earlier harvest (not enough ripeness and low juice contents in citrus varieties and grapes) or late harvest (in case of tomatoes). In the latter case, at the time of harvest the tomatoes should be sufficiently developed, but without displaying full ripeness in order to allow them further ripening during transport in order to reach the appropriate degree of maturity on the final market. Besides some quality problems, a critical issue for some interviewed importers was also the lack of reliability of exporters in terms of date of delivery, amounts of products as well as problems with communication, packaging and logistics.

3.5.2.3 Appropriate logistics and transport

According to few interviewees, potential suppliers of organic FFV for the German market have to guarantee that their products are handled and transported in appropriate packaging and containers from the farms up to the importers in the EU. In this context, all bags, boxes or containers of organic FFV must be prepared and transported in such a manner that the content cannot be exchanged or manipulated. In addition, this system should avoid any possible contamination from other non-organic products. The consignments also need to be clearly labelled with the name of the operator, country of origin and the name of the certification body which has inspected the product, and must be accompanied by all other required documents (Interviewees G1, G2 and G5).

Most interviewed companies were generally satisfied with logistics and transport issues regarding the imports of organic FFV from the Mediterranean Non-EU countries. The transport by land and freighter approximately needed 4-7 days on average to reach Rotterdam harbour in the Netherlands, or other custom points in the EU. Sometimes the duration was extended, depending on the country of origin and due to bureaucratic issues. However, the main concern of most of the interviewed importers was the speed with which organic FFV were moved from the farm to the export point. The speed is always critical since (organic) FFV are perishable goods. Other concerns were the time for which organic FFV were kept at the farm after picking, the conditions under which they were stored, how they were transported from the field to the export point, and how long they were stored/kept at the export point. All these issues affect the overall quality of (organic) FFV exports. Therefore, the cooperation and transparency alongside the value chain, from farmers up to the import
3 Analysis of German imports of (organic) fresh fruit and vegetables

point, are crucial in order to overcome any barriers which can lead to delay in the value chain, and to avoid any quality problem.

3.5.3 Future trends of organic fruit and vegetables imports from the Mediterranean Non-EU countries

Few of the interviewees stated that the German market of organic products, particularly in the FFV sector, is highly developed with a strong competition. The larger distribution and retail structures of the organic market in Germany have led to higher quality and price pressure. However, this situation can also offer opportunities for new suppliers to enter the market (Interviewees G3 and G6).

According to the interviewed importers, German traders and retailers whenever possible prefer domestic organic FFV or products from EU neighbouring countries. Nevertheless, imports from Extra-EU have an important share to supplement domestic supplies during the counter season and for bridging bottlenecks in the supply. Under these circumstances, most of the interviewees favoured organic vegetables originating from the Mediterranean Non-EU countries, while they perceived that vegetables from overseas have little prospect for market access. Regarding organic fruit, most of interviewees were convinced that the import proportions from Extra-EU have increased, and potential for further imports of exotic fruit and some counter season fruit is likely to grow. Moreover, one of the interviewees stated that “In addition to counter season produce, adverse weather and poor yields of organic FFV during the season in the EU can also provide short-term opportunities for organic FFV producers in the Southern and Eastern Mediterranean countries to increase their exports of their organic produce into the EU markets” (Interviewee G2).

Furthermore, most of the interviewees expected a positive development in the market for organic vegetables during the upcoming years after 2011. This trend was also expected for organic fruit, but only to a lesser degree. This means, the supply gap of organic FFV in the German market is likely to grow further. This situation will bring along a growing opportunity for those who would like to export to Germany.
3.5.4 Potential opportunities for exporting Syrian fresh organic fruit and vegetables into the German market: German importers’ perspectives

Importing organic FFV into the German market presents a major challenge in terms of quality and prices. Most of interviewed companies believed that the strong competition among the actors in the German market of organic produce has significant effects on the import of organic food. Thereby, the German traders of organic FFV have become extremely demanding in terms of quality/price ratios, quantity and continuity of supply, services, communication, etc. Therefore, prior of seeking German market entry, Syrian exporters of (organic) FFV have to acquire at least a basic knowledge of the German organic market and its requirements. Identifying a competent importer in Germany (the EU) is an important precondition for success, as the importer, besides being reliable and efficient, has in-depth knowledge of the German market of organic FFV.

For organic FFV which are not yet supplied year round in the German market, a good potential for market access from other producers exists. This is particularly true for some organic vegetables that always have a market potential like tomatoes, sweet peppers, cucumbers and spring vegetables, and additionally some organic fruit like citrus fruit, white and seedless grapes. Moreover, interviewed importers mentioned that their import potential of such FFV from Syria, should take into account the compulsory minimum standards for organic produce as well as the aforementioned qualitative and logistics issues.

3.5.5 Recommendations for better access for Syrian fruit and vegetables into Germany

In order to have better access to the German market, Syrian suppliers of organic FFV must take the following considerations into account. The development of long-term relationships between market operators in Germany and the potential suppliers from Syria are quite important. Moreover, potential suppliers also have to be able to supply consistent volumes of guaranteed quality on the right time. They also have to be very efficient, flexible and able to respond to new developments on the market. The origin of organic produce and the story behind the product are also very important in the organic sector. Therefore, the production process needs to be transparent. With this respect, one of the interviewees stated that “Organic consumers currently seek to know more about ‘their’ farmer, and where and how the FFV are produced, including working conditions, human rights of workers, etc.” (Interviewee G6).
For better access into the German market of organic FFV, “it is quite important for Syrian traders and farmers to concentrate on FFV which are out-of-season in the EU or not available from the European countries in the appropriate quantities” (Interviewee G2). Other interviewed importers recommended that Syrian traders of FFV should visit fairs like Biofach in order to get direct contacts with the EU traders. Other advantages of visiting such events are the option to get up-to-date information on issues like market access requirements, market size, consumer trends, trade logistics, packaging, pricing, terms of trade and export guidelines for those products to the EU.

3.5.6 **Recommendations for supporting the production of organic fruit and vegetables in Syria**

Some of the interviewed companies stated that they have different projects supporting organic farming in many countries around the world. They also indicated that they prefer to work directly with farmers’ cooperatives for the development of the organic sector in these countries, and for having full transparency over the value chain from the farm up to the final consumers (Interviewees G2, G5 and G8). At the time of interviews, the interviewed importers stated that their companies have not yet any plans to conduct projects on organic FFV in Syria, but it could be taken into consideration for the future. Other interviewed companies emphasised the role of national governments to support this sector. The government should consider all possibilities that encourage farmers to convert to organic production while remaining competitive. Drafting a national legislative framework for organic produce which complies with EU standards, and establishing a technical centre for organic agriculture, are important matters to support and train farmers in organic practices. Few of the interviewees mentioned other options. For instance, area-based payments for farmers are an option which can motivate farmers to convert their farms to organic. Other options should also be promoted; like helping farmers to be get organised in cooperatives. In such manner, FFV farmers can reduce certification costs through group certification. It can also help farmers to decrease their transaction costs when they market their organic produce collectively.
4 Analysis of Syrian exports of (organic) fresh fruit and vegetables

4.1 Introduction

Foreign trade in Syria had witnessed an important development over the first decade of 21\textsuperscript{th} Century (i.e. the pre-crisis decade). This was mainly reflected in terms of quantity and quality of exported products. The legislative and administrative structures were also reinforced by significant liberalisation of the foreign trade, thereby enhancing further integration of Syria into the global economy after a long time of governmentally planned economy. In this context, Syria signed several agreements of free trade zones with Arab countries, Turkey, the EU, Iran and World Trade Organisation (WTO). While the agreements with Arabic countries, Turkey and Iran were already in force, the agreements with the EU and WTO have not been completely applied. However, the European Mediterranean Association Agreement (AA) was signed in the initial letters (2004), which only included a partial application of the AA until the final signature from the Syrian government, which was supposed to be signed during 2011. In December 2008, Syria had also signed the Euro-Mediterranean Partnership (Euromed). Euromed’s main objective was to establish a strong and robust Euro-Mediterranean Free Trade Area, which aimed at eliminating hurdles to trade and boosting investments between both the EU and the 16 EU Mediterranean neighbours in North Africa and the East Mediterranean. Additionally, Syria had joined the WTO as ‘observer member’ in 2010\textsuperscript{13} (EDPA 2010, Babili et al. 2012, EC 2015b, NAPC 2015a).

Under the conditions of the liberal market, strengthening the national products in terms of quality and cost became an essential concern of the Syrian economy (García-Alvarez-Coque 2003: 37). In this regard, several institutions were established by the government between 2005 and 2010 such as the Export Development and Promotion Agency (EDPA), the Export Development Fund, the Union of Exporters, and the National Agency for Export Guarantee, in order to support the export activities and to ensure that Syrian products are in line with the international quality requirements (EDPA 2010). In parallel, non-governmental organisations concerned with export affairs were also established, such as the Syrian Association of Exporters for Agricultural Products (SAPEA).

\textsuperscript{13} The Syrian-EU Association Agreement and Syrian-WTO agreement had been suspended due the war conditions in Syria. In May 2011 the EU suspended all ongoing bilateral programs with the Syrian authorities under European Neighbourhood and Partnership Instrument (EC 2015b).
As a large quota of the Syrian economy is based on the agricultural sector and the industrial and commercial activities related to it, the exportation of Syrian agricultural products, including FFV, is vital for further development of the agricultural sector (MAAR 2014a: 8f). In the 1990s and at the beginning of 2000s, the exports of agricultural products in general and FFV in particular had faced many barriers, including unorganised traditional export value chains, logistics and quality criteria. As an attempt to cope with such barriers, SAPEA was established in 2006 with the intention of encouraging and promoting the export of Syrian agricultural products, either fresh or processed, to foreign markets. SAPEA took, in cooperation with the Syrian chambers of agriculture, the responsibility to find a wide variety of agricultural products (fresh or processed) with high quality and competitive costs as the baseline for further access of Syrian agricultural products to the high value markets, including the EU markets (SAPEA 2015).

The growing health consciousness and environmental awareness among EU consumers on the one hand and the changes of the agro-food trade over the last two decades within the EU markets on the other hand have significant implications for third countries, including Syria. Thus, as it was depicted in Chapter 3, EU suppliers of FFV are confronted with increasing demands in planning, communication and logistics, systematic production and harvesting processes, quality, continuity and food safety. Many importers of FFV in the EU expect their suppliers from third countries to be certified for GLOBALGAP and/or organic and see these certifications as important conditions to import from there (Santucci 2007, Bisso 2010, CBI Market Intelligence 2015d, 2015e).

While other Mediterranean countries (most notably Egypt and Morocco) had already strengthened their ties with the European food retail industry under the AA, Syria is still far behind, in spite of many steps had been taken between 2005 and 2010 to improve the quality of FFV. The marketing value chain of FFV in Syria is inefficient with absence of coordination among farmers, traders and exporters in the value chain (García-Alvarez-Coque 2003, Nehme 2005, Cafiero 2007, Cafiero et al. 2009, Bisso 2010).

The main intention of this chapter is to shed light on Syrian exports of (organic) FFV (from 2000 onwards) and their destination markets. An analysis of the Syrian value chain of FFV (including the relationship between farmers and exporters) is provided, too. Based on nine expert interviews with Syrian exporters of FFV which were carried out in September and
October 2011, a particular focus of this chapter is to explore export barriers of Syrian FFV to the EU high value markets. The perspectives of the interviewed exporters of how to overcome existing export barriers and to improve export the value chain of organic FFV are also given.

This chapter is structured as follows; first, the development of the Syrian production of FFV from 2000 onwards is presented and second, the development of Syrian exports of these goods. Third, results from interviews with Syrian exporters, including an analysis of Syrian value chain of FFV are given. Further information on the main destination countries of Syrian FFV is provided. The FFV export barriers in general and to the EU in particular are presented. Finally, suggested solutions by the interviewed exporters for the existing barriers and trade opportunities of high value FFV to the EU markets are presented.

4.2 Syrian production and export of fresh fruit and vegetables

4.2.1 Syrian production of fresh fruit and vegetables

Syria is a largely agricultural country in the Middle East, with 43% of its population\(^\text{14}\) living in rural areas in 2013 (FAOSTAT 2015, World Bank 2015a: 27). Prior to the current war circumstances in Syria, about 80% of rural dwellers basically depended on the agricultural sector as a main source of livelihood (Goodbody et al. 2013: 10, NAPC 2015b: 1f). About 1.5 million were agricultural workforce, representing 18.3% of the total Syrian labour in 2010 (CBS 2012, World Bank 2015b). Female labour was strongly present in the agricultural sector and accounted for almost 63% of total agricultural labour in Syria in 2014 (FAOSTAT 2015).

The Syrian sector of agriculture had significantly developed over the last two decades (before 2011) and had also considerably contributed to other sectors of Syrian economy, as through providing raw materials for the Syrian processing industry (Fiorillo and Vercueil: 2003: 15f). However, the statistical evidence showed that the contribution of agriculture to the Syrian Gross Domestic Product (GDP) witnessed a gradual decline from 29.8% in 1990 to only

\(^{14}\)According to the Syrian Central Bureau of Statistics (CBS), the Syrian population was estimated at 24.5 million according to the civil records in Syria; however, 21.2 million of them were living in Syria in June 2011, and the rest of them had been living abroad for different reasons, nevertheless, the vast majority were in the Gulf countries for work purpose (CBS 2012). Due to the war conditions in Syria and its consequences, updated data about Syrian population were difficult to estimate.
19.7% in 2010\textsuperscript{15} (UNCTAD 2014: 352, World Bank 2015b). This can be attributed to the augmented growth of other sectors of the Syrian economy compared to the agricultural sector over the same time period. Besides meeting the domestic demand, large quantities of agricultural products were available for export (MAAR 2010a, Bisso 2010: 27, NAPC 2015b, UNCTAD 2015: 21).

Since the 1990s, FFV have played an important role in the Syrian agricultural sector. One of the most significant shifts in Syrian agriculture was the expansion of the horticultural area over the last two decades (before 2011). Large quantities of FFV were produced in Syria for both the domestic and export markets. Syrian farmers cultivated a wide array of fruits and vegetables (e.g. tomatoes, cucumbers, potatoes, lettuces, onions, citrus fruit, grapes, etc.). Multiple statistical yearbooks of MAAR (from 2002 to 2015b) were used in this dissertation to provide annual statistics about Syrian production of FFV for the years from 2000 to 2013, respectively. Figure 4.1 illustrates Syrian production development of FFV from 2000 onwards. Until 2011, the total production of FFV had increased considerably through horizontal and vertical expansion in different FFV subsectors. The total production of FFV exceeded 6 million tons in 2009, which is an increase of 50% from four million tons of FFV that were produced in the year 2000. Figure 4.1 also shows that Syria produced roughly equal amounts of fruit and vegetables in most of the observed years. For instance, about three million tons for each subsector were produced in 2009 and about two million tons for each in the year 2000. This substantial increase in area and production of FFV was mainly due to the preference given to these crops because of their high returns compared with other field crops, and also to supply the growing domestic market and foreign demand for FFV (Bisso 2010: 27, MAAR 2010a). Owing to the current war in Syria, the production of FFV has been decreasing from 2012 onwards. That was particularly observed in the case of fresh vegetables, where the production dropped by almost 50% in 2013 compared to its volume in 2009 (see Figure 4.1).

\textsuperscript{15} The contribution of agricultural sector to the Syrian economy started to increase and reached 21% in 2012 (UNCTAD 2014: 352). This can be attributed to the dramatic decline of the Syrian economy (in particular, sectors of industry, tourism, and services) over the last 4 years due to war conditions, in which the Syrian GDP was declined in 2013 to only 50% of its volume in 2011 (UNCTAD 2014: 332).
Figure 4.1: Syrian production of fresh fruit and vegetables since 2000

Source: Own calculation based on official statistics of the Syrian Ministry of Agriculture and Agrarian Reform. For this purpose, annual statistical abstracts of MAAR for years from 2000 to 2013 have been used.

FFV are produced in all Syrian governorates\textsuperscript{16}. Figures 4.2 and 4.3 provide a comparison of the distribution of FFV production in different Syrian governorates in 2009 and 2013, respectively. The Western governorates of Syria (Tartous and Lattakia) were by far the largest producers of FFV. The Southern, Middle and Northern governorates produced relatively significant amounts of FFV. The lowest producers of FFV in Syria were the Eastern governorates (Al-Hassake and Dair-Ezzor), which were mainly dedicated to types of crop production. In Figures 4.2 and 4.3 it can be seen that there is a remarkable decrease of fresh vegetable production in most of Syrian governorates in 2013 compared to their production levels in 2009. The data of FFV from Dair-Ezzor and Al-Raqqa governorates are absent for 2013. These changes can be understood as a result of extraordinary high production costs of agricultural products in general and vegetables in particular in 2013 compared to 2009; on average, the production costs tripled (Goodbody et al. 2013, MAAR 2015c, NAPC 2015b). Additionally, unstable areas in the country are currently out of production or there are no official data available about the FFV production in those areas. This can provide an explanation of why the severe fall in production happened mainly with annual crops (vegetables and melons), whereas durable crops (fruit) were less affected (see Figures 4.4 and 4.5).

\textsuperscript{16} Syria consists of 14 governorates. Tatrous and Lattakia governorates are located in the Western part of Syria (coastal region on the Mediterranean Sea). Homs and Hama governorates represent the Middle part of Syria. Governorates of Sweida, Dar’a, Quneitra, Damascus Rural, and Damascus city are the Southern part of Syria. Governorates of Aleppo, Idleb, and Al-Raqqa represent the North of the state, and Al-Hassake and Dair-Ezzor are the Eastern part of Syria.
Figure 4.2: Syrian governorates production of fresh fruit and vegetables in 2009

Source: Own calculation based on official statistics of the Syrian Ministry of Agriculture and Agrarian Reform (MAAR 2011). * Ghab plain is not a governorate; it represents the Northwestern part of Hama governorate but in agricultural statistics of MAAR is considered as independent unit.

Figure 4.3: Syrian governorates production of fresh fruit and vegetables in 2013

Source: Own calculation based on official statistics of the Syrian Ministry of Agriculture and Agrarian Reform (MAAR 2015b). * Ghab plain is not a governorate; it represents the Northwestern part of Hama governorate but in agricultural statistics of MAAR is considered as independent unit.
Figures 4.4 and 4.5 depict the production development of the most important FFV cultivated in Syria during 2000 and 2013. While citrus fruit varieties, melons, apples, table grapes, and stone fruit were the main fresh fruit produced in Syria, tomatoes, potatoes, eggplants, cucumbers, onions, squashes, peppers and beans represented the major fresh vegetables. Citrus fruit varieties (oranges, lemon and other citrus fruit) were the leading fruit subsector and more than one million tons were produced in 2009, representing more than one-third of total Syrian fruit production. Citrus fruit production reached 1.25 million tons in 2013, indicating a considerable development of this subsector despite of the war in the country. The production of water and yellow melons accounted for a significant share during 2000 and 2011 despite the remarkable fluctuation in production over the mentioned years. However, melon production dramatically declined by three times in 2013 compared to 2009, where its production level drops to only 250 thousand tons. Considerable amounts of table grapes, apples and stone fruit were also produced between 2000 and 2013. The production levels of these fruit varieties were relatively steady during 2009 and 2013 as it is portrayed in Figure 4.4.

Regarding vegetable production, tomatoes were by far the most important fresh vegetables produced. More than 1.1 million tons were produced in 2009 which represents about 40% of Syrian vegetable production in 2009. Moreover, tomatoes were produced year round in Syria, taking into account the significant amounts of greenhouse production in the Western part of Syria. However, the production of tomatoes abruptly dropped in 2013 to only 500 thousand tons due to the high production costs or according to the fact that some traditional areas like the Dar’a governorate were out of production. Potatoes were the second most important vegetables in term of quantity, more than 700 thousand tons were produced in 2009. Significant amounts of onions, eggplants, cucumbers and beans were also produced between 2000 and 2013. Like tomatoes, the production levels of these vegetables also dropped on average by 50% in 2013 compared to 2009. A detailed overview of production development of other FFV traditionally produced in Syria can be found in Appendices 1.5 and 1.6.
Figure 4.4: Production development of main fresh fruit cultivated in Syria since 2000

Source: Own calculation based on official statistics of the Syrian Ministry of Agriculture and Agrarian Reform (MAAR). For this purpose, annual statistical abstracts of MAAR for years from 2000 to 2013 have been used.

Figure 4.5: Production development of main fresh vegetables cultivated in Syria since 2000

Source: Own calculation based on official statistics of the Syrian Ministry of Agriculture and Agrarian Reform (MAAR). For this purpose, annual statistical abstracts of MAAR for years from 2000 to 2013 have been used.
Most FFV farms in Syria are operated by the owners or their families with seasonal labour. Almost all vegetable production in Syria undergoes irrigation, while Syrian fruit production is mainly depending on rainfall with supplemental irrigation (MAAR 2014a). Until 2012, fruit and vegetable yields were relatively stable and not subject to weather fluctuations as in most countries in the region (NAPC 2015b). The governmental support essentially lay in subsidising farmers with seeds, seedlings, irrigation modernisation, fertilisers and some cash subsidies. Subsidies were mainly oriented towards the production of Syrian so-called strategic crops (cereals, sugar beets, tobacco, and cotton), the production of lentils and chick peas. In the late 2000s, the production of some fruit and vegetables including potatoes, tomatoes, olives, citrus fruit and grapes were partly subsidised through the Syria Agricultural Support Fund and the Cooperative Agricultural Bank (Abou Ajeeb 2011, MAAR 2014a, NAPC 2015c). As the government mainly provided subsidised prices for supporting the above mentioned strategic crops, it had a relatively small role in the marketing of FFV (MAAR 2014a).

4.2.2 Syrian export of fresh fruit and vegetables

In the 1980s, the export of agricultural products, including FFV, was mainly controlled by the state, and the exports were primarily handled by governmental trading companies with barter or counter trade arrangements with Eastern European and Arabic countries (Rama 2003: 265f, Parthasarathy 2003: 383). However, the exported amounts were relatively small due to the strong demand in the local market. Since the late 1990s, the private sector has gradually taken over the exporting function of FFV. Syrian exports of FFV witnessed significant increases over the pre-crisis decade, particularly after fully implementing the Greater Arab Free Trade Agreement (GAFTA) in 2005. GAFTA had a significant effect on Syrian agricultural trade in general and FFV in particular. As a consequence, all agricultural commodities were totally exempted from custom duties and other related tariffs (Babili and Baghassa 2008, Abedini and Péridy 2008, Yigezu et al. 2013: 274).

Figure 4.6 indicates the evolution of Syrian export of FFV during 2002 and 2012\(^\text{17}\). While the total export of FFV was only 400 thousand tons in 2002, the exported quantity reached almost two million tons by the year 2009. This can be appreciated as a positive consequence of

\(^{17}\) Prior to 2002, official statistics about Syrian exports of FFV were not available online at the Syrian Central Bureau of Statistics (CBS) and were not accessible from other sources as well.
GAFTA application which had facilitated the agricultural trade in the Arabic region (NAPC 2015a). The quantities of exported fresh vegetables were larger than those of fresh fruit during 2002 and 2012. For instance, in 2009, fresh vegetable export was roughly 1.2 million tons (43% of Syrian production of fresh vegetables), while about 800 thousand tons of fresh fruit (26% of Syrian production of fresh fruit) were exported. Though substantial levels of FFV had been exported in 2012, their volume remarkably dropped, where only about 480 thousand tons (19% of Syrian production of fresh vegetables) and 380 thousand tons of fresh fruit (16% of Syrian production of fresh fruit) were exported in 2012 (see Figure 4.6). This can be implicitly understood as a result of the current war conditions in the country and its consequent effects on production and export levels of FFV.

Figure 4.6: Export development of Syrian fresh fruit and vegetables since 2002

Alongside with FFV export, Syria also exported non-fresh fruit and vegetables. Figure 4.7 provides a comparison of the export development of fresh and non-fresh fruit and vegetables in Syria from 2002 onwards. From 2005 to 2010, this Figure shows a reverse relationship between the export volumes of FFV and non-FFV. Though most Syrian fruit and vegetables were generally exported as fresh, substantial amounts of processed, frozen, dried, or preserved fruit and vegetables were also exported (notably in the time period from 2006 until 2008).
Tables 4.1 and 4.2 show the Syrian export evolution of the most important FFV cultivated in Syria from 2002 onwards. Likewise production development of FFV in Syria, tomatoes, potatoes, carrots, cucumbers, onions, peppers, eggplants and green beans represent the main Syrian export of fresh vegetables, while citrus fruit varieties, melons, apples, table grapes, stone fruit, and strawberries are the major exported fresh fruit. Tables 4.1 and 4.2 illustrate that most of Syrian exported FFV witnessed significant increase over the years 2002 and 2009. Thereby, Syrian exports of tomatoes, potatoes, carrots and cucumbers remarkably increased in 2009. Among fruit, the exports of citrus fruit varieties, watermelons, apples and table grapes showed significant increase in 2009 compared with the previous years. By the year 2012, however, the exported quantities of different fruit and vegetables sharply decreased. This can be particularly seen in the case of citrus fruit, melons, and tomatoes, where the export volumes in 2012 dropped to less than 50% of its levels in 2009.
Table 4.1: Evolution of Syrian exports of selected important fresh vegetables since 2002

<table>
<thead>
<tr>
<th>Product in 1000 MT</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomatoes</td>
<td>210.2</td>
<td>218.0</td>
<td>260.3</td>
<td>293.9</td>
<td>261.6</td>
<td>493.9</td>
<td>367.8</td>
<td>627.6</td>
<td>408.3</td>
<td>278.0</td>
<td>201.1</td>
</tr>
<tr>
<td>Potatoes</td>
<td>15.2</td>
<td>16.8</td>
<td>16.8</td>
<td>11.4</td>
<td>53.2</td>
<td>13.8</td>
<td>122.8</td>
<td>102.4</td>
<td>112.0</td>
<td>55.4</td>
<td>102.5</td>
</tr>
<tr>
<td>Carrots and leguminous turnips</td>
<td>14.7</td>
<td>19.8</td>
<td>18.1</td>
<td>14.0</td>
<td>80.6</td>
<td>84.4</td>
<td>44.5</td>
<td>78.2</td>
<td>72.1</td>
<td>39.0</td>
<td>31.6</td>
</tr>
<tr>
<td>Onions and shallots</td>
<td>3.3</td>
<td>0.0</td>
<td>7.3</td>
<td>4.3</td>
<td>8.9</td>
<td>4.7</td>
<td>10.7</td>
<td>45.5</td>
<td>45.3</td>
<td>21.0</td>
<td>27.3</td>
</tr>
<tr>
<td>Lettuces and chicories</td>
<td>0.0</td>
<td>19.4</td>
<td>17.7</td>
<td>20.1</td>
<td>175.1</td>
<td>56.2</td>
<td>25.9</td>
<td>43.1</td>
<td>37.7</td>
<td>34.5</td>
<td>25.2</td>
</tr>
<tr>
<td>Peppers</td>
<td>n.a.</td>
<td>13.5</td>
<td>16.3</td>
<td>n.a.</td>
<td>n.a.</td>
<td>1.8</td>
<td>32.3</td>
<td>36.9</td>
<td>29.1</td>
<td>24.3</td>
<td></td>
</tr>
<tr>
<td>Cabbages</td>
<td>4.2</td>
<td>6.8</td>
<td>6.1</td>
<td>5.9</td>
<td>33.2</td>
<td>39.7</td>
<td>53.5</td>
<td>26.5</td>
<td>25.2</td>
<td>14.7</td>
<td>14.8</td>
</tr>
<tr>
<td>Cauliflowers and broccoli</td>
<td>6.0</td>
<td>4.7</td>
<td>5.7</td>
<td>5.0</td>
<td>32.8</td>
<td>23.4</td>
<td>8.3</td>
<td>18.4</td>
<td>17.3</td>
<td>11.2</td>
<td>12.3</td>
</tr>
<tr>
<td>Eggplants</td>
<td>5.7</td>
<td>4.8</td>
<td>8.0</td>
<td>2.1</td>
<td>21.6</td>
<td>18.2</td>
<td>19.5</td>
<td>18.0</td>
<td>24.2</td>
<td>7.8</td>
<td>9.8</td>
</tr>
<tr>
<td>Cucumbers and gherkins</td>
<td>0.2</td>
<td>4.6</td>
<td>2.0</td>
<td>4.6</td>
<td>11.0</td>
<td>12.2</td>
<td>24.1</td>
<td>50.0</td>
<td>22.6</td>
<td>8.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Salad beetroots, celeriac, and radishes</td>
<td>n.a.</td>
<td>n.a.</td>
<td>2.6</td>
<td>2.5</td>
<td>41.0</td>
<td>37.2</td>
<td>9.9</td>
<td>38.2</td>
<td>18.7</td>
<td>5.0</td>
<td>4.4</td>
</tr>
<tr>
<td>Green beans (including broad beans)</td>
<td>6.9</td>
<td>6.4</td>
<td>4.4</td>
<td>3.5</td>
<td>6.4</td>
<td>3.9</td>
<td>0.1</td>
<td>13.3</td>
<td>11.6</td>
<td>4.5</td>
<td>4.1</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>24.0</td>
<td>9.8</td>
<td>3.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Green peas</td>
<td>1.6</td>
<td>2.3</td>
<td>2.1</td>
<td>3.2</td>
<td>7.4</td>
<td>2.8</td>
<td>0.8</td>
<td>1.4</td>
<td>2.0</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Garlics</td>
<td>0.1</td>
<td>n.a.</td>
<td>0.3</td>
<td>0.2</td>
<td>1.2</td>
<td>1.6</td>
<td>n.a.</td>
<td>2.9</td>
<td>1.8</td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Source: Own calculation based on official statistics of the Syrian Central Bureau of Statistics (CBS). For this purpose, annual statistical abstracts of CBS for years from 2002 to 2011 have been used. * Statistics of 2012 were calculated based on the database of Syrian National Agricultural Policy Centre (NAPC).

Note: n.a.: no available data.
### Table 4.2: Evolution of Syrian exports of selected important fresh fruit since 2002

<table>
<thead>
<tr>
<th>Product in 1000 MT</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Citrus fruit (Total):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Oranges</td>
<td>26.5</td>
<td>20.2</td>
<td>23.3</td>
<td>31.0</td>
<td>64.5</td>
<td>28.1</td>
<td>51.9</td>
<td>166.3</td>
<td>207.2</td>
<td>151.0</td>
<td>97.6</td>
</tr>
<tr>
<td>➢ Mandarins</td>
<td>9.1</td>
<td>6.2</td>
<td>2.0</td>
<td>11.8</td>
<td>4.5</td>
<td>7.9</td>
<td>10.8</td>
<td>9.3</td>
<td>21.2</td>
<td>37.0</td>
<td>14.9</td>
</tr>
<tr>
<td>➢ Lemons and limes</td>
<td>0.7</td>
<td>0.0</td>
<td>0.9</td>
<td>0.8</td>
<td>0.9</td>
<td>32.9</td>
<td>42.1</td>
<td>32.6</td>
<td>20.2</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>➢ Grapefruit</td>
<td>2.1</td>
<td>2.0</td>
<td>1.6</td>
<td>9.8</td>
<td>4.7</td>
<td>4.4</td>
<td>8.5</td>
<td>50.0</td>
<td>39.7</td>
<td>25.7</td>
<td>3.0</td>
</tr>
<tr>
<td>➢ Other from citrus fruit</td>
<td>n.a.</td>
<td>n.a.</td>
<td>0.1</td>
<td>0.6</td>
<td>0.7</td>
<td>0.7</td>
<td>24.1</td>
<td>2.1</td>
<td>0.1</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Apples</strong></td>
<td>15.8</td>
<td>13.9</td>
<td>28.3</td>
<td>68.5</td>
<td>130.9</td>
<td>125.4</td>
<td>89.5</td>
<td>162.8</td>
<td>103.8</td>
<td>116.1</td>
<td>89.6</td>
</tr>
<tr>
<td><strong>Watermelons</strong></td>
<td>11.5</td>
<td>9.6</td>
<td>9.3</td>
<td>8.6</td>
<td>81.3</td>
<td>73.8</td>
<td>103.7</td>
<td>170.1</td>
<td>211.1</td>
<td>80.7</td>
<td>29.3</td>
</tr>
<tr>
<td><strong>Plums and sloes</strong></td>
<td>9.2</td>
<td>5.4</td>
<td>3.9</td>
<td>3.3</td>
<td>10.3</td>
<td>3.0</td>
<td>1.0</td>
<td>15.9</td>
<td>20.2</td>
<td>24.7</td>
<td>21.0</td>
</tr>
<tr>
<td><strong>Pears and quinces</strong></td>
<td>10.2</td>
<td>7.2</td>
<td>4.7</td>
<td>9.4</td>
<td>11.4</td>
<td>15.6</td>
<td>1.4</td>
<td>22.7</td>
<td>18.9</td>
<td>21.9</td>
<td>20.3</td>
</tr>
<tr>
<td><strong>Grapes</strong></td>
<td>25.5</td>
<td>13.0</td>
<td>9.1</td>
<td>13.0</td>
<td>66.0</td>
<td>25.1</td>
<td>4.7</td>
<td>31.6</td>
<td>29.7</td>
<td>16.3</td>
<td>15.3</td>
</tr>
<tr>
<td><strong>Peaches including nectarines</strong></td>
<td>6.3</td>
<td>4.1</td>
<td>1.4</td>
<td>4.4</td>
<td>7.9</td>
<td>2.9</td>
<td>1.0</td>
<td>24.0</td>
<td>15.4</td>
<td>21.3</td>
<td>14.3</td>
</tr>
<tr>
<td><strong>Cherries</strong></td>
<td>13.0</td>
<td>10.4</td>
<td>4.9</td>
<td>6.7</td>
<td>9.6</td>
<td>3.9</td>
<td>1.5</td>
<td>11.7</td>
<td>13.8</td>
<td>11.5</td>
<td>13.5</td>
</tr>
<tr>
<td><strong>Yellow melons (musk-melons and cantaloupes)</strong></td>
<td>16.9</td>
<td>15.7</td>
<td>17.3</td>
<td>15.8</td>
<td>35.6</td>
<td>34.0</td>
<td>0.4</td>
<td>35.6</td>
<td>40.2</td>
<td>30.2</td>
<td>10.6</td>
</tr>
<tr>
<td><strong>Apricots</strong></td>
<td>9.4</td>
<td>7.7</td>
<td>4.5</td>
<td>7.1</td>
<td>9.2</td>
<td>0.4</td>
<td>0.8</td>
<td>14.0</td>
<td>19.5</td>
<td>24.7</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>Figs</strong></td>
<td>5.8</td>
<td>4.9</td>
<td>4.4</td>
<td>4.5</td>
<td>4.9</td>
<td>3.1</td>
<td>11.7</td>
<td>5.4</td>
<td>4.4</td>
<td>4.7</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Strawberries</strong></td>
<td>n.a.</td>
<td>n.a.</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>0.8</td>
<td>0.2</td>
<td>2.8</td>
<td>1.8</td>
<td>2.6</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Dates</strong></td>
<td>0.4</td>
<td>0.5</td>
<td>0.1</td>
<td>0.4</td>
<td>n.a.</td>
<td>0.3</td>
<td>0.0</td>
<td>3.4</td>
<td>1.0</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Pomegranates</strong></td>
<td>2.4</td>
<td>2.8</td>
<td>0.7</td>
<td>0.9</td>
<td>0.4</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Source: Own calculation based on official statistics of the Syrian Central Bureau of Statistics (CBS). For this purpose, annual statistical abstracts of CBS for years from 2002 to 2011 have been used.* Statistics of 2012 were calculated based on the database of Syrian National Agricultural Policy Centre (NAPC).

Note: n.a.: no available data.
4.3 Interviews with Syrian exporters of fresh fruit and vegetables

Through semi-structured interviews, each lasting around half an hour, 9 Syrian export companies for FFV were interviewed. Three of the interviewed companies were members in the Syrian Association of Exporters for Agricultural Products (SAPEA), while one of the interviewees represented the governmental company for marketing of agricultural products which is the General Establishment for Storing and Marketing of Agricultural and Animal Products (GEMAAP). The other five interviewees were individual exporters of agricultural products. The individual exporters represent the majority of Syrian export activities of FFV. The interviews were conducted via telephone in September and October 2011. The interviews focused on Syrian export of FFV and its destination countries, including the current export to the EU market. The exporters were interviewed about their individual export levels for (organic) FFV, the times of export, quality standards and logistics barriers. They were also queried to identify the problems related to the export of FFV to the EU. Further, they were asked for an assessment of potential future export of Syrian (organic) FFV to the EU in general and Germany in particular. Additionally, the interviewed exporters were asked about their opinion on the likeliness of support for Syrian farmers. For a detailed overview, the questionnaire used to guide the interviews with Syrian exporters of FFV can be found in Appendix 1.2.

The aim of these interviews was to provide a better understanding of the Syrian export subsector of FFV and its development, and also existing export barriers of (organic) FFV in general and to the EU in particular. Finally, the interviews included Syrian exporters’ perspectives to overcome the described barriers as well as the export potential of high quality FFV to the EU markets under the AA.

Generally speaking, the interviewed exporters were primarily exporting to the Arabic region. However, few of the interviewees also exported relatively small amounts of FFV to the European markets. In order to get a better understanding for the development of Syrian exports of FFV, it was important first to shed light on the existing value chain of FFV including the interviewees’ opinions in this regard. Section 4.3.1 presents the interviewees’

---

18 The author contacted in total 14 Syrian exporters of FFV via phone. E-mail or mail requests for an interview were not an easy option due to the lack of proper or undeveloped infrastructure of mail and email services in Syria. 9 exporters out of the 14, who were requested to take part in an expert interview, accepted to be interviewed. Only three of them agreed their telephone interviews to be recorded.
perceptions of the existing export value chain of FFV, including logistics and quality issues. Section 4.3.2 provides an analysis of export destinations of Syrian FFV. A special attention in this section is given to perspectives of interviewed Syrian exporters of FFV regarding European markets, including existing barriers and future opportunities.

In the following results sections, a number of verbatim quotations are exhibited to provide a more detailed insight into the views and opinions of the interviewed Syrian exporters of FFV. When words or sentences within a quotation were omitted, it is marked with: (…). Directly after the quotation, the ID of the interviewee is provided in brackets. The letter S stands for a Syrian interviewee.

4.3.1 Syrian value chain of fresh fruit and vegetables

4.3.1.1 Literature overview of Syrian value chain of fresh fruit and vegetables

In the 1990s, Syrian production of FFV was mainly oriented to meet the domestic market demand, given the measures that restricted exports of FFV. Such procedure was a governmental attempt at reducing the prices of FFV in the domestic market whenever dramatic increases happened. However, Syria began exporting as late as the 1990s when Syrian food security of FFV was reached and a significant surplus for export was achieved (García-Alvarez-Coque 2003, Rama 2003, FAO 2004, Bashour et al. 2005, NAPC 2009). The value chain of FFV was predominantly operated by the private sector with relatively small governmental intervention, where almost 95% of FFV marketing operations were done by the private sector while the remaining 5% represented the governmental public institutions (Cafiero 2007, Khazma 2007, NAPC 2009, Bisso 2010, Al-Kassar 2011, Lançon 2011). The pricing of most agricultural products, including FFV, was determined by demand and supply forces with minimum intervention from the Syrian Ministry of Economy and Foreign Trade. That was mainly through restricting export licenses of FFV with the purpose of consumer protection (Bisso 2010: 27).

The main characteristic of the Syrian value chain of FFV is that many intermediates are operating in all levels from the farmer up to the final consumer. The long value chain of some perishable FFV and the seasonality of production lead to price fluctuations on the domestic market. Thus, many farmers of FFV were exposed to higher price risk due to weaknesses of
marketing ability and absence of collective marketing strategies for their fresh products. Despite farmers’ cooperatives\textsuperscript{19} of FFV having been established in Syria, their role was mainly to supply farmers with agricultural inputs with very limited engagement in post-harvest and marketing operations (such as sorting, grading, packing) (Rama 2003, Khazma 2007, Bisso 2010).

4.3.1.2 Exporters’ perceptions of the Syrian value chain of fresh fruit and vegetables

Based on the interviewed Syrian exporters, a conceptualisation of the Syrian value chain of FFV (for both domestic and export markets) was elaborated. Figure 4.8 provides a visualisation of the exporters’ view about the Syrian value chain of FFV from farm level to final destinations, where the interviewed exporters offered a clear and precise description. “At the farm level, fresh fruit and vegetables are usually transferred to the markets in small or medium trucks that can be loaded with 2-6 tons (…). Sometimes they are transported with trailers due to the unavailability of normal and refrigerated trucks that protect the product from the weather conditions (sun, wind, rain etc.)” (Interviewee S1). This opinion was also shared by other interviewees. Additionally, more than one type of FFV were arranged in the same truck regardless of the boxes types and shapes, which sometimes led to deterioration of FFV quality. Most farmers transported their produce individually with small trucks either to the local markets of municipalities or to the governorates’ wholesale market named ‘Souq El-Hal’. Large amounts of Syrian production of FFV were sold directly on these markets (Interviewee S6).

In order to cope with marketing risk, many farmers of FFV also sold some amounts of their produce on the farm by the ‘Damman’\textsuperscript{20} at a negotiated price with an intermediate buyer,

\textsuperscript{19} Farmers’ cooperatives in Syria are semi-public organisations of farmers under the umbrella of Peasants’ Unions Federation (PUF). Cooperatives are vertically organised in peasant associations, at the district and governorate levels, up to the PUF at the state level. These cooperatives “have an essential role in the preparation and implementation of the national production plan. Although some cooperatives market part of the products of associated farmers, their main function is to provide members with the necessary inputs, through a system if in-kind and cash credit, both calculated on the basis of individual assignments in the plan. Even the minimum legal size of cooperatives, 30 members, testifies to their nature of agricultural associations rather than enterprises for marketing agricultural products” (Rama 2003: 254 f).

\textsuperscript{20} Damman means that some buyers of fruit and vegetables negotiate the farmers to purchase their produce directly before the harvest season at certain price. Then the buyers are responsible for the harvest, post-harvest and marketing of these products on their behalves. After harvest, the buyers usually sell these products on the wholesale markets in the main cities and in some cases, these products are sold immediately to the packing houses’ owners or exporters. Additionally, Damman in Syria is more often practiced in the fruit subsector more than in the vegetable subsector.
sacrificing some profit margin. “This practice is particularly common for perishable products that suffer most from price fluctuations on the local markets as there is a lack of long-period storage facilities (such as grapes, tomatoes, citrus fruit, onions and garlics) during the peak of the harvest season (...). Damman is also practiced for less perishable products (such as potatoes and apples), mainly when farmers have less access to the cold storage companies particularly during the peak of the harvest season” (Interviewee S4).

The governmental company of storage and marketing of agricultural products (GEMAAP) played an increasing role in the marketing of fresh produce from 2010 onwards. According to one of the interviewees, GEMAAP “procures different FFV directly from the farmers (particularly from small-scale farmers) with prices 5-10% higher than offered by private buyers, and then sell through their own retail outlets with prices 10-30% lower than the local market prices” (Interviewee S3). This company was unprofitable and the main task was price stabilisation through pushing market actors to offer better prices for farmers and also to mitigate consumer prices. GEMAAP was also involved in exporting of agricultural products, including FFV to the international markets (Interviewee S3, see Figure 4.8).

Most of the interviewees indicated that their companies were directly operating at the wholesale market or indirectly through wholesale agents. The wholesale markets21 of FFV existed in all Syrian cities which can be considered as the main transit points for most FFV products in Syria. Moreover, semi-wholesale markets were scattered in the main production regions. “The difference between the operators in the wholesale and semi-wholesale markets is that wholesalers are richer and more experienced” (Interviewee S8). In addition to wholesale and semi-wholesale markets, spot markets of FFV were common in many Syrian towns. However, such markets mainly took place in the weekend and had relatively small size.

FFV transport from wholesale and semi-wholesale to retail markets was done by retailers in small trucks of the capacity of 0.5-2 tons that were, mostly, uncovered and the produce was exposed to the weather conditions. However, the transport process usually took place before sunrise in order to minimise any undesirable effects on the quality of FFV (Interviewees S3

---

21 From the administrative and logistic point of view, wholesale markets are operated under supervision of the local municipalities. The municipalities rent the shops and provide the main services such as water, sewerage, toilets, cleaning, and security. Support is also offered by the Wholesale Market Commission, comprised of delegates, who represent the market traders and are mainly responsible for the regulation of the market operation and supervision of the trade activities therein (Khazma 2007).
and S5). “Large retailers, hotels, governmental establishments, processors and exporters also procure their FFV through agents that operate on the wholesale markets” (Interviewee S4). Moreover, FFV were usually collected at the local and wholesale markets by wholesalers or semi-wholesalers to be loaded in medium or relatively large trucks (5-12 tons) and usually transported to wholesale markets in other Syrian governorates to meet the domestic demand.

To sum up, FFV were usually transported to the traditional Syrian domestic markets by the farmers themselves or transport agents who brought their product from rural areas to the local markets or the wholesale markets in the main cities. FFV were then distributed at the wholesale market level through three channels: local consumption, processing, and export. “More than half production is locally consumed and the rest is either processed or exported, mostly to the Arabic countries” (Interviewee S7).
Figure 4.8: Syrian value chain of fresh fruit and vegetables (domestic and export markets)

Source: Own elaboration based on the interviewed Syrian exporters of FFV. *: GEMAAP is the General Establishment for Storing and Marketing of Agricultural and Animal Products.
4.3.1.2.1 Traditional export value chain of fresh fruit and vegetables

The traditional export value chain of FFV accounted for the majority of Syrian export of these products. The above mentioned steps from the farm level to wholesale market level were similar between the domestic and the traditional export value chains (see Figure 4.8). However, at the wholesale market, the commissioners usually made only a partial sorting of FFV products for the domestic consumption, whereas this procedure was applied more strictly when these products were prepared to the export market. Nevertheless, usually the exporters themselves were responsible for final sorting of FFV before exporting to the final destinations. The exporters mainly purchased FFV directly from wholesale markets (Interviewees S1, S9). In other cases, “some of the exporters and major processors of tomatoes, potatoes and citrus fruit also purchase their required quantities directly from the farmers through contract growing arrangements or at harvest, or through independent buyers” (Interviewee S4).

According to the interviewees, there were only few dozens Syrian exporters of FFV who had their own packing houses and operated outside the wholesale markets. A large amount of Syrian exports of FFV was traded by many ‘non-specialised exporters’, who were mainly operating in the domestic market without having enough knowledge about the requirements of foreign markets. “In such manner, the destination markets of Syrian FFV can be viewed as an expansion of the Syrian domestic market, where the non-specialised traders are exporting FFV surplus to these markets (particularly Arabic markets) in a similar way they are used to distribute in the domestic market” (Interviewee S3). As a consequence, Syrian exports of FFV were frequently affected by price fluctuations in the Arabic markets. Interviewee S1 stated that such problems were a direct result of the fragmented marketing channels of FFV export, which made it difficult to transmit the market signals from the foreign market demand to the supply side. Consequently, huge distances existed between Syrian farmers and the consumers in the targeted countries. This situation basically reflects the traditional export value chain of Syrian FFV to the Arabic countries (see Figure 4.8).

Section 4.3.2.2 of this chapter provides a further discussion of the main barriers of the traditional export value chain of FFV in Syria as well as interviewed exporters’ perspectives at improving the existing value chain.
4.3.1.2.2 Export value chain of fresh fruit and vegetables with direct sourcing from farmers

According to most of the interviewees, the vast majority of Syrian exporters of FFV were exporting ‘production surpluses’ through procurements from the wholesale markets, rather than exporting ‘production dedicated for export’. Yet, some of the interviewed exporters mentioned that some of their procurements of FFV were directly purchased from the farmers through ‘oral’ or ‘written’ contracts (see Figure 4.8). In such contracts, the farm gate prices were only determined according to the existing market prices whenever the products were delivered to the packing house of the exporter. Additionally, the exporter guaranteed price premiums higher than market prices. According to one interviewee, the price premium was about 5-10% above the market price (Interviewee S3), while another interviewee claimed that the price premium could even reach 30-50% for some assortments of FFV with high quality (Interviewee S1).

Few of the interviewees perceived contract farming, ‘production dedicated for export’, as the only way to motivate farmers of FFV to get involved in the export value chain. With contract farming, the exporter would have a better control over the production processes, resulting in high quality FFV for the export market (Interviewees S1, S3 and S4). Thus, contract farming could help to bridge the existing gap between the Syrian farmers of FFV and the consumers in the destination countries. Consequently, the tight relationship between farmers and exporter could lead to better transparency and feedback over the export value chain.

Few of the interviewees explicitly indicated that a modern export value chain of FFV should rely only on a ‘production dedicated for export’ model as the main tool to coordinate linkages and boost cooperation between exporters and farmers. In this regard, Interviewee S1 stated that “contract farming, on the one hand, will definitely help exporters to be dynamically engaged in production, harvesting, and post-harvest operations, and ultimately ensuring a timely and steady supply of foreign markets with fruit and vegetables that comply with the agreed quality requirements (...). On the other hand, contract farming dedicated for export will help farmers to minimise agricultural risks and marketing costs, and thus, farmers will obtain better incomes through marketing substantial parts of their fruit and vegetable production in the modern value chains of destination countries”(Interviewee S1). Yet, an adequate legal framework of the ‘production dedicated for export’ model is needed to be
elaborated in order to support stakeholders in implementing and fostering this concept in Syria (Interviewee S1, S3 and S4).

### 4.3.2 Export destinations of Syrian fresh fruit and vegetables

Most of the interviewees stated that they exported a wide assortment of FFV to the Arabic countries (particularly to Iraqi and Saudi markets). However, few of them also exported relatively small amounts of few FFV to the European markets. Since most of the interviewees had given only little information regarding the quantities being exported by their companies, the information being presented in this section includes the latest available official data\(^{22}\) of the export of FFV to the destination countries, followed by interviewees’ expectations of market trends in these countries. Figure 4.9 illustrates the regional distribution of Syrian FFV exports in 2011. Considerable amounts of FFV were exported, mainly to the Arabic region (neighbouring, Gulf, and North African countries). Though Europe had only a small share of Syrian FFV exports, about 16 thousand tons were exported in 2011. A detailed analysis of the current Syrian export of FFV to the above destination markets as well as exporters’ perspectives in this regard are given below.

---

\(^{22}\) The official data were obtained from Syrian Central Bureau of Statistics (CBS) based on the Syrian custom database.
Figure 4.9: Regional distribution of Syrian fresh fruit and vegetable exports in 2011

Source: Own calculation based on official statistics of the Syrian Central Bureau of Statistics (CBS).

4.3.2.1 Arabic markets of Syrian fresh fruit and vegetables

Trade with the Arabic countries is of great importance for Syrian agricultural products, including FFV. In the Arabic region, neighbouring countries and Gulf States were the main destinations of Syrian FFV while North African countries had a relatively small share of Syrian exports of these products.

4.3.2.1.1 Neighbouring Arabic markets

Figures 4.10 and 4.11 exhibit the main destinations of Syrian exports of FFV in the Arabic region in 2009 and 2011, respectively. These figures show that Iraq was by far the leading importer of Syrian FFV, followed by Saudi Arabia. Though Syrian FFV exports had sharply decreased in 2011 compared to 2009, about 420 thousand tons of fresh fruit and 135 thousand tons of fresh vegetables were exported to the Iraqi market, accounting for more than 68% and
25% respectively of Syrian total export of those products in 2011. Among fresh vegetables, tomatoes were the most important product that Syria exported to Iraq, where tomatoes solely accounted for 43% of Syrian exports of fresh vegetables to the Iraqi market. Regarding fresh fruit, citrus fruit were the main Syrian products being exported to Iraq, representing almost 50% of Syrian exports of fresh fruit to Iraq in 2011. An overview and details on the structure of Syrian exports of FFV to the Iraqi market in 2011 are depicted in Figure 4.12.

The other neighbouring countries, Jordan and Lebanon, produced some FFV similar to those cultivated in Syria, but on a relatively small scale. These countries also imported considerable amounts of FFV. In 2011, Jordan imported about 66 thousand tons of Syrian FFV (33 thousands for each), while Syria mainly exported fresh vegetables (60 thousand tons) and only relatively small quantities of fresh fruit (5 thousand tons) to the Lebanese market (see Figure 4.10).
Figure 4.10: Main destinations of Syrian fresh fruit and vegetable exports in the Arabic region in 2009

Source: Own calculation based on official statistics of the Syrian Central Bureau of Statistics (CBS).

Figure 4.11: Main destinations of Syrian fresh fruit and vegetable exports in the Arabic region in 2011

Source: Own calculation based on official statistics of the Syrian Central Bureau of Statistics (CBS).
Figure 4.12: Structure of Syrian exports of fresh fruit and vegetables to Iraq in 2011

Source: Own calculation based on official statistics of the Syrian Central Bureau of Statistics (CBS).
All of the interviewed companies were exporting FFV to the Iraqi market. Few of the exporters mentioned that their FFV exports to this market had witnessed a substantial increase since 2004, and by time of the interviews, Iraq represented the largest market for their fresh produce. Furthermore, most of the interviewees expected consistent growth in Syrian export of FFV to the Iraqi market over the next years. Some of the interviewees who were exporting to Lebanon and Jordan expected only a small growth in Syrian FFV to these markets over the next years, since those countries are relatively small and they also produce similar assortments of FFV. Interestingly, a small number of the interviewees stated that the Lebanese market is expected to request higher compliance with international standards, including FFV produced organically.

4.3.2.1.2 Arabic Gulf States markets

The trade of the Arabic Gulf States in FFV accounted for only a small fraction of the world trade. However, these markets were important outlets for Syrian products, due to their proximity and cultural similarities. Saudi Arabia was the biggest market in the Arabic Gulf States for Syrian agricultural products, including FFV. In 2011, Saudi Arabia represented the second largest importer of Syrian FFV after Iraq (see Figure 4.10). Though Saudi Arabia mainly imported fresh vegetables from Syria, a significant amount of Syrian fresh fruit was also exported to the Saudi market. By volume, about 190 thousand tons of Syrian vegetables and 40 thousand tons fresh fruit were exported to Saudi Arabia, representing 35% and 7% of Syrian exports of fresh vegetables and fresh fruit, respectively. Detailed structure of Syrian export of FFV to Saudi market is demonstrated in Figure 4.13. While Syria mainly exported tomatoes and potatoes to the Saudi market, substantial amounts of pome fruit and stone fruit were also exported in 2011.
4 Analysis of Syrian exports of (organic) fresh fruit and vegetables

Figure 4.13: Structure of Syrian exports of fresh fruit and vegetables to Saudi Arabia in 2011

Source: Own calculation based on official statistics of the Syrian Central Bureau of Statistics (CBS).
Other countries of the Arabic peninsula, namely Kuwait, United Arab Emirates, Oman, Qatar and Bahrain, also imported significant amounts of FFV originating from Syria. Kuwait, United Arab Emirates and Oman imported relatively higher quantities of Syrian FFV than the smallest countries (Qatar and Bahrain) in this region\(^\text{23}\) (see Figure 4.10). These countries imported the same assortments of FFV from Syria as Saudi Arabia did. Moreover, Figure 4.10 shows that all Gulf countries were mainly importing fresh vegetables from Syria.

All interviewed Syrian exporters supplied Gulf markets with different varieties of FFV. Most of these products were usually sold on the traditional markets in these countries. Few of the interviewees further indicated that these markets were becoming more demanding, especially with regard to quality compliance with the international standards. A growing number of specialised outlets in these countries were established in the major cities. These outlets put a stronger focus on the quality of FFV (including organic produce, though still in small quantities). Few of the interviewees mentioned that they supplied these niche markets with high quality cherries and mushrooms (Interviewees S1, S4). Furthermore, these exporters expected a higher demand of these outlets for FFV over the next years (after 2011).

### 4.3.2.1.3 Northern African markets

North Africa came in the third place after the neighbouring countries and the Gulf States with respect to the destination of Syrian export of FFV in 2011. Figure 4.9 indicates that North African countries mainly imported fresh fruit from Syria, while small quantities of fresh vegetables were imported by Libya and Egypt in 2011. Among the North African countries, Egypt was the main destination of Syrian FFV exports. Sudan, Libya and Algeria imported relatively small quantities of Syrian fresh fruit, mainly apples. About 95% of Egyptian imports of fresh fruit from Syria were apples. Apples also accounted for the majority of Syrian exports of fresh fruit to Sudanese, Libyan and Algerian markets. Among other fruit, figs and stone fruit were also exported to North Africa; however, together they only amounted for 5% in these markets. Few of the interviewees exported apples to these countries, however in relatively small scale. They expected that their exports were likely to grow, particularly to Sudan.

\(^{23}\) The population in these countries, namely Kuwait, United Arab Emirates, Oman, Qatar and Bahrain, is relatively small; accounting all together for about 15 million (almost 60 % of the population is non-Arabs, mainly from Southeast Asia).
4.3.2.1.4 Interviewed exporters’ experiences in the Arabic markets of fresh fruit and vegetables

Exports to the Arabic region (neighbouring, Gulf and Northern African countries) were composed mostly of packaged bulk products (package size of 25 kg for some assortments of FFV). These were purchased through the main wholesale markets in Syria, and in few cases through contract farming of ‘FFV production dedicated for export’. These products were then exported by refrigerated trucks to the Arabic countries. Some of these trucks were hired from the aforementioned countries as few of the interviewees had mentioned. Additionally, few exporters indicated that Syrian exports of FFV were done in refrigerated trucks of 17-18 tons of mixed products to avoid marketing risk in the destination countries. Nevertheless, this option did not allow applying the adequate temperature for these mixed assortments of FFV, resulting occasionally in quality degradation of some products before reaching the final consumers. Moreover, few of the interviewees stated that most of their FFV exports were sold on the traditional market in these countries. This market was strongly characterised by price instability of FFV. For instance, “market price increases on such markets are usually followed by large export volumes, resulting in sharp decreasing prices some days later” (Interviewee S3). High temperatures and lack of access to cold storage at the traditional Arabic markets also contributed to increase the pressure on the quality and selling prices of FFV (Interviewees S2, S5 and S9). Furthermore, few interviewed exporters mentioned that Syrian export activity of FFV rarely responded to long-term strategies in the destination markets. Most exporting activities were usually encouraged by the existence of family relations between the Syrian exporters (who mainly operated on the wholesale markets) and the operators in the Arabic peninsula, which partly explains the relative specialisation on Iraqi and Gulf markets. Additionally, the exporting activities seemed to be characterised by fragmented marketing channels, where most of Syrian exporters tended to act in an individualistic way. The market information was valuable for the exporters; however, it was not a shared asset by the different chain actors. Consequently, there were huge distances between the producers in Syria and the consumers in the Arabic countries, with little feedback on the quality requirements, which is a serious problem for marketing in modern value chains. Moreover, the laboratory analyses of chemicals or fertilisers’ residues were done at a minimum level as most of the Syrian exports destinations were the Arabic countries, but these analyses would be crucial for accepting Syrian exports in high value markets such as EU markets. Accordingly, some of the interviewed exporters indicated the important role of
establishing new accredited laboratories according to the international standards of chemicals’ residues.

4.3.2.2 Syrian exports of fresh fruit and vegetables to Europe: Eastern Europe and EU

Syrian exports of FFV to the European markets\textsuperscript{24} were relatively small compared to the situation of export to the Arabic region (see Figure 4.9). Exports to European markets represented less than 1.5\% of all exported Syrian FFV in 2011. Figure 4.14 shows that Eastern Europe was the main market of Syrian FFV in Europe, while the EU market represented only a relatively small share of Syrian FFV exports. The main destinations in Europe were Russia, Ukraine, Moldovia and one of the EU Member States (Romania). Syria exported a wide variety of FFV to those countries; however, the amounts varied from product to product and from year to year (the exported quantities between 2009 and 2011, for instance, ranged from 100 tons for some products to 3 thousand tons for some other products). Tomatoes, cucumbers, peppers, onions, cherries, citrus fruit, table grapes and figs were the most important FFV being exported to the Eastern European countries within this period. The EU countries, including Germany, imported only little amounts of FFV from Syria over the same period. Small amounts of different FFV were exported to the EU countries (which was mainly sold in Arabic shops in the EU according to few of the interviewees). Tomatoes, cucumbers, potatoes, table grapes and lemons were the most important FFV exported to the EU in 2011, amounting to more than one thousand tons in this year. Syrian exports of FFV to the German market were below 100 tons in the same years. However, Germany imported some processed fruit and vegetables which amounted to 1.8 thousand tons in 2011 (CBS 2015).

\textsuperscript{24}The data of exports into Europe were obtained from the statistical abstracts at Central Bureau of Statistics of Syria (CBS 2012) and Eurostat database.
4.3.2.2.1 Perspectives of Syrian exporters of fresh fruit and vegetables toward European markets

The interviewed Syrian exporters of FFV were mainly exporting to the Arabic region, in line with the previous section of this chapter. However, some of the interviewees stated that their FFV exports witnessed a remarkable development in Eastern Europe markets during 2011. A wide variety of FFV was exported, compared to previous years. Significant quantities of citrus fruit, cherries, figs, table grapes, pears, plums, and other stone fruit were exported by some of the interviewed exporters, mainly to Russia, Romania and Ukraine. Among vegetables, tomatoes, sweet peppers, onions cucumbers, eggplants and okras were also exported to the Eastern European markets. In terms of quantity, interviewed Syrian exporters indicated that more fresh vegetables than fresh fruit were exported to these markets. Furthermore, some of the exporters indicated that other Eastern countries as Moldovia, Azerbaijan, Albania, Serbia,
Georgia, Macedonia, Bulgaria, Slovakia and Turkey were also importing FFV from Syria. Significant amounts of tomatoes, peppers, cucumbers, potatoes, onions, lettuces and figs were exported to these markets by some of the interviewed exporters. Regarding quality criteria, the exported FFV were subject to control for pesticide residues and food safety standards. Some exporters mentioned that some amounts of the exported cherries and tomatoes to these countries were also certified according to GLOBALGAP\textsuperscript{25} standards. The transport to the destination countries was mainly done by refrigerated trucks across Turkey and by sea freight, which approximately takes one week to arrive in these countries (Babili et al. 2014). Syrian exporters often relied on Turkish trucks to transport FFV to the European countries, given the bilateral transport agreements between Turkey and Europe that enable Turkish trucks to cross through Europe with relatively small cost compared to Syrian trucks. Few of the interviewed exporters expected that Syrian exports of FFV to the Eastern European markets would significantly increase over the next few years (after 2011). That was mainly due to the remarkable improvement of exported FFV in terms of compliance with qualitative requirements and logistics (Interviewee S1).

Regarding the Western EU markets, some of the interviewees were already exporting FFV to the EU, including Germany. However, the quantities were relatively small. Significant amounts of cherries were exported by few of the interviewed exporters (SAPEA) to Germany, France and the United Kingdom in 2011. In this context, one of the interviewees stated that “Syria has a longer production season of cherries than the EU countries, lasting from the beginning of June until the middle of September (...). Also rather newly, some citrus fruit are being imported by an Italian company that distributes them to other EU countries, including Germany. The harvest season of citrus fruit in Syria starts in October and takes until June. The early harvest and the long season of the multiple varieties of Syrian citrus fruit in addition to the utilisation of integrated pest management (IPM) represent a great opportunity for an expanding export volume for citrus fruit to the EU markets in the next years” (Interviewee S2). Small amounts of red and white table grapes (with seeds) were also exported to Germany, particularly to Arabic shops in Berlin. Small quantities of sweet peppers, cucumbers, mini-cucumbers and potatoes were exported to Western Europe (Germany, United Kingdom and Sweden) from December until May. Few of the interviewees also mentioned that small quantities of fresh leafy vegetables (parsley, coriander, celery, 25 GLOBALGAP mainly focuses on the producer level and is often supplemented by International Food Standards on the wholesale level. A major component of both systems is the extensive documentation requirement for all stages of the production process (GLOBALGAP 2015).
mints and mallow-leaves) were among the fresh products exported to EU markets, mainly to France. Significant amounts of strawberries were exported to the EU countries, particularly to the United Kingdom in winter time. The exported cherries were certified by EU certification bodies according to GLOBALGAP and EUREPGAP standards. Other FFV were only subject to control for pesticide residues and food safety standards. Most of the aforementioned FFV were exported by air freight to Berlin, Paris and London, while the potatoes and citrus fruit were mainly carried by Turkish trucks cross through the EU and also by sea freight to Italy and Cyprus.

4.3.2.2 Exporters’ perspectives about the main barriers regarding Syrian exports of fresh fruit and vegetables to the EU markets

By the time of interview conduction, Syrian exports of FFV were facing significant challenges in accessing the high value markets of Western EU markets. According to the interviewed exporters, the generally occurring problems which hindered exporting FFV to these markets could be summarised as follows:

1. Most FFV exports were organised by several small companies. These small companies operated the export activities without having a long-term strategy in the destination markets. This problem came along with the absence of contract farming between these exporters and Syrian farmers.

2. There were only few Syrian associations or companies that were exporting FFV according to the prerequisite standards of modern value chains such as GLOBALGAP. SAPEA was one example of those associations; however, by the time of interview conduction, SAPEA was still working to develop their methods and quality requirements for better access to the high value markets, including Western EU markets.

3. The traditional export value chain of FFV in Syria was inadequate for accessing the high value markets in the EU. Most of Syrian exports of FFV to the Arabic region were relying on traditional ways of transport. The agricultural products were mainly transferred from the scattered farms to the wholesale markets. Post-harvest operations also represented a major challenge for FFV marketing, which could reflect positively or negatively on the product quality. Poor post-harvest technology and lack of cold chain infrastructure from the field to the wholesale market might consequently lead to quality degradation of Syrian FFV. By the
time of interview conduction and earlier, the wholesale markets in Syria represented the transit points for the Syrian export of FFV. However, these markets were relatively old and located inside the major cities. They were mainly designed to meet the local demand in the past. Moreover, the wholesale and semi-wholesale markets were also not well organised, particularly in terms of trucks entry and exit. The data related to the quantities coming in and out of the market were also not available, as well as there was a lack of information about the sale and procurement prices and the quality of products. The markets also suffered from the lack of adequate cold storage, warehouse and refrigerated delivery vehicles. These reasons might cause further degradation of a substantial portion of the fresh produce and also increase the rate of rejection in destinations like the EU market.

4. There was a lack of an appropriate information system in the Syrian value chain of FFV, regarding the qualitative and quantitative requirements of the destination markets. The lack of transparency and information exchange over the value chain (from the farm up to the final destination and vice versa) represented a major challenge for the further development of the Syrian export sector of FFV in the existing markets and also hindered export opportunities to the EU markets under the AA.

5. Pre-war time, Syria had a large fleet of trucks that transported Syrian FFV to the Arabic region. However, most Syrian trucks were relatively old and unable to access into many European countries. That was particularly due to the scarcity of bilateral agreements with the EU and Eastern Europe in the field of transport. Syrian trucks paid high tariffs in these countries compared with e.g. Turkish trucks. While the transport cost of Syrian trucks was about US$ 3000-3500 to Moscow and Western European countries (according to two of the interviewees), the Turkish trucks paid less than half to arrive to the same destinations. That was particularly due to bilateral agreements between Turkey and European countries. To reduce the cost of transport, some of the Syrian exporters depended on Turkish trucks when they exported to EU and Eastern Europe markets.

6. The lack of cooling and cold storage facilities in the export outlets (borders, airports and seaports) embodied a major barrier for expanding the export of FFV to the EU markets. The lack of accredited laboratories for pesticide residue analysis within these outlets was also crucial for further development of Syrian export of high quality FFV.
7. The lack of air freight for agricultural products and the lack of cooperation with foreign companies of air transport hindered the export of some perishable agricultural products to the EU markets.

8. The lack of market research and market information on the EU markets of FFV and the dearth of participation in important events in the EU countries such as exhibitions were crucial for the development of Syrian exports of FFV to the EU markets. The knowledge on the retail distribution and wholesale trends of FFV in the EU market is absolutely necessary to help Syrian exporters of FFV to identify the opportunities in order to access the EU markets. As mentioned in Chapter 3, the trend in the EU is that a limited number of large distribution and wholesale companies are responsible for importing a large quota of the EU imports of FFV. Long-term agreements between suppliers and distribution companies in the EU are also important. In this context, the creation and establishment of large exporting companies (such as SAPEA) becomes an essential step for Syrian exports of FFV to the high value EU markets.

4.3.2.2.3 Exporters’ perspectives towards an improvement of the existing value chain of fresh fruit and vegetables

With the aim of finding better opportunities for Syrian FFV in the high value foreign markets, few of the interviewed Syrian exporters pointed out that the horticultural sector should be improved on three levels (Interviewees S1, S3 and S4). These levels can be summarised as follows:

I. The first level deals with adoption of new agricultural practices that improve the quality and raise the competition of Syrian FFV on the international markets. That is particularly important for some assortments of Syrian FFV that could have ‘comparative advantages’ in the EU markets, such as tomatoes, citrus fruit, cherries, apricots, figs, spring and leafy vegetables. These FFV species can be produced in Syria for a relatively longer time and at lower costs than those produced in countries like Morocco and Turkey, who supply such products to the EU (as it was stated by two of the interviewees S1 and S3 in 2011). According to these interviewees, this step should be followed by identifying the assortments of FFV for which the EU markets have demand potential over the next years (after 2011). Furthermore, quality requirements that are expected by the import countries should be identified. The
adoption of ‘contract farming of FFV dedicated for export’ will help at improving the information flow and build mutual trust between Syrian farmers and exporters, which are important to guarantee high quality of FFV from the farm level up to export destination. Consequently, the improved relationship between farmers and exporters can help to ensure a high competition of Syrian FFV on the foreign markets.

II. The second level deals with all procedures that can promote Syrian horticultural products in the target markets, such as participation in the international exhibitions of FFV, campaigns and advertising for these FFV. The direct communication between the Syrian exporters of FFV and the importers from the target countries facilitates the efforts to export these products and also helps the exporters to get feedback to update their information about the demand trends of these FFV in the target countries.

III. The third level is the reduction of the export costs of FFV that have ‘*comparative advantages*’ in the foreign market. Alike the successful governmental support of olive oil and cotton exports to the high value markets, interviewed exporters expressed the need for export subsidies that should be provided by governmental institutions such as EDPA and Export Development Fund. Such subsidies will help exporters to substantially reduce the export cost to the high value markets like Western EU markets. Consequently, FFV exports will provide the Syrian state treasury with hard currencies (e.g. € and US$) needed for the import activities.

Regarding the logistics infrastructure solutions that can foster Syrian export of high quality FFV, few of the interviewed exporters stressed on the urgent need for new wholesale markets, which have to be bigger in size and located outside the cities and equipped with storage centres as well as modern packing houses with cold rooms and grading and sorting lines for citrus fruit, apples, tomatoes, potatoes, which represents the major Syrian exports of FFV. Furthermore, those exporters also mentioned the urgent need to develop the transport infrastructure and refrigeration system of fresh agricultural products within Syrian border ports, establishing cargo village near Damascus airport and allocating parts of the marine terminal in Tartous harbour for the shipment of fresh agricultural products. Consequently, such new markets and transport infrastructure development will reduce the costs related to transport from and to the market, and will lead to a shorter and more efficient value chain that can significantly reduce the vulnerability of perishable FFV and ensure their freshness from
the farm up to the final market. In such manner, the expansion of perishable agricultural products export to the high value markets will be guaranteed.

**4.3.2.2.4 Case study: SAPEA experience in the EU market of fresh fruit and vegetables**

SAPEA was the first agricultural association of exporters in Syria. SAPEA cooperated with universities in a number of Arabic and European countries in order to study the market demand within these countries. SAPEA also had a cooperation with the FAO, the Japanese Agency for International Cooperation and the Chambers of Agriculture in Europe and the EU-Syria project for quality development. SAPEA received GLOBALGAP certification in 2010 which facilitated its exports to Germany, France, Austria, Italy and Eastern Europe.

Two out three interviewed exporters under SAPEA had adopted the necessary investments to their production and post-harvest handling systems to meet the stringent quality requirements of the EU value chain of FFV. The EU quality requirements of FFV usually exceeded those that were required by the high quality retail outlets in the Arabic region. These two exporters expressed that substantial amounts of their exports of fresh produce complied with the international standards (mainly GLOBALGAP, EUREPGAP, and in some cases organic standards), and they also had control over all agricultural practices starting from the farm up to the final market. In this vein, the value chain starts with the supply of farmers with inputs and their consultation about the optimal ways of what and how to produce, certification, post-harvest activities, etc. These exporters also had their own packing houses with cooling rooms and modern sorting lines in addition to refrigerated lorries which directly carry the produced goods from the farms to the packing houses. After sorting, their own or hired refrigerated trucks immediately transported the fresh produce to the destination markets within the Middle East and Europe. Moreover, one of the interviewed exporters under SAPEA also mentioned some new experiences linked with carriers such as Syrian, European, and Gulf Airlines for some perishable fresh produce (such as cherries, strawberries, figs, leafy vegetables and cut flowers). In such manner, the exporters managed to ship orders quickly and efficiently to the main airport hubs in France, UK, and Germany. However, when time is not as critical and the fresh produce less delicate, 'land-sea-land' transport offered a reliable and cost efficient alternative for the transport of FFV within the Mediterranean region, where the maritime transport line took only 3-4 days from Tartous harbour in Syria to Venice or Livorno harbours in the North of Italy.
Interviewed exporters under SAPEA finally expressed their recent knowledge about the EU markets’ demand of organic FFV and their efforts to have better access to these markets over the next years (after 2011). Interestingly, SAPEA already had a long experience of exporting organic olives and olive oil to Italy and Spain, France and Greece. With respect to SAPEA’s exports of organic FFV to the EU market, only small quantities of organic figs and table grapes had been exported to Germany and England so far. However, by the time of interviews, SAPEA planned to export organic potatoes, carrots, tomatoes, strawberries and citrus fruit to this market over the next years (after 2011). Likewise, SAPEA had good experience of exporting substantial amounts of organic mushrooms, tomatoes, and citrus fruit to Lebanon, Kuwait, Arab United Emirates and Saudi Arabia over the previous years (before 2011). “In spite of some success reached by few exporters regarding the access of the EU value chain of (organic) FFV, nevertheless, more efforts are still required” (Interviewee S1).

In this context, few interviewees stated that Syrian exporters of FFV have to be aware that a direct and continuous contact with the actors within the EU market of FFV plays a significant role to build trust and long-term relationships. Therefore, the regular attendance of trade fairs in the EU (e.g. Fruit Logistica and Biofach in Germany), market study tours and other means are crucial tools to identify EU market requirements of (organic) FFV including assortments, quality specifications, price, volume, timing, information exchange and fast response to market signals, payment terms, etc.
5 Theoretical framework: The reasoned action approach

5.1 Introduction

In a social psychology context, intentions towards specific behaviours are considered to be good predictors of the actual performing of these behaviours. Many contemporary models of human social behaviour have used intentions (or similar concepts) as a critical component for understanding the behaviour in question. Among these models are for instance the theory of interpersonal relations and subjective culture (Triandis 1977), the Miniard-Cohen model of behavioural intention (Miniard and Cohen 1983), the information–motivation–behavioural skills model (Fisher and Fisher 1992), the theory of trying (Bagozzi and Warshaw 1990), social cognitive theory (Bandura 1988, 1999), the prototype/willingness model (Gibbons et al. 1998) as well as the theory of reasoned action (Ajzen and Fishbein 1973) and the theory of planned behaviour (Ajzen 1985 and 1991). Generally speaking, the scope of the aforementioned models exceeds behaviour prediction, to deal with the factors that determine the behavioural intention itself. Even though these models differ in the details regarding the factors that lead to the formation of intentions, there is growing convergence on some factors that account for a large proportion of the variance in behavioural intentions (Bandura 1999, Fishbein et al. 2001, Ajzen and Fishbein 2005). These factors can be summarised in three major kinds of determinants that influence the decision to engage in a specific behaviour: the likely positive or negative outcomes of the behaviour, the approval or disapproval of the behaviour by important referents or groups, and the factors that may facilitate or impede performance of the behaviour. According to Ajzen (1991, 2005), these three determinants of behavioural intention are called behavioural beliefs, normative beliefs and control beliefs, respectively (See 5.3.1 for an overview).

This chapter presents the social-psychological framework which is used in the thesis in order to assess the intentions of Syrian farmers of FFV towards organic farming and the likelihood to convert their farms to organic. The first section of this chapter provides an overview of the Theory of Reasoned Action (TRA) and gives a brief insight into the traditional attitude-behaviour model. The second section gives an overview over the Theory of Planned Behaviour (TPB) as well as an elaboration of its components. While subjective norms and attitudes towards behaviour constitute the mean components of the TRA, the TPB assumes that individual’s behaviour is guided by three components, namely attitudes, subjective norms
and perceived behavioural control (Ajzen 1991). Therefore, taking these factors into account is crucial for measuring farmers’ intentions to adopt organic farming and in turn, to predict farmer’s behaviour. The third section includes a literature review of the applications of the TPB in agricultural decision making, including the farmers’ intentions to adopt organic farming. The last section of this chapter deals with the measurement procedure which has been used to construct and formulate items for calculating the TPB components.

5.2 Theory of Reasoned Action

The TRA was first proposed by Ajzen and Fishbein (1973) and illuminated by their further work (Fishbein and Ajzen 1975, Ajzen and Fishbein 1980). The notion of this theory was essentially derived from previous social psychology research on the relationship between an individual’s attitudes and behaviour (Fishbein 1967b). More than any other psychological construct, attitudes have been the cornerstone to predict and explain social behaviours. Much of human behaviour research in the early days was guided by the general attitudes towards broad objects rather than specific behaviours (Thomas and Znaniecke 1918, Watson 1925 cited in Ajzen and Fishbein 2005: 174). General attitudes can be defined “as the latent disposition or tendency to respond with some degree favourableness or unfavourableness to a psychological object” (Fishbein and Ajzen 2010: 76). In the 1950s and 1960s, results of most attitude-behaviour research showed that general attitudes correlate well with broad measures of behaviours towards physical objects, institutions, ethnic groups, policies, events and other general targets. However, these general attitudes were found to be poor exclusive predictors of specific behaviours (Fishbein and Ajzen 2010) and many social psychologists argued that general attitudes are not efficient to measure specific behaviours under investigation (e.g. Blumer 1955, Campbell 1963, and Wicker 1969 cited in Ajzen and Fishbein 2005: 175).

Nevertheless, attitudes may have a strong impact on behaviour, particularly under certain circumstances or for certain types of individuals (Ajzen 2005). This is also supported by some empirical research which has shown that a specific behaviour can be predicted well by using compatible measures of attitudes towards a specific behaviour, rather than measuring general attitudes towards a broad object (e.g. Manstead et al.1983, Sheppard et al.1988, Terry and O’Leary 1995).

According to Hale et al. (2002: 259) the TRA was “born largely out of frustration with traditional attitude-behaviour research, much of which found weak correlations between
attitude measures and performance of volitional behaviours”. Consequently, as an attempt to solve the weaknesses of traditional attitude-behaviour theory, Fishbein and Ajzen (1975) elaborated the concept of attitude towards specific behaviours instead of using the concept of general attitudes towards broad objects. They also introduced new components (subjective norms and behavioural intention) into this theory, seeking to have a comprehensive understanding of performing volitional behaviour. The separation of behavioural intention from the associated behaviour in the reasoned action approach allows for better understanding of attitudinal influence on the behaviour under investigation (Ajzen and Fishbein1980). Thus, the TRA can be considered as deliberative processing model, as it implies that people are rational and they carry out their behaviours based on careful consideration of accessible information (Conner and Armitage 1998). Figure 5.1 illustrates the major components of the TRA model. Three constructs can be identified: behavioural intention to perform behaviour, attitudes towards behaviour and subjective norms. A detailed overview about the TRA components is illustrated under the TPB model later in this chapter.

Figure 5.1: Theory of Reasoned Action

In the reasoned action approach, concerns are shifted from general attitudes towards broad objects into attitudes that are compatible with a particular behaviour in terms of target, action, context, and time elements (Ajzen and Fishbein 1977). However, some investigators have criticised such shift in focus from broad behavioural criteria into attitudes towards a particular behaviour, claiming that attitudes towards a particular behaviour are too specific to give an accurate prediction of the behaviour under investigation. According to Fishbein and Ajzen (2010) the abovementioned claims are mainly due to the misunderstanding and the misinterpretation of the principle of compatibility, which is used to specify such attitudes and
behaviours. Indeed, the principle of compatibility merely insists that predictors (e.g. attitudes, subjective norm) and behavioural criteria (e.g. behavioural intention) must be defined at the same level of generality or specificity. For instance, “an investigator studying energy conservation should construct an aggregate index of this type of behaviour as the criterion and then assess attitudes towards the general construct of energy conservation. However, if the behavioural criterion is operationalized as recycling paper every week, then the compatible attitude would be the more specific attitude towards this behaviour, that is, attitude towards recycling paper every week. It is up to the investigator to decide at what level of generality or specificity to operate” (Ajzen and Fishbein 2005: 198f).

While the TRA is able to provide superior prediction for performing volitional behaviours, a wide range of behavioural categories, such as spontaneous, impulsive, habitual and mindless behaviours, are excluded from the explanatory scope of this theory. That is primarily due to the fact that the performance of these behaviours might not be voluntary or might not involve conscious judgement by the decision maker (Hale et al. 2002: 259f). Moreover, other behaviours, which necessitate some external prerequisites, are also excluded from the scope of this theory. This implies that individuals might be precluded from performing a given behaviour because they lack certain prerequisites, which are needed to perform that behaviour, rather than the absence of their voluntary decision to involve in such behaviour. These prerequisites might be for instances: the lack of some special skills, unique opportunities and/or resources, or even the lack of the cooperation from other people to perform the behaviour under consideration (Hale et al. 2002: 259f).
5 Theoretical framework: The reasoned action approach

5.3 Theory of Planned Behaviour

The TPB (Ajzen 1985 and 1991) is a prominent reason action model in the domain of social psychology, built upon the TRA as an attempt to better understand an individuals’ behaviour (Ajzen 2005: 117). Whereas the TRA seeks to explain human behaviour through behavioural intention based only on attitudes and subjective norm, the TPB in addition addresses the perceived behavioural control (Madden et al. 1992). Perceived behaviour control was added to the TRA model “to overcome its limitations when dealing with behaviours over which individuals have incomplete volitional control” (Ajzen 1991: 181). Thus, this component emphasises on human ability to control over the behaviour in question.

The essence of the TPB is that the intention to perform (or not to perform) a specific behaviour is the immediate antecedent of that behaviour, and the intention itself is considered as a function of attitudes towards the behaviour, subjective norms (i.e. perceived social pressure) and perceived behavioural control. The TPB also stipulates that these three conceptual components of person’s intention to perform a specific behaviour are also functions of behavioural beliefs, normative beliefs and control beliefs, respectively. Moreover, the abovementioned beliefs can also vary as a function of a wide range of background factors (Ajzen 2012). Against this background, the TPB can be thought as a multidimensional model which incorporates socio-economic, socio-cultural, psychological and economic aspects into the behaviour analysis (Burton 2004, Ajzen 2005, Jackson et al. 2006). A graphical representation of the TPB is exhibited in Figure 5.2. A detailed description of the components of the TPB is given in the following sub-sections.
Figure 5.2: The Theory of Planned Behaviour (after Fishbein and Ajzen 2010: 22)

Demographic variables

Personality variables

Other background factors:
Past behaviour,
general attitudes,
knowledge, affect:
mood and emotion,
social environment,
etc.

Behavioural beliefs

Attitudes towards the behaviour

Normative beliefs

Subjective norms

Intention to perform the behaviour

Control beliefs

Perceived behavioural control

Behaviour

Actual behavioural control
(Skills, abilities,
environmental factors)

Direct effect

Proxy effect

Background factors’ effects

Feedback effect
5.3.1 Components of the Theory of Planned Behaviour

Behavioural intention to perform a specific behaviour represents the core point in the TPB and it can be briefly defined as people’s motivation in the sense of their conscious plan or decision to exert effort to carry out the behaviour under consideration. The direct path from behavioural intention to behaviour, within the TPB model, reveals the fact that people have a tendency to involve in behaviours they intend to perform. Intention to perform a specific behaviour comprises all factors that affect that behaviour and indicates how much effort a person will take to perform the behaviour under investigation. Therefore, measuring the underlying components of the behavioural intention is crucial for understanding and predicting the associated behaviour (Ajzen 2005:118). Within the TPB framework, there are three direct components that have been identified as important predictors of the behavioural intention (attitudes towards behaviour, subjective norms and perceived behavioural control):

1) Attitudes towards the behaviour are the individual’s favourable or unfavourable evaluation of performing a particular behaviour. People who seize favourable attitudes are likely to notice, take into account, and process mainly the object’s positive attributes. Conversely, individuals who hold unfavourable attitudes towards the object (or behaviour) are likely to direct awareness to its negative aspects. Accordingly, people’s perceptions of the object (and related contextual components such as subjective norms) influence people’s definition of the event, possibly directing attention to positive or negative outcomes of carrying out the behaviour in line with the positive or negative appraisal of the object (or behaviour) under consideration (Fazio and Towles-Schwen 1999, Ajzen and Fishbein 2005, Montano and Kasprzyk 2008). Three dimensions of attitudes can be distinguished: cognition (beliefs towards object or behaviour), affect (evaluation of behavioural outcomes) and conation (behavioural inclination to perform the behaviour) (Edwards 1990, Trafimow and Sheeran 1998, Ajzen 2005). In the context of the TPB, while cognitive and affective dimensions of attitudes explain the relationship between the behavioural beliefs and attitudes towards the behaviour, the third dimension of attitudes (conation) is postulated to have a causal effect on the intention to perform the behaviour (Ajzen 2012: 422).

2) Subjective norms can be identified as a person’s perception of the social pressure on carrying out a specific behaviour. In other words, subjective norms represent a
person’s perception that most people who are important to her/him think that she/he should (or should not) engage in a given behaviour. Consequently, the positive or negative influence of these respected referents (i.e. important others such as family, friends, etc.) is postulated to have either a positive or a negative influence on the individual’s decision of performing a specific behaviour. Like the attitudes towards behaviour, the subjective norms are also derived from a set of salient beliefs (so-called normative beliefs) and they are assumed to have a direct effect on the formation of the behavioural intention (Fishbein and Ajzen 2010: 130f).

3) Perceived behavioural control deals with the factors that facilitate or impede performance of a given behaviour (Ajzen 2005: 125). Ajzen (1985) suggested that behavioural intention would become a stronger predictor of the behaviour in question when perceived behavioural control increases. Ajzen’s construct of perceived behavioural control (Ajzen 1985) is equivalent to Bandura’s concept of self-efficacy (Bandura 1982, 1997). That is because each construct (i.e. perceived behavioural control and self-efficacy) can be thought as a continuum with easily performed behaviours at one end and behaviours requiring specialised skills, opportunities and resources at the other end (Terry and O’Leary 1995, Conner and Armitage 1998, Ajzen 2002, Sheeran et al. 2003). According to Ajzen (2005: 118): the TPB “does not deal directly with the amount of control a person actually has in a given situation; instead, it considers the possible effects of perceived behavioural control on achievement of behavioural goals. Whereas intentions reflect primarily an individual’s willingness to try enacting a given behaviour, perceived control is likely to take into account some of the realistic constraints that may exists”. Accordingly, it can be assumed that to the extent to which perceived behavioural control corresponds practically well to actual behavioural control, perceived behavioural control can serve as a good proxy of the actual control over behaviours under consideration. Perceived behavioural control can also provide useful information which help at explaining and predicting the associated behavioural intentions (Ajzen 2005: 118f). Figure 5.2 exhibits the set of relationships among actual behavioural control, perceived behavioural control, behavioural intention and behaviour. Since perceived behavioural control rather than actual control can be measured, the relationships of perceived behavioural control with the constructs of behaviour and actual behavioural control are portrayed by broken arrows.
Thus one or two of the theory components might be more important for specific individuals than others at predicting their intention to perform a given behaviour and vice versa. For instance, some individuals can be influenced more by subjective norms – e.g. family and/or friends’ pressure – than other individuals. Accordingly, subjective norms will have a greater effect on behavioural intention of these individuals than it has for other individuals (Ajzen 2005:118, Miller 2005: 127).

The TPB generally assumes that, the more favourable the attitudes and subjective norms and the greater the perceived behavioural control, the stronger should be the individual’s intention to perform the behaviour under investigation (Ajzen 2006a: 1). Once an intention is formed, individuals are expected to carry out their intentions when the opportunity arises. After performing a behaviour (i.e. past behaviour), individuals can revise and change their beliefs and attitudes due to their personal experience and new information about the likely outcomes of the behaviour (see Figure 5.2). Consequently, the past behaviour is seen as one of the most important background factors for changing behavioural intention over time. Therefore, there is a feedback between the performance of the behaviour and the salient beliefs. When beliefs are changed, a change in attitudes, subjective norm and perceived behavioural control will also follow. These changes eventually lead to a change in the intention towards performing the behaviour in question (Ouellette and Wood 1998, Fishbein and Ajzen 2010).

Just as behavioural intention is held to have direct determinants (attitudes towards behaviour, subjective norm and perceived behavioural control), these components are also held to have determinants (so-called beliefs). Beliefs generally represent the information an individual holds about an object (or behaviour) in question, regardless whether this information is correct or not (Beedell and Rehman 2000, Fishbein and Ajzen 2010: 99). Generally speaking, people’s beliefs about an object or given behaviour can be formed as a result of their direct observations or even through self-generated inference processes. People may also acquire these beliefs indirectly by accepting information from their social network, media, and other accessible information sources about the object or the behaviour under consideration (Fishbein and Ajzen 2010: 96). The underlying assumption of the TPB is that most
individuals behave rationally according to the salient beliefs they hold about a particular behaviour. Thus, exploring these beliefs is indispensable to understand the considerations that underlie individuals’ decisions to perform (or not to perform) the behaviour under study (Ajzen 2006a: 1). As it is depicted in Figure 5.2, three kinds of beliefs can be distinguished: behavioural beliefs, normative beliefs and control beliefs.

1) Behavioural beliefs represent an individual's beliefs about the likely consequences (or outcomes) of a particular behaviour. The basic notion of behavioural beliefs is rooted in individuals’ subjective probability that performing a given behaviour will produce a particular outcome. Within the TPB framework, behavioural beliefs together with their outcome evaluations (by individuals) are assumed to produce an overall favourable or unfavourable attitude towards the behaviour under investigation. In other words, if the perceived advantages of performing a specific behaviour exceed its perceived disadvantages, individuals are likely to form a positive attitude towards the behaviour. In contrast, a negative attitude will likely be formed by the individuals if the perceived disadvantages exceed the perceived advantages. Accordingly, the behavioural beliefs are considered as an antecedent driver of an individual’s attitudes (Ajzen and Fishbein 2005, Ajzen 2012). However, not all potential beliefs towards a specific behaviour are expected to have a direct influence on the attitudes; instead, only readily accessible beliefs are assumed to play a significant role in determining person’s attitudes towards performing specific behaviours. In such manner, the beliefs that determine the attitudes towards a given behaviour can be decreased to a limited number (less than 10). Nevertheless, such readily accessible beliefs should be elicited from people themselves in order to properly explain their attitudes towards the behaviour under study (Ajzen 2012).

2) Normative beliefs embody an individual’s considerations about the judgement of important other people regarding the performance of a particular behaviour. The likely approval or disapproval of those people (regarding the behaviour under investigation) is postulated to lead to perceived social pressure (i.e. subjective norm) on the decision maker to perform or not perform this behaviour. Therefore, normative beliefs constitute the underlying determinant of subjective norms. Accordingly, if the decision makers believe that their most respected referents would expect them to perform the behaviour, or these respected referents are carrying out the behaviour themselves, the
The theoretical framework: The reasoned action approach

Perceived social norm will increase the pressure on the decision maker to perform the behaviour in question. In contrary, when most normative beliefs are unsupportive, the subjective norms will exert pressure on the decision maker not to be engaged in that behaviour (Ajzen and Fishbein 2005). In the TPB, the decision maker can take into account the normative beliefs with respect to more than one referent person or group. Referent groups are people whose preferences about a person’s behaviour in this domain are important to him or her. Commonly identified respected referents are an individual’s spouse, close family, friends and co-workers, while a referent group can be an institution, organisation, association, company, etc. (Ajzen 2012).

3) Control beliefs are an individual's beliefs about the presence or absence of factors that may facilitate or impede performance of the behaviour (Ajzen 2005). The control beliefs explain an individual’s perceived control over the behaviour in question. In other words, perceived behavioural control is induced by beliefs concerning whether people have access to the required resources and opportunities to carry out the behaviour effectively, weighted by the perceived power of each factor to facilitate or impede performing that behaviour (Ajzen 1991, Conner and Armitage 1998). Control factors can comprise both internal factors (such as information, skills, abilities) and external factors (e.g. opportunities, barriers, dependence on others). In this context, individuals who believe that they have the capacities and skills which are needed to carry out the behaviour or to overcome barriers are likely to mentally create a strong perceived behavioural control. Conversely, people who believe that they have lack of access to the required resources are likely to hold a weak perceived control over the behaviour (Ajzen 1991, Ajzen and Fishbein 2005: 193).

Behavioural, normative and control beliefs are considered to be powerful predictors of behavioural intention and thus the psychological foundation for human social behaviour (Fishbein and Ajzen 2010: 221). Beliefs are considered to be a function of a wide range of background factors. A vast number of background factors could latently influence individuals’ beliefs. Background factors can include age, gender, education, income, nationality and cultural background, personality traits, mood, emotion, values, stereotypes, general attitudes, past behaviour, exposure to information and new knowledge, social support, coping skills, association membership, etc. (Fishbein and Ajzen 2010: 22f). The potential influence of the background factors on behavioural, normative and control beliefs is
demonstrated by the dotted arrows in Figure 5.2. The dotted arrows however reflect no necessary relationship between these factors and people’s beliefs. In this context, Fishbein and Ajzen (2010: 25) stated that “Whether a given belief is or is not affected by a particular background factor is an empirical question. In light of the vast number of potentially relevant background factors, it is difficult to know which ones should be considered without a theory to guide selection in the behavioural domain of interest”. Against this notion, the sufficiency of the causal predictors of the TPB to explain the variance in behavioural intentions and actions was frequently questioned by many researchers (e.g. Parker et al. 1995, Richard et al. 1996, Sparks and Guthrie 1998, Conner and Armitage 1998, Ouellette and Wood 1998, Sheeran and Orbell 1999a, 1999b, Armitage et al. 1999, Fekadu and Kraft 2001, Bamberg et al. 2003, Sheeran et al. 2003, Smith et al. 2007, Zhou et al. 2013). In addition to the basic components of the TPB model, these researchers have considered background factors such as demographic variables or personality traits as direct predictors of intentions to perform given behaviours. However, the findings of these studies showed that the added constructs have only a small contribution at predicting the behavioural intentions. In this regard, Fishbein and Ajzen (2010) demonstrated that background factors can further the understanding of the behaviour under investigation by providing insight into the origins of underlying beliefs. However, their influences on behavioural intentions and actions have a tendency to be circuitous. Moreover, even when a background factor is found to give an explanation of some additional variance in behavioural intentions or actions, the amount of this variance is generally very small, and hardly ever have investigators recommended that personality or demographic variables should be considered as direct determinants of behavioural intentions and actions (Fishbein and Ajzen 2010: 221ff). Nevertheless, “the theory of planned behaviour is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behaviour after the theory’s current variables have been taken into account. The theory of planned behaviour in fact expanded the original theory of reasoned action by adding the concept of perceived behavioural control” (Ajzen 1991:199). In such manner, additional predictors can be added to the theory’s basic predictors. Like the major constructs of the TPB, the proposed additional predictors have to be defined at a level compatible with the behaviour under investigation. However, such additional predictors should be proposed and added to the theory with appropriate precaution, and only after cautious deliberation and empirical examination (Abraham and Sheeran 2003, Ajzen and Fishbein 2005).
5.3.2 Expectancy-value model

Among the behavioural models, the TRA and the TPB follow an expectancy-value model in order to predict the behaviour under study (Feather 1982, Fishbein and Ajzen 2010). The essence of this model is the expectancy or probability that performing a specific behaviour will be followed by a particular outcome and this outcome can be then evaluated by a subjective expected utility placed on this outcome (Peak 1955, Fishbein 1963, 1967a). According to Ajzen (2012), the belief-based measures (calculated by the expectancy-value model) are presumably considered to provide a more accurate prediction for the behavioural intention than its direct determinants (attitudes, subjective norm and perceived behavioural control), because belief-based measures can reveal why people hold certain attitudes, subjective norms or control perceptions (Fishbein and Ajzen 2010: 98ff). This section provides a brief explanation on how the expectancy-value model can be used to calculate the belief-based measures of attitudes towards behaviour, subjective norms and perceived behavioural control.

In the context of the expectancy-value framework, attitudes towards behaviour are determined by accessible beliefs about the outcomes of the behaviour and by the evaluation of these particular outcomes. Following the expectancy-value model, Fishbein and Ajzen (1975) and Ajzen (1991) computed outcomes as the multiplicative composition of the perceived likelihood that carrying out that behaviour will lead to a particular outcome and the evaluation of that outcome. These expectancy-value products are then summed over the various salient beliefs. Fishbein and Ajzen (2010: 117) emphasised the importance of multiplicative composition rule by stating that “On strictly theoretical grounds, there is no logic in predicting attitude from belief strength without taking the evaluative implication of the belief into account or predicting attitude from outcome evaluation without knowing whether the outcome is considered likely or unlikely”. Accordingly, a belief-based measure of the attitudes ($ATT$) is obtained by multiplying belief strengths ($bs_i$) and outcome evaluation ($oe_i$) and summing the products over the total number of accessible behavioural beliefs according to the following formula:

$$ATT \propto \sum bs_i \times oe_i$$  \hspace{1cm} (5.1)
Strength of behavioural belief ($bs_i$) is defined as the subjective probability that performing a given behaviour will produce a certain outcome ($i$) and the outcome evaluation ($oe_i$) can be regarded as the utility received if the outcome ($i$) occurs (Fishbein and Ajzen 2010: 97).

In a manner parallel to the expectancy-value model of attitudes, subjective norms are assumed to follow this model as a function of normative beliefs which represent perceptions of respected referents’ preferences about whether one should or should not perform a specific behaviour. Accordingly, subjective norm ($SN$) is obtained from multiplying strength of normative belief ($nb_i$) with motivation to comply ($mc_i$) with the normative referents. The products are then summed up for all accessible referents as following:

$$SN \propto \sum nb_i \times mc_i$$

(5.2)

Strength of normative belief ($nb_i$) is the individual’s subjective probability that a specific normative referent ($i$) wants this individual to carry out a particular behaviour. Motivation to comply ($mc_i$) represents the degree to which the individual complies with the perceived expectation of the normative referent ($i$) (Fishbein and Ajzen 2010: 137).

The expectancy-value model is also used to calculate the perceived behavioural control. Consequently, perceived behavioural control ($PBC$) is determined by weighting control belief strength ($cb_i$) with power of control ($pc_i$) and summing over the total number of accessible control beliefs

$$PBC \propto \sum cb_i \times pc_i$$

(5.3)

Strength of control belief ($cb_i$) represents the subjective probability that the control factor ($i$) is present, and power of control ($pc_i$) is the degree to which factor ($i$) facilitates or impedes performance of a particular behaviour (Fishbein and Ajzen 2010: 170).

Based on the belief-based measures of attitudes, subjective norms, and perceived behavioural control, the model to explain the behavioural intention ($BI$) can be computed according to the following formula

$$BI \propto \beta_1 ATT + \beta_2 SN + \beta_3 PBC + \varepsilon$$

(5.4)
\( \beta_1, \beta_2 \) and \( \beta_3 \) are empirically determined weights to estimate the importance of each component and \( (\varepsilon) \) is an error term. This model reflects the combined influences of attitudes towards the behaviour, subjective norm and perceived behavioural control on the behavioural intention. Thus, intention to perform the behaviour can vary according to its underlying components, which in turn vary according to the individual, the behaviour under consideration and the context in which it is performed (Ajzen 2012: 450f).

In addition to the belief-based measures of attitudes towards behaviour, subjective norms, perceived behavioural control, and behavioural intention (i.e. equations 5.1 to 5.4), these constructs should be also quantified by means of direct measures. The direct measures of these constructs are usually constructed by using semantic differential, Likert, and/or Thurstone scaling methods, to confirm that the items on the final instrument are virtuous measures of the TPB constructs. To validate the TPB model, the direct measures of the attitudes towards behaviour, subjective norms, perceived behavioural control, and behavioural intention should correlate well with their respective belief-based measures (Fishbein and Ajzen 2010: 184).

5.3.3 Literature review on applications of the Theory of Planned Behaviour

In this section, applications of the TPB are reviewed. The first sub-section provides a concise outline about studies which implemented this theory in different social contexts. The second sub-section provides evidence about the TPB use in important agricultural contexts, and the third sub-section delivers a comprehensive overview about its applications in the adoption of organic farming.

5.3.3.1 Applications of the Theory of Planned Behaviour in important social behaviours

Among socio-psychological models, the TPB has been dominating the literature to predict and explain social cognitive behaviours over the last two decades. It has been extensively used in different research areas, for instances in social domain (e.g. White et al. 2009), educational domain (e.g. Yan and Sin 2015, de Leeuw et al. 2015), leisure choice and sport exercises (e.g. Hausenblas et al.1997), health domains and nutrition issues (e.g. Lien et al. 2002, Lobb et al. 2007, Visintin et al. 2012, Kothe and Mullan 2015, Riebl et al. 2015), adoption of e-commerce and new technology (e.g. Aboelmaged 2010, Yousafzai et al. 2010), environmental
activism (e.g. Fielding et al. 2008b), consumer’s behaviour towards agri-food supply chains (e.g. Vieira et al. 2013, Giampietri et al. 2016), recycling behaviour and food waste management (e.g. Ramayah et al. 2012, Pakpour et al. 2014), environmental concerns and green purchase behaviour (e.g. Sparks and Shepherd 1992, Robinson and Smith 2002, Staats 2003, Albayrak et al. 2013, Zhu et al. 2013, Rex et al. 2015, Mancha and Yoder 2015). Over the past decade, a plenty of studies concerning the consumption and consumer choice of organic food have also applied the TPB as the main theoretical framework (e.g. Arvola et al. 2008, Vermeir and Verbeke 2008, Guido et al. 2010, Aertsens et al. 2011, de Maya et al. 2011, Voon et al. 2011, Dean et al. 2012, Zagata 2012, Al-Swidi et al. 2014, Liang 2014, Yazdanpanah and Forouzani 2015, Yadav and Pathak 2016).

5.3.3.2 Applications of the Theory of Planned Behaviour in important agricultural contexts

In the context of conservation behaviour and adoption of new technology in agriculture, the economic models (e.g. expected utility theory) usually have limitations in providing full explanation of the complexity of farmers’ decisions (Lynne et al. 1988). Consequently, many studies accounted for a possible influence of farmers’ attitudes to explain conservation behaviour (Burton et al. 2003, Defrancesco et al. 2008). However, to fully understand farmers’ decisions towards environmental schemes or adoption a new technology, a more sophisticated approach is required that goes beyond merely accounting for general attitudes of farmers. In this context, several researchers suggested using social psychology models (e.g. Lynne et al. 1995, Beedell and Rehman 2000, Burton 2004) which specify attitudes and beliefs in a defined framework in order to provide a comprehensive understanding of farmer intentions towards the behaviour in question.

Among other social psychology models, the TPB has gained a growing attention from researchers in the agricultural field where many studies have applied this theory as the main conceptual framework for modelling farmers’ decision to adopt a new technology. The TPB has been successfully used to understand farmers’ adoption of soil conservation practices (e.g. Beedell and Rehman 2000, Wauters et al. 2010, Poppenborg and Koellner 2013), reducing pesticide use and farmer safety behaviour (e.g. Colémont and van den Broucke 2008, Staats et al. 2011), land management and pro-environmental agricultural practices (e.g. Martínez-García et al. 2013, Price and Leviston 2014), adoption of agricultural best management practices (e.g. Baumgart-Getz et al. 2012, Reimer et al. 2012), uptake of agricultural and
agroforestry innovations (e.g. Zubair and Garforth 2006, Meijer et al. 2015), uptake of agri-environmental schemes and environmental conservation behaviour on the farm (e.g. Defrancesco et al. 2008, Sutherland 2010, Greiner 2015, Micha et al. 2015, van Dijk et al. 2015, Deng et al. 2016), nature conservation on farmland (de Snoo et al. 2013, Home et al. 2014), climate change and water conservation strategies (e.g. Lynne et al.1995, Boyer et al. 2012, Poppenborg and Koellner 2013, Wheeler et al. 2013, Yazdanpanah et al. 2014), farmers’ participation in agricultural training-extension programmes (e.g. Akbari et al. 2014), implementation of diversification strategies for micro-farms (including adding value to farm production, and marketing it through tourism) (Alonso and Krajsic 2015), adoption of improved natural grassland management system (Martínez-García et al. 2013, Borges et al. 2014), uptake of new livestock farm systems (e.g. Rehman et al. 2007), and animal welfare (e.g. Bruijnis et al. 2013, Jones et al. 2015). Hereafter, few studies are briefly reviewed with a special attention being given to the role of the TPB components at predicting and explaining the associated behaviours.

The study of Fielding et al. (2008a) used an extended model of the TPB to explain farmers’ decisions to participate in sustainable agricultural practices in Queensland/Australia. Key findings are in line with the TPB assumptions. Thus, farmers’ intentions to adopt sustainable agricultural practices (i.e. engagement in riparian zone management) were the main predictor of self-reported behaviour. Past behaviour, attitudes and perceived behavioural control were found significant predictors of the behavioural intentions. Moreover, social and group norms together with intergroup perceptions (i.e. relations between rural and urban groups) were also significant at predicting the behavioural intentions, providing support for including the concepts of social identity in the TPB (Fielding et al. 2008a: 23f). The study of Staats et al. (2011) also used the TPB to understand the intentions of greenhouse growers in the Netherlands to reduce emissions and to predict the actual use of pesticides. Findings of this study are consistent with the TPB assumptions. Intentions to reduce emission were principally explained by attitudes, subjective norms, and perceived behavioural control (especially by self-efficacy factor) and actual use of pesticides were well predicted by the interactions between the intentions and self-efficacy over performing that behaviour (Staats et al. 2011: 2461f).

With respect to the serious shortage of water resources in the Middle-East and North Africa, Yazdanpanah et al. (2014) investigated Iranian farmers’ intentions to adopt water
conservation strategies by applying the TPB model. Findings suggested that farmers’ intentions to adopt a water conservation strategy were mainly influenced by their subjective norms and social environment together with farmers’ perceptions of risk and their attitudes towards water conservation policy. Overall, perceived behavioural control showed a relatively small effect at explaining and predicting farmers’ intentions and actual conservation behaviour. Nevertheless, since farmers were found to be heterogeneous in this study, the abovementioned results might differ when comparing farmers’ sub-groups. Two farmers’ sub-groups were explicitly identified: the farmers who were already using advanced water management strategies (sub-group 1) and those farmers with traditional water management (sub-group 2). Though the former revealed a stronger perceived behavioural control, both sub-groups demonstrated strong normative inclinations to explain their decisions to adopt water conservation methods. These findings suggest the important implications of normative inclinations when setting up policy measures for improving water conservation management in the region under study (Yazdanpanah et al. 2014: 63f).

By means of a TPB framework, Meijer et al. (2015) investigated the attitudes of Malawian farmers towards agroforestry innovation (i.e. tree planting on their farms). Farmers who reported planting trees on their farms within the last five years showed favourable attitudes, positive subjective norms and strong perceived behavioural control towards this behaviour in comparison to those farmers who had not planted trees on their farm yet. Furthermore, this study indicated that poverty was a main factor to hinder agroforestry innovation in the surveyed region, since many farmers reported that their agricultural income was low and they preferred to spend their scarce resources on the urgent needs of their families rather than expanding tree planting on their farms (Meijer et al. 2015: 1f).

5.3.3.3 Applications of the Theory of Planned Behaviour in understanding farmers’ intentions to adopt organic farming

The number of studies that have applied the TPB model to explain the adoption of organic farming methods is relatively small (Wehinger et al. 2002 in Germany; Tutkun et al. 2006 in Switzerland; Hattam 2006a in Mexico; Kaufmann et al. 2009 in Estonia and Latvia; Sutherland 2011 in England; McCarthy et al. 2007 and Läpple 2010 in Ireland; Johansson 2012 in Uganda; and Asadollahpour et al. 2014b in Iran). These studies used the TPB as the principal theoretical framework for modelling the conversion to organic farming. Most of these studies however used only simplified versions of the TPB model, including attitudes,
subjective norms and perceived behavioural control and behavioural intention and behaviour. The role of salient beliefs for predicting and explaining the behavioural intention was often overlooked. Henceforth, a brief review of some of these studies’ findings is given below with a special emphasis on those studies which deal with FFV production and those which consider the role of salient beliefs at predicting and explaining the behaviour under study.

The study of Hattam (2006a) used the TPB to assess the intentions of small-scale farmers of avocados in Mexico towards the adoption of organic practices. Results showed that farmers generally drew positive attitudes towards organic practices, including the benefits on family health, environment and market opportunity. Even though the farmers possessed positive attitudes towards organic farming, the farmer’s intentions to convert were weak, suggesting that positive attitudes alone are not sufficient to explain the behavioural intention (Hattam 2006c). Moreover, the influence of other components of the TPB, namely perceived social pressure (subjective norms) and perceived ease of conversion (perceived behavioural control) were found to be influential on farmer’s intention towards organic conversion (Hattam 2006b). Perceived social pressure, particularly the effects of extension agronomists, had a negative influence on farmer’s intention to convert. Extension agronomists represented the main source of information about agricultural inputs and practices for most of the small-scale producers of avocados (Hattam 2006b). However, only few of those agronomists had prior knowledge about the techniques of organic agriculture, while the majority only provided advice for the conventional farm management, resulting in limited information being available for farmers who had positive attitudes towards organic farming. Perceived behavioural control was also found to have significant influence on farmers’ negative intention towards organic farming, particularly on farmers’ risk perceptions about organic agriculture. The paucity of prior knowledge of organic production practices, the cost of organic certification and the credit constraints for organic agriculture constituted the main barriers to adopt organic practices, regardless of the fact that most of the conventional farmers under study had positive perceptions of the existing price premium for organic avocados on the export market (the price premium was between 20% and 30%). Hattam (2006a) also considered the influences of farmers’ age and education on the intention to convert. The results are in line with the literature on organic adoption, where younger farmers (who are generally better educated) were more willing to adopt organic farming than older farmers (who usually have a lower education level). Consequently, the study suggested that any
promotion of organic production among avocados producers should be oriented to the younger and more educated farmers (Hattam 2006a, Hattam 2006b).

Another example for applying the TPB to organic conversion is a study of Tutkun et al. (2006). The study used a combined model of the TPB and the diffusion of innovation theory (Rogers 2003) in order to explain Swiss farmers’ decisions about conversion to organic farming. The study showed that beside farmers’ goals, attitudes and subjective norms were significantly important to explain the intention to convert to organic farming. Additionally, the study gave empirical evidence that communication with farmers about certified organic farming through personal channels had a significant impact on farmers’ decision-making (Tutkun et al. 2006: 1f).

Kaufmann et al. (2009) applied the TPB to simulate the diffusion of organic agricultural practices among farmers in Latvia and Estonia. Though the public support policy for organic farming had substantially increased in both countries after joining the EU, the adoption rates varied considerably according to the economic and social factors, which have been implemented in the context of the public support policy. This study analysed farmer behaviour and the factors which determined the diffusion of certified organic farming among the organic and conventional farmers in both countries. Findings emphasised the important role of interdependence of social norms and economic factors at influencing farmers’ decision. By implementing subsidies only as an intervention procedure, farmers’ attitudes and their perception of economic factors appeared to be more influential than social factors regarding their decisions towards the adoption process. However, by including the social factors to the TPB model, the adoption rates increased beyond those obtained from the economic factors solely. This result suggests that along with the economic aspects, the role of the social environment should also be considered for better understanding farmers’ decisions to adopt organic farming. For instance, increasing the number of organic farm advisors and extension agents in the study areas was found significant at increasing the adoption rates of certified organic farming (Kaufmann et al. 2009: 2589f).

The study of Läpple (2010) used an extensive model of the TPB in order to understand the drivers and barriers of Irish drystock farmers to produce organic meat. This study was mainly concerned with investigating the intention of conventional farmers to convert to organic farming. The behavioural intention to convert to organic farming was identified by applying
direct measures of the TPB alongside with the belief-based measures (i.e. indirect measures). The belief-based measures were confirmed by using principal component analysis. The results indicated that behavioural intention was strongly influenced by all components of the TPB: farmer’s attitudes towards organic farming, subjective norms and perceived behavioural control. Both direct and indirect measures showed that most farmers had weak intentions regarding an organic conversion. Most of the farmers expressed neutral or negative scores on the direct measures of attitudes, subjective norms and perceived behavioural control. Regarding the indirect measures, belief-based measures showed that farmers possessed positive attitudes for financial incentives of organic farming while they held negative attitudes towards the affective beliefs, suggesting that farmers follow an expected utility model in their behavioural beliefs. The negative scores of the normative beliefs illustrated that Irish conventional farmers did not receive encouragement from significant others to convert to organic farming. Finally, in terms of perceptions of control, maintaining good animal health appeared to be a major concern. However, the negative value of control belief indicates that most of the farmers deemed to be uncertain about the possibility to adopt organic farming, since they were sceptical about their own ability to adopt organic practices and whether their farms were suitable for organic farming (Läpple 2010).

Sutherland (2011) utilised a qualitative approach upon the TPB among a cohort of English conventional farmers who were practising what they defined as ‘effectively organic’ or ‘semi-organic’. The study focused on the environmental attitudes of conventional farmers towards ‘low-inputs’ and conversion to organic farming. The results showed that most of those farmers were practicing ‘low-inputs’ farming only as a response to financial pressures and risk associated with their production, rather than environmental consciousness. Furthermore, organic farming was perceived by those farmers as one among other options for increasing the financial viability of their farming operation. The affiliation of ‘low-input’ farmers with organic production reflected favourable attitudes towards both organic farming and environmental practices, but it also showed lack of farmers’ understanding about organic farming techniques.

5.4 Farmers’ survey design

In order to explore the intentions of Syrian farmers towards organic farming and the likelihood to convert their farms to organic, the TPB was used as the theoretical framework
for this purpose. The TPB in this study aimed to assess intentions to convert, attitudes towards, and perception of organic farming among Syrian farmers of FFV. Intentions are basically derived from a person’s beliefs, therefore measuring farmers’ beliefs was also important to better understand farmers’ intentions and their decisions to adopt organic FFV production. Thus, a survey of the population of interest (Syrian farmers of FFV) was a suitable instrument to achieve that aim. Developing such a survey typically comprises two distinct stages: first, identification of salient beliefs with respect to the behaviour of interest and second, development of a quantitative survey, based on identified salient beliefs (Ajzen 2006b, 2010).

According to Ajzen (2010), salient beliefs are best drawn from the respondents themselves or from a small sample of respondents that is representative of the research population. This procedure is considered for being superior to an intuitively chosen set of beliefs by the investigator (Sutton et al. 2003, Schulze and Wittmann 2003, Ajzen 2006b, Montano and Kasprzyk 2008). However, in this study and due to financial and time constraints, the salient beliefs were based on the literature review and experts’ judgements. Therefore, questions were obtained from previous studies regarding conventional farmers’ expected advantages and disadvantages of going organic. Furthermore, questions and statements that include influences of other significant people and information sources on farmer's decision-making were also considered. Questions and statements of perceived behavioural problems with respect to the possible conversion of the farm were also taken into account when eliciting the salient beliefs.

The selected beliefs from the first step need to be included in the quantitative survey in the second step. Following the TPB, it is quite important to formulate questions or statements that best represent those beliefs. In order to do that, the principle of compatibility should be followed. Under the principle of compatibility, “a single behaviour can be viewed as involving an action directed at a target, performed in a given context, at a certain point in time” (Ajzen and Fishbein 2005: 182). This means that each question or statement has to be undoubtedly defined at the same level of specificity in terms of action, target, context and time (Ajzen 2006b). In the present study, these four elements were explicitly identified as follows: the action was defined as ‘producing fruit and vegetables organically’, the target was ‘organic fruit and vegetables’, the context was ‘the specific farm’ and the time frame was set as ‘five years’. As mentioned above, the intention to perform a particular behaviour may
change over time, therefore the period between the measurement of behavioural intention and 
behaviour itself should be minimised in order to maximise the likelihood of performing the 
intended behaviour. With a sufficient degree of actual control over intended behaviours, 
individuals are expected to carry out their intentions to actions when the opportunity arises 
(Ajzen 2006a). Nevertheless, implementing the intentions of much behaviour might require 
longer time to be performed. That is particularly due to the absence of sufficient perceived 
control over behaviour. For instance, Hattam (2006a, 2006b) found that Mexican farmers 
expressed stronger intention to convert to organic avocado production measured in the more 
distant future (10 years) than in the short term (1 year).

Farmers’ responses to the TPB questionnaire were measured along five-point fully anchored 
scales. Attached labels were dependent on the factor under consideration. The data was 
collected through face-to-face interviews with conventional farmers of FFV in Syria. In 
Chapter 6, the choice of face-to-face personal interview as the most appropriate method to 
approach Syrian farmers of FFV is justified.

5.4.1 Formulating items for measuring components of the TPB

Questions and statements were formulated to directly measure each of the main constructs in 
the TPB: salient beliefs, attitudes, subjective norms, perceived behavioural control, intention 
to adopt organic farming, and the adoption decision. Seven-point scales are often used to 
evaluate the statements in quantitative surveys of the TPB (Fishbein and Ajzen 2010). 
However, in this study five-point, uni- and bipolar scales were employed. The reason to do so 
was to simplify them and to avoid ambiguity when approaching farmers who might be 
illiterate or have a low education level, and even educated farmers who are not used to be 
interviewed. Suggested items (i.e. observed measures) for assessing behavioural intention and 
each aspect of attitudes, perceived norms and perceived behavioural control are shown below. 
Additional items were also included in the farmer survey in order to measure farmers’ beliefs 
regarding organic farming (belief-based measures or indirect measures of behavioural 
intention).
5.4.1.1 Intention and behaviour measurements

Following Armitage and Conner (2001: 471), “intentions and self-predictions were better predictors of behaviour (…), than individual’s desires”. Accordingly, intention to adopt organic farming was measured by using two questions scaled in a bipolar way from -2 to +2. While one question was dedicated to measure behavioural intention, the other one was devoted to capture self-prediction. Thereby, intention was measured by asking farmers: Do you have the intention to produce organic fruit and vegetables on your farm within the next five years? evaluated by ‘Definitely no/Definitely yes’ (behavioural intention) and How likely is it that you will (think seriously to) produce organic fruit and vegetables on your farm within the next five years? evaluated on a scale labelled with ‘Very unlikely/Very likely’ (self-prediction question). In a similar fashion, two questions (reflecting farmers’ self-report of their future behaviour) were used to measure the decision to adopt organic farming. That was by asking: For you, is the conversion to organic farming within the next five years possible? evaluated on a scale from ‘Definitely impossible/Definitely possible’ and For you, how probable is that you will start the conversion to organic farming within the next five years? gauged on a scale labelled with ‘Not probable at all/Highly probable’.

5.4.1.2 Attitudes measurement

Both direct and indirect measures of attitudes were taken in consideration. Direct measures of attitudes were elicited by asking four questions in total, such as Producing organic fruit and vegetables on your farm within the next five years would be: ‘Very good/Very bad’, ‘Definitely possible/Definitely impossible’ and ‘Not profitable/Profitable’, scored on bipolar five-point scales (-2 to +2). Regarding the indirect measure of attitude (or belief-based measure of attitudes), the expectancy-value model was followed. In total, 9 statements to measure behavioural belief strength followed by evaluation of their outcomes were incorporated into the farmer survey. Five items attempted to elicit the cognitive component of the attitudes and four items attempted to determine the affective component. Accordingly, behavioural beliefs on the cognitive part were measured by asking: If you produce organic fruit and vegetables you will: (1) solve marketing barriers (through getting opportunities to reach better markets), (2) save on production costs (mainly fertiliser and pesticide costs), (3) receive better prices, (4) increase farm income (5) increase agricultural risk (for you, it would be risky to convert to organic farming) scaled on ‘Strongly agree/Strongly disagree’
five-point scale. Each of these statements was then followed by the evaluation of the importance of the outcomes (e.g. solving marketing barriers is: ‘Very important/Very unimportant’) measured on a five-point scale. The affective component of behavioural beliefs was measured as follows: Producing organic fruit and vegetables on your farm will: (1) lead to a backward farming as it was long time ago, (2) protect the environment, (3) improve soil fertility and soil structure(4) provide a healthier food for your family. These questions were followed by the evaluation of the outcome measured on a Very important/Very unimportant scale. While the behavioural beliefs were scaled in a unipolar point scale from 1 to 5, the evaluations of their outcomes were scaled in a bipolar five-point scale form -2 to +2 (Ajzen and Fishbein 2008).

5.4.1.3 Subjective norm measurement

The direct measure of subjective norm was calculated by three questions measured on a bipolar five-point scale (-2 to +2). The first question was: Would your family favour the idea that you should produce organic fruit and vegetables on your farm within the next five years?, evaluated from ‘Definitely unfavourable/Definitely favourable’. The second question stated that: In general, do people whose opinion is important to you disapprove of you producing organic fruit and vegetables on your farm within the next five years?, measured on a ‘Definitely false/Definitely true’ scale. Normative beliefs were identified by the question: How likely is it that the following referents think you should produce organic fruit and vegetables on your farm within the next five years?, followed by a list of the important referents (family, neighbours, best friends, fellow farmers, extension advisors, governmental support programmes, etc.). The degree of motivation to comply was evaluated by asking: How motivated would you be to follow the opinion/advice of those people listed below regarding producing organic fruit and vegetables on your farm within the next five years?. Normative beliefs were scored in a bipolar scale (-2 to +2) and motivation to comply was scaled in a unipolar scale (1 to 5) (Ajzen and Fishbein 2008).

5.4.1.4 Perceived behavioural control measurement

The perceived behavioural control was measured by 6 questions. At constructing these questions, particular attention was given to elicit the self-efficacy and the perceived ease-difficulty to perform the behaviour. These questions were evaluated on a bipolar five-point
scale from -2 to +2. Accordingly, the farmers were asked: Do you think that you have the technical ability to produce organic fruit and vegetables on your farm within the next five years? This question showed how confident farmers were about their technical ability to produce organic FFV within the specified period. Farmers were also asked: Do you think that you can afford the costs of conversion into organic farming on your farm within the next five years? Thus, producing organic FFV by farmers would be easy or difficult according to the extent farmers could afford the costs of conversion.

Regarding the indirect measures of perceived behavioural control, 8 statements in total were used to measure the control beliefs. The farmers were asked to indicate how strongly they agree or disagree with these statements measured by five bipolar five-point scale, for instance one of these statements is: You have the means to afford the certification and inspection costs of organic farming. Each of these statements was then followed by a power of control statement that expressed farmers’ level of agreement on the extent to which this particular statement would make the production of organic FFV easier for farmers. Regarding the statement of belief control mentioned above, the fellow power of control statement would be: Being able to afford the certification and inspection costs of organic farming would make it easier for you to produce organic fruit and vegetables on your farm within the next five years, measured on five-points ‘Strongly disagree/Strongly agree’ scale. Control beliefs were measured by bipolar five-point scale (-2 to +2) and the power of control statements were scaled in unipolar manner from 1 to 5 (Ajzen 1991).

Finally, it is essential to emphasise the importance of using both uni- and bipolar scales in assessing the belief-based measures of attitudes towards behaviour, subjective norm and perceived behavioural control. Following the expectancy-value model, the product of the aforementioned scales will produce a range from -10 to +10, and thus overcomes the problem of double negative signs when both scales are bipolar (Ajzen and Fishbein 2008).

5.4.2 Hypotheses

The following relationships are supposed to be tested by the empirical data obtained from the TPB survey with Syrian farmers of FFV:

H1: Farmers’ intentions to convert to organic FFV production within the next five years are the main predictor of that behaviour.
H2: Farmers’ perceived behavioural control over producing organic FFV within the next five years plays a significant role at determining the associated behavioural intention and behaviour itself.

H3: Farmers’ attitudes towards organic FFV production within the next five years play a significant role at determining the associated behavioural intention.

H4: Farmers’ subjective norms towards organic FFV production within the next five years play a significant role at determining the associated behavioural intention.

H5: There is a strong relationship between behavioural beliefs and attitudes towards organic FFV production within the next five years and there are causal effects of behavioural beliefs on farmers’ attitudes towards organic FFV production within the next five years.

H6: There is a strong relationship between normative beliefs and subjective norms towards organic FFV production within the next five years and there are causal effects of normative beliefs on farmers’ subjective norms towards organic FFV production within the next five years.

H7: There is a strong relationship between control beliefs and perceived behavioural control towards organic FFV production within the next five years and there are causal effects of control beliefs on farmers’ perceived behavioural control towards organic FFV production within the next five years.

H8: Farmers’ attitudes towards organic FFV production within the next five years play a significant role at determining the associated behaviour. However, their influence is indirect.

H9: Farmers’ subjective norms towards organic FFV production within the next five years play a significant role at determining the associated behaviour. However, their influence is indirect.

H10: Farmers’ attitudes towards organic FFV production within the next five years play a significant role at determining the associated behaviour. However, their influence is indirect.

H11: Behavioural beliefs towards organic FFV production within the next five years are important determinants of the associated behavioural intention. However, their influence is indirect.

H12: Control beliefs towards organic FFV production within the next five years are important determinants of the associated behavioural intention. However, their influence is indirect.

H13: Normative beliefs towards organic FFV production within the next five years are important determinants of the associated behavioural intention. However, their influence is indirect.
6 Methodology: Data collection

6.1 Introduction

This chapter outlines the methods and procedures which have been used for the purpose of data collection about the adoption of organic farming among Syrian farmers of FFV. The first section of this chapter gives a brief overview about the geographic location and the agro-climatic zones in Syria. Then, justifications are provided with respect to the choice of the coastal region in Syria as the study area. The second and third sections of this chapter provide a concise explanation of the method of data collection and sampling procedure which have been employed. The last two sections briefly highlight the questionnaire design and procedures of data collection.

6.2 Case study and location

6.2.1 Geographic location and agro-climatic zones in Syria

The location of Syria on the Eastern part of the Mediterranean Sea, at the borders of the three continents Asia, Africa and Europe, gives special importance to this country. The area of Syria covers about 18.5 million hectares, in latitude between 32° and 37° North and longitude between 35° and 42° East. The topography and climate of the country are full of variety. In this context, Syria is characterised by Mediterranean climate of rainy winters and relatively hot summers separated by two short transitional seasons (autumn and spring). According to physical geography, Syria can be divided into five distinct regions: the coastal region along the Mediterranean Sea, the mountains and the highlands, the Eastern Plateau, Al-Badia (i.e. Syrian steppe), and the oases (Hübschen 2011: 173f, NAPC 2015b: 1f).

In terms of precipitation and crop patterns, five agro-ecological zones can be distinguished in Syria (see Figure 6.1; FAO 2003: 3ff, Masri 2006: 6f, GCSAR 2006, Verner et al. 2013: 14):
Zone 1 has an average annual precipitation of over 350 mm. It extends over 2.7 million ha and represents about 14.6 % of the total country area. It includes around 44.4 % of the total arable land of Syria. This zone is divided into two sub-zones:

- The first sub-zone (a) represents the area which has an annual average rainfall of over 600 mm, allowing for low risk cultivation of rain-fed crops.
- The second sub-zone (b) has an annual average rainfall that lies between 350 and 600 mm and not less than 300 mm during two thirds of the observed years. This allows getting at least two years of low risk cultivation of rain-fed crops every three sequential years.

Zone 1 (a and b) is cultivated mainly with wheat, legumes, summer crops and various fruit and vegetables. The most important FFV cultivated in this zone are citrus fruit, tomatoes, apples, olives and almonds.

Zone 2 presents an average annual rainfall ranging between 250 and 350 mm and not less than 300 mm during two thirds of the observed years. Its total surface (2.5 million ha) represents 13.5% of the total area of Syria and includes 30% of the total arable land which is mainly planted with barley, wheat, legumes and fruit (particularly grapes, olives and almonds).

Zone 3 has an average rainfall of 250 mm annually and not less than this amount during half of the relevant years. The total area in this zone is 1.3 million ha, representing 7.1% of Syria’s total area. The main crops are barley and legumes.

Zone 4 has an average annual rainfall ranging between 200 and 250 mm and not less than 200 mm during half of the observed years. This area corresponds to about 1.8 million ha and represents 9.9% of the country’s total area. The cultivable area reaches 592,000 ha, out of which 7,000 ha are planted with trees and 585,000 ha devoted to field crops (barley, lentils, and chickpeas).

---

26The arable land in Syria is 6.1million ha accounting for one-third of the total area of the country, Syrian agricultural statistical abstract 2013 (MAAR 2015b).
Zone 5 has an average annual rainfall of less than 200 mm in more than half of the observed years. This zone consists of rangeland and desert areas, extending over more than 10 million ha and representing about 55.1% of the country’s total area. This zone includes 86% of the total pastoral land in Syria and is not suitable for rain-fed cultivation.

Figure 6.1: Map of Syria with agro-ecological zones and water basins

For each agro-ecological zone, crops and cropping patterns are centrally determined after extensive consultation between local civil authorities and representative bodies of the farming community as a part of the agricultural policy plan. Decisions are not based on agro-climatic factors only, but also on other criteria related to national objectives and policies, such as self-sufficiency in staple foods (GCSAR 2006, MAAR 2010a, NAPC 2015b).

Within the aforementioned agro-ecological zones, Syria has irrigated areas of 1.34 million ha in 2013 allocated around the 16 rivers in the country, the largest being the Euphrates. Irrigated areas are mainly cultivated with wheat, cotton and sugar beet; however, near the main urban locations they are planted with FFV, and alfalfa as forage for dairy cows (Masri 2006: 6, Hübschen 2011: 172ff, MAAR 2015b). Syrian farmers in agro-ecological Zones 1 and 2 have been traditionally cultivating some forage, pastoral and food legumes as a common practice to
maintain soil fertility in plant rotation systems, which include intensive crops such as wheat, barley, tobacco, FFV or cotton. Beside maintaining soil fertility, some of the cultivated legumes provide fodder for farm animals while other legumes serve as a cheap alternative of protein resources to human consumption (e.g. Cocks 1988: 3ff, Zaroug 1988: 25f, Saxena 1988: 11f, Osman et al. 1990: 107ff).

6.2.2 Study area and sampling

This section outlines why the governorates Tartous and Lattakia, in the West of Syria on the Mediterranean Sea, were the areas from which farmers were selected (see Figure 6.2). The Mediterranean coastal region of Syria is characterised by coastal plain and hills of 20-30 km in width and 180 km in length. This area is located between the coast-line on the Mediterranean Sea and mountain ranges that run parallel to the coast. The weather is temperate and the cultivation of a wide range of FFV is popular. At high altitudes, the annual precipitation amounts to more than 1,200 mm, and even the coastal plains have over 800 mm rainfall per year. The relatively high humidity (more than 65% on average) and year round warm climate represent the main characteristics of this area (Hübschen 2011: 173f).

Agriculture in this region is characterised by citrus fruit varieties and greenhouse vegetables, especially tomatoes (see Chapter 4 for an overview). The cultivation of citrus fruit witnessed a significant development in this region over the last three decades (Westlake 2003: 195f, Mouhamad 2008: 5f). That is due to the economic viability in the local and international markets for different varieties of citrus fruit: oranges, mandarins, lemons and grapefruit (Mouhamad 2008: 7). More than 14.6 million trees of citrus fruit are cultivated in Syria with a total area of 43.7 thousand hectares producing about 1.25 million tons, amounting to more than one-third of Syrian production of fresh fruit in 2013. The coastal region represents the main production area of citrus fruit in Syria, accounting for 97% and 99 % of the citrus area and production in Syria respectively (MAAR 2015b). Furthermore, citrus fruit in this region are cultivated under integrated pest management (IPM) with low level of chemical inputs, which has been proved to be effective, thanks to the development of pest control methods using biological enemies at the agricultural institutes of the GCSAR. Low chemical use and using biological enemies are good pre-conditions for further expansion of organic agriculture among Syrian farmers of citrus fruit.
Tomatoes represent the majority of fresh vegetables which are cultivated in different regions in Syria, amounting to 500 thousand tons in 2013 (prior to the war in Syria, the production of tomatoes was 1.2 million tons in 2010) (MAAR 2015b). More than half of Syrian production of tomatoes is produced in the coastal area on the Mediterranean Sea (MAAR 2015b). In this region, tomatoes and other fresh vegetables (cucumbers, eggplants, peppers, marrows, green beans, etc.) are mainly cultivated in unheated greenhouses in the winter season where mild temperate weather conditions exist (Fakhro et al. 2010: 99, NAPC 2015c: 3f). Among 130 thousand greenhouses in the coastal region, about 95 thousand were dedicated to produce winter tomatoes on an area of 4.3 thousand ha, producing 570 thousand tons in 2010. Though the area and production of tomatoes in 2013 had dropped to half compared to the 2010 figures, this sector showed substantial recovery in 2014, where 410 thousand tons of tomatoes were produced in 68 thousand greenhouses (MAAR 2015b). Moreover, the promotion of beekeeping within the greenhouses in the coastal region played an important role at increasing the production of greenhouse vegetables in the winter. The bees raised the level of pollination and the fertilisation ratio, and on the other hand provided additional source of income for greenhouse farmers (MAAR 2015b, NAPC 2015c).

About 100.000 farmers and workers are involved in citrus fruit and tomato production in this region. That is in addition to those who work in the agricultural services, harvesting, marketing, juice plants, and transport of citrus fruit and tomatoes (Citrus Fruit Board 2011). Against this background, the main component of the data collection was a representative survey among conventional farmers of citrus fruit and tomatoes in the coastal provinces (see Figure 6.2). In the following sections of this chapter, a discussion about the method of data collection, sampling approach and the interview procedures are provided.
6 Methodology: Data collection

Figure 6.2: Map of coastal region in Syria

Note: the towns and villages represent survey area are highlighted in green plots.
Source: Citrus Fruit Board in Tartous, Syria.

6.3 Method of data collection

In this section, the appropriate method for data collection is discussed and the choice of face-to-face interview method is justified. In social research, there are different methods which can be used to obtain information from the targeted population. For collecting primary data from the potential respondents, a survey suggests itself to researchers (Bryman 2012: 160f). Foremost, a survey has the advantage of collecting an abundant amount of data about the respondents under investigation at one time. Important advantages of a survey are its versatility, as it can be used with different types of respondents, and its flexibility to research objectives that require either a causal or descriptive design (Aaker et al. 2011: 198, Dillman et al. 2014: 1f). However, the effective implementation of a survey necessitates an extensive judgement in the selection of the appropriate survey method, whether a face-to-face or telephone interview, a mail or web survey, mixed-mode surveys, etc. (Aaker et al. 2011: 198, Bryman 2012: 186, Dillman et al. 2014: 1f). Each of these survey methods has its own advantages and disadvantages. Henceforth, these methods are briefly presented. Then, the face-to-face interview method is discussed including a rationalisation of the choice of this method for data collection.

In present days, a telephone interview is one of the most common data collection methods, owing to the fact that it is cost efficient and fast. In many cases, this method makes it possible to approach individuals who are otherwise difficult to contact. On the other hand, the method
has limitations related to data validity and the quantity of questions that may be asked. Since respondents are only verbally contacted, this method does not employ any visual support that can help at guiding interview in complex points. Telephone interviews can also have the potential of a sampling bias since not all targeted respondents may have their own phones. That is particularly true in developing countries, where the density of telephone lines in the countryside is still relatively low compared to those in developed countries (Aaker et al. 2011: 241f, Dillman et al. 2014: 258ff).

Mail or web surveys can also be potential alternatives to be employed, since these methods are fast and they have very low cost compared to personal or telephone surveys. In both methods, the questionnaire is administrated with respondents through the mail or web services and thereby, interviewers have no contact or direct communication with the target respondents and thus interviewer bias will be at minimum. However, these methods have also limitations that can affect the validity of the obtained data, since the response rates with such methods are relatively low. Like the case of telephone surveys, the use of mail and web survey methods in developing countries might be not easy options to be considered, since the infrastructure for mail and internet services are still poor (Aaker et al. 2011: 230ff, Dillman et al. 2014: 301ff, Bryman and Bell 2015: 239f).

In many cases, face-to-face interviews are considered to be the best suited survey method for approaching people due to their flexibility and versatility. The interviewer can record the interviewees’ responses and acquire a better understanding of their answers. This method also helps the interviewer to gain a wealth of information about the topic and to establish a good relationship with the interview partners, which is reflected by a high response rate compared with other survey methods. On the other hand, face-to-face interviews have some limitations. The most prominent of these limitations is that they are expensive and highly time consuming. This is due to high travelling costs if a large geographical area must be covered. Additionally, this method requires well-trained interviewers who are fluent in the relevant languages and dialects of targeted population (Churchill and Brown 2007, Shao and Zheng 2007, Burns and Bush 2010, Aaker et al. 2011: 240 f). Nevertheless, face-to-face interviews are considered to be the best method to approach persons like Syrian farmers of FFV, who are living in the rural areas of the coastal region, where neither access to mail and internet services is widespread nor do the telephone lines necessarily cover the whole rural areas in this region. Furthermore, the novelty of the topic under study (i.e. the conversion to organic FFV production) together
with the complexity of the TPB’s rating scales used in this study may justify the choice of face-to-face interviews as the best feasible option for the survey with Syrian farmers of FFV.

6.4 Sampling procedure

The sampling approach is the process of selecting units from a population of interest so that by studying the sample parameters the obtained findings may reasonably be generalised back to the population from which the sample was chosen (Burns and Bush 2010: 366). In social research, a subset group of the target population (i.e. sample) is surveyed rather than the entire population. That is mainly because of too high cost and time needed to survey the whole population. Furthermore, a representative sample can reflect the parameters in the target population to a fair extent. In order to generalise the obtained results from a sample, the researcher should make sure that all members of the investigated population have equal chances to be chosen by the sampling procedure (so-called random sampling) (Burns and Bush 2010, Aaker et al. 2011). This procedure is considered superior to non-random sampling which is susceptible to biased selection by the researcher. Seeking to achieve high external validity (i.e. generalisability of finding into the entire population), a cluster random sampling procedure was employed in this survey.

A total random sampling procedure would have been too difficult to employ, particularly for a population that is distributed across a wide geographic area as in the present survey. To deal with such problem, a cluster random sampling can be applied. In a cluster sampling procedure, the sample frame is usually divided into clusters according to geographic boundaries and these clusters must be as similar to each other as possible. Then few clusters are randomly selected for the sample and eventually all members of these clusters should be surveyed (i.e. one-stage cluster sampling). On the other hand, in two-stage cluster sampling the researcher can choose more clusters for the sample and then randomly select members from the chosen clusters. A two-stage cluster sampling procedure is desirable when the target population is spread on a wide geographic area (Burns and Bush 2010: 369, Bryman 2012: 193f). Thus, in the current study, after defining the target population (i.e. conventional farmers of FFV in Syria) and the study area (the coastal region of Syria), a two-stage cluster random sampling procedure was employed: in the first stage 75 clusters (i.e. villages) situated in different districts of the coastal region were chosen. Figure 6.2 shows a map of the coastal region in Syria. On this map, the towns and villages of survey area are highlighted in green.
plots. In the second stage of the sampling procedure, few farmers in each of the clusters were randomly selected to be interviewed. The number of interviewed farmers in the chosen clusters varied between 1 and 7, according to the size of the clusters.

The sample size of 266 farmers was primarily determined to fulfil the needs of the data analysis procedures employed in the current study. Partial least squares structural equation modelling, factor analysis and multiple regression analysis were the main analytical tools applied (see Chapter 7). Such analytical techniques require a sufficient sample size to ensure that the statistical tests are valid. For instance, a minimum ratio of 5:1 between sample size and variables number should be considered and a sample size greater than 250 is recommended to increase the precision and consistency of estimated parameters of the partial least squares structural equation modelling (Hair et al. 2014: 18ff).

6.5 Questionnaire design and structure

During the construction process of the farmer survey, three important issues had been considered. First, the research problem and objectives, which determine the concepts of the present study, were taken into account. Second, the theoretical framework being used (i.e. TPB) was contemplated. By constructing the TPB questionnaire, a particular attention on the principle of compatibility was given (see Chapter 5). Third, the adequate method for questionnaire administration was considered prior to questionnaire design.

To ensure the quality of the collected data, the issues of reliability and validity of the used measures were highly deliberated in questionnaire wording. While reliability means the extent to which one or more manifest variables (i.e. observed measures of study concepts) are consistent in what they are intended to measure, the validity refers to the extent to which those measures are correctly representing the concept under investigation (i.e. the degree to which the measures of a given concept are free of any non-random error). Thus, reliability concerns how to measure a given concept whereas validity focuses on what should be measured (Hair et al. 2010: 2f). Significant attention was also given to avoid using any double-negative or superfluous questions. In such manner, the questionnaire was designed to meet the aim of the study and to help both the interviewers and farmers to feel that the questions are easy-to-ask and easy-to-answer respectively. In order to encourage farmers to participate and interact with the interviewers, the questionnaire had a cover sheet which was presented orally by the
Methodology: Data collection

Interviewers at the beginning of the interview to welcome participating farmers, to introduce the purpose of the interview and to tell the farmers that their answers will be anonymised and they may, at any time, withdraw their participation, including the withdrawal of any information they have provided. If they completed the interview, however, it would be understood that they have consented to participate in this research and agreed to the publication of the overall results of this research with the understanding that anonymity of the interviewees would be taken into account.

After this introduction, the questions flow was designed to ensure smooth interaction between interviewers and farmers. Easy-to-answer questions were first presented in the survey, such as farmers’ current practices on the farm. The second part of the survey covered the main topic for this research and involved questions and statements about attitudes towards organic farming. These questions were important to be asked before the participating farmers became tired and/or ran out of time. The last part of the survey included questions that could be considered sensitive such as demographic and farm characteristics (i.e. income, age, education and future of the farm, etc.). They were left to the end of the questionnaire in case the respondents were unwilling to answer them, and consequently, they might be discouraged from continuing with the survey. The interview finished with a statement thanking the respondents for their participation in order to leave them with positive feelings about the survey and about the importance of their involvement in this study.

The questionnaire designed for this analysis combines three sections of questions (see Appendix 1.3). These were as follows:

1) A background interview for collecting information about the current agricultural practices (fertilisers and pest control methods) and whether any organic practices were currently used on the farm. The questions included in this section were mainly categorical multiple-choice and probed open-ended questions which were easy to be answered by the interviewed farmers and also served as an introduction to the main topic.

2) A structured interview, based on the TPB framework, for eliciting farmers’ attitudes towards, and intentions to convert their farms to organic farming and thus take the decision to adopt organic farming within the next five years. The main focus in this survey was to explore the components of the TPB, which can serve as the behaviour’s cognitive foundation (Ajzen
2006a: 2) for the application of new technology (organic agriculture system) by Syrian farmers of FFV within the next five years. Farmers’ responses on the TPB questions were measured along five-point fully anchored scales (Likert and semantic differential scales, etc.). The TPB questionnaire included questions and statements covering the following components:

- adoption behaviour of organic FFV;
- intention to adopt organic FFV;
- attitudes towards the adoption of organic FFV;
- perceived behavioural control towards the adoption of organic FFV;
- subjective norms towards the adoption of organic FFV;
- perceived beliefs on the likely benefits from the adoption of organic FFV;
- perceived beliefs on the consequences from the adoption of organic FFV;
- perceived beliefs about social expectations to adopt organic FFV;
- motivation to comply with the expectation of significant others;
- beliefs about external supporting or impeding factors for applying organic FFV; and
- beliefs about internal supporting or impeding factors for applying organic FFV.

Additionally, farmers were asked to rate their attitudes and opinions about organic farming in general along five-point fully anchored Likert scales from strongly disagree to strongly agree. These included 27 attitudinal statements covering different aspects of organic farming (economic, environmental, health and animal welfare issues), strengths and weaknesses of organic production system, difficulties about organic certification and marketing of organic products, etc. These general attitudes and opinions served as background factors for the section of the questionnaire related to the TPB model.

3) The last section of the questionnaire is related to farm and household attributes. Questions about farmer’s household, age, income, education, farm size, marketing channels for product sales, etc. were included in this section in a metric natural scale, categorical multiple-choice or probed open-ended question format.

---

27 For detailed insight about eliciting questions for the TPB components, readers are referred to see Chapter 5 and Appendix 1.3 for a comprehensive overview of how the TPB questions were elaborated.
6 Methodology: Data collection

6.6 Procedures of data collection

The farmer survey was carried out from December 2012 until mid of May 2013. Using a two-stage cluster sampling procedure, 266 conventional farmers of FFV in 75 villages located in different districts of the coastal region were selected for this survey. Data was collected through face-to-face interviews by a project partner in Syria (Citrus Fruit Board in Tartous). A pre-test of five interviews was conducted in November 2012.

The farmer survey was prepared in English language and then translated into High Arabic, which is the native language in Syria, though various dialects of it are spoken in different regions. Thus, the questions in these interviews were orally asked in the dialect spoken in the coastal region. Prior to the interview process, several telephone calls were conducted with the project partner (Citrus Fruit Board in Tartous and MAAR) to explain the design and the purpose of farmer survey, implications, the interview approach and the sample selection procedures. These frequent calls and constant communication with the project partner resulted in an agreed respondent selection process, a tentative timetable for data collection, and reformulating few ambiguous questions after the pre-test.

6.6.1 Pre-test

To check the credibility of the instruments used in the survey, a pilot study or pre-test should be performed before launching the data collection. That is particularly important to ensure the validity of an instrument in question (Ajzen 2010: 5). Therefore, a pre-test of the questionnaire was undertaken in November 2012 with five conventional farmers of FFV in Tartous. The pre-test was indispensable to figure out the weaknesses of the questionnaire regarding question and statement clarity, wording, format, flow of questions, order and timing. After the pre-test was done the researcher went through the questionnaire with the interviewers to determine whether the questions and statements were fully understandable for both farmers and interviewers. Taking into account suggestions from the interviewers, all ambiguous questions were reformulated in a way that they were effortlessly comprehensible for farmers without changing the meaning of the original questions or statements. This procedure allowed the effectiveness of the questions and statements in the questionnaire to be

28 Only 10 farmers refused to take part in this survey. Details about response refusal are provided below in this chapter.
tested and improved before launching data collection process by means of face-to-face interviews.

6.6.2 Conduction of face-to-face interviews

All interviews took place either on the farm or in farmers’ houses and ran without any significant problems. The interviews were conducted by trained interviewers of the Citrus Fruit Board in Tartous who read out the questions to the participating farmers and filled in the answers for them. At the beginning of the interview, the purpose of the research was clearly explained to the respondents. Thus, the interviewers had to inform the participating farmers that this survey was a part of an academic study and not a baseline study in preparation of a bigger project. However, the findings and the recommendation of this survey and the other parts of the study would be made available to policy makers (i.e. whether governmental or non-governmental organisations) who might use them in future development projects in the region.

Almost all respondents were attentive to the questionnaire and willing to spend about one hour to be interviewed. Farmers were enthusiastic to acquire new information, and many of them requested investigators to provide an analysis directly after they accomplished the interview. Few of the respondents in this survey however, were reluctant to provide detailed responses for questions related to their income. This is because they were anxious about the interviews’ consequences on their income tax or because of the current war situation in Syria and its influence on agriculture. Others wanted to know whether this study was within a MAAR development programme and if participation in the survey would ensure that they would get benefits from their engagement in such a programme. About 10 farmers denied to be interviewed as they perceived many former studies which had been conducted in their region were without any tangible benefits; or they perceived the topic of the study as irrelevant under the current condition in Syria.

To ensure the interviewers’ correct proceeding in data collection, the researcher stood in close and regular phone contact with the director of the Citrus Fruit Board. After all interviews were completed, the interviewers entered the farmers’ answers to the questions into Microsoft Word files of the questionnaire. Seeking accuracy in data transcription, another person checked out the matching and consistency between answers on the paper form of the
questionnaires and its Word files for the whole survey. As soon as the Word files of the questionnaires were completed, the director of the Citrus Fruit Board sent them to the researcher via email and Dropbox. The researcher then inserted the data into Microsoft Excel and SPSS 20. After the completion of data entry and data cleaning (all 266 questionnaires were retained since missing values were very rare), data analysis started in the mid of June 2013. The next chapter of this dissertation provide a comprehensive overview of the statistical tools and analysis methods which have been used to analyse the collected data of farmer survey.
7 Methodology: Data analysis

7.1 Introduction

The obtained data from the survey with Syrian farmers of FFV were examined through performing different univariate, bivariate and multivariate analysis methods, which provided descriptive statistics and examined associations between and among variables under investigation. Factor analysis and multiple regressions were performed to investigate existing patterns in the data set. Finally, the TPB model of the intentions of Syrian farmers to convert their farms to organic farming was explored and assessed by partial least squares structural equation modelling. The aforementioned data analysis methods were analysed by means of two statistical package tools: SPSS 20 and SmartPLS 2.0.

This chapter is dedicated to explain the multivariate techniques being employed for the data analysis purpose. The chapter is organised as follows: the first and second sections provide brief descriptions about factor analysis and multiple regression analysis, respectively. The main section of this chapter gives a comprehensive overview about the approach of structural equation modelling. Initially, a general introduction about this approach is given. The differences between the covariance-based and the variance-based structural equation modelling are then provided. The final part of this section is devoted for partial least squares structural equation modelling technique.

7.2 Factor analysis

Factor analysis is a widely applied analysis method for examining interdependence relationships among a specified set of observed variables as measured through questions or statements in a survey instrument (Hair et al. 2010: 94ff, Beavers et al. 2013: 1). As the number of observed variables increases in multivariate data analysis, the need for investigating any underlying structure or pattern, which can represent these variables in subsequent analyses, also increases. Thus, factor analysis is primary employed for examining the patterns and dimensionality issues among a large set of observed variables and consequently determining “whether the information can be condensed or summarised in a smaller set of factors or components” (Hair et al. 2010: 91). Optimal structure (i.e. factor or component) can be derived when two or more of the observed variables under investigation
are highly loading on a single component while their cross loadings on other components are relatively small. Subsequently, the obtained factors can fairly replace the original variables in further analysis such as multiple regressions or cluster analysis. The extracted factors should be meaningful and make sense in terms of theoretical and conceptual considerations (Zwick and Velicer 1986: 432ff, Hair et al. 2010: 122, Courtney 2013: 1ff).

It is also important to indicate that factor analysis is not a singular multivariate analysis technique, but rather represents a family of analytical techniques that share a similar approach and functionality (Beavers et al. 2013: 1). Depending on the purpose of factor analysis, two broad approaches of factor analysis can be distinguished: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Stevens 2009: 345f, Hair et al. 2010: 94, Brown 2015: 35ff). Though the core point in both approaches relies upon the strength of the association (i.e. correlations) among a set of given variables, they are quite different from a philosophical point of view. While the EFA explores and investigates correlational patterns in the data set to develop theories, the CFA provides confirmative tests for existing theories by using empirical data (Hair et al. 2010: 95, Brown 2015: 35ff):

a) EFA is usually used to explore and examine the original variables for the underlying structures (if any exists) and then eliciting a set of factors that can best represent the original data. Therefore, the factors in the EFA approach cannot be previously known but are obtained as a consequence of applying EFA approach. According to the statistical results of the correlational relationships among variables under investigation and the derived factors, the researcher can determine which variables should be incorporated to a certain factor. She or he can also judge the appropriate number of factors that represent best the variance in the original variables. Thus, a good factor solution should include factors that make sense, can easily be interpreted, and possess a simple structure. The obtained factors should be named in such a manner that the underlying meanings of the variables that belong to each of those factors are reflected (Costello and Osborne 2005: 2f, Hair et al. 2010: 100f, Beavers et al. 2013: 1ff, Courtney 2013: 2ff). Two extraction schemes are widely applied in EFA approach: principal component analysis and common factor analysis29 (also referred to as

principal axis factoring in SPSS 20). The main difference between these two methods is that principal component analysis utilises the total variance in the original variables as a basis for extracting the components while common factor analysis assumes that only the shared variance among the variables under consideration is important to extract those factors (Costello and Osborne 2005: 1f, Hair et al. 2010: 107, Härdle and Simar 2012: 269ff).

\[ \text{2) Before conducting CFA, the researcher should determine the exact number of the factors (also known as constructs in CFA) as they are represented in an existing theory. It is also important to assign a set of variables to measure each of those constructs. Thus, in CFA, the chosen set of variables for each construct is expected to load higher on their pre-specified factors than to cross-load on the other constructs within the theory under investigation. For this reason, the CFA approach is known as confirmative approach to prove the hypothesised paths in an existing theory. Thus, to employ a confirmatory approach of factor analysis, the researcher draws upon an established theory, expert judgment, prior research, and research objectives to identify and test hypotheses about the relationships between latent variables (Harrington 2009: 27f, Hair et al. 2010: 693f).} \]

Though the theoretical framework of the current study (i.e. the TPB) is a well-established theory and widely applied in psychological social research areas, its applications for modelling the adoption of organic farming are relatively new. Therefore, in the current study, the loadings of the pre-specified set of observed variables for each of the TPB constructs should be examined with caution. For instance, the two observed variables used to measure the construct of farmers’ intentions to convert to organic farming were highly loading on their assigned construct, while their cross loadings were relatively small on all other constructs within the TPB framework. Thus, the empirical data provided evidence that support the theoretical foundation of this pre-specified construct (i.e. confirmative approach). However, few of the pre-assigned measures of other constructs (for examples, behavioural and control beliefs within the TPB model) showed relatively low loadings on their pre-specified constructs or, in some other cases, demonstrated relatively high cross loadings. Therefore, some of these measures were subject to be eliminated from the model in order to improve the model quality (i.e. exploratory approach). Since factor analysis (regardless whether explorative of confirmative in nature) is a substantial part for building a structural equation
model, a comprehensive overview about how to employ multiple-items (i.e. observed variables) for measuring each construct in the structural equation model can be found below under the third section of this chapter.

7.3 Multiple regression analysis

Like factor analysis, multiple regression analysis is a key multivariate analysis technique that is widely utilised in different research areas. Multiple regression is based on dependence relationships among a set of variables (Gujarati 2003: 18, Hair et al. 2010: 16, Fahrmeir et al. 2013: 21, Lynch 2013: 143f). In this context, the main objective of multiple regression analysis is to predict one dependent variable from two or more independent variables (Wooldridge 2006: 24, Stevens 2009: 63f, Hair et al. 2010: 161f, Härdle and Simar 2012: 97).

When the dependence relationship includes only one independent variable, it is referred to as simple regression analysis. Since simple or multiple regression analysis is an essential component of a structural equation model, a further discussion about this analysis technique and the related quality criteria of prediction are given in sub-section 7.4.2.

To understand how multiple regression analysis was employed in the current study, the author draws the following example: to explore the behavioural intention of Syrian farmers of FFV to convert their farms to organic farming within the next five years (i.e. dependent variable), three potential components of intention (i.e. explanatory variables) were identified according to the TPB (i.e. farmer’s attitudes towards organic farming, perceived social pressure from important referents, and perceived behavioural control over organic practices) (Ajzen 1991). Multiple variables were used to measure each of the aforementioned concepts in order to reduce the measurement errors that may happen when the reliance is only on a single variable as the sole representative of the concepts under investigation. Using factor analysis procedure, summated scales of these concepts were obtained from each set of the multiple variables to represent the concepts in further analysis (Hair et al. 2010: 172). The relationship between the intention and its components was then modelled by multiple regression analysis. The objective of using multiple regression analysis is to predict the behavioural intention to convert into organic agriculture (as dependent variable) through a set of independent variables selected for this purpose as stated by the following formula:
Methodology: Data analysis

\[ BI = b_0 + b_1 \text{ATT} + b_2 \text{SN} + b_3 \text{PBC} + \varepsilon \]  (7.1)

\( BI, \text{ATT}, \text{SN} \) and \( \text{PBC} \) represent summated scales of TPB constructs. The summated scales are calculated by summing up the observed variables of each of the TPB construct and then dividing the obtained sum of the number of variables that were used to measure each construct. Thus, \( BI \) is a summated scale of the behavioural intention of Syrian farmers of FFV to convert their farms to organic farming within the next five years. \( ATT \) is a summated scale of the farmer’s attitudes towards conversion to organic farming within the next five years, \( SN \) is a summated scale and represents the subjective norm (perceived social pressure from important referents) about the conversion to organic farming within the next five years, and \( PBC \) represents a summated scale of the perceived behavioural control over the conversion to organic farming within the next five years. \( \varepsilon \) is the residual term that represents unexplained variance in \( BI \). \( b_0 \) is an intercept and \( b_1, b_2, b_3 \) are regression coefficients of \( ATT, SN \) and \( PBC \), respectively.

With multiple regression analysis, each of the independent variables in the model is weighted by regression coefficients in a way that ensures the best prediction of the dependent variable (\( BI \)) from the set of independent variables (\( ATT, SN \) and \( PBC \)). This set of weighted independent variables stands for the best linear composite of the independent variables that minimises the sum of squared errors of prediction of the dependent variable, whereby the regression weights (also referred to as path coefficients in structural equation modelling) denote the relative contribution of each of the independent variables at explaining the variation in the dependent variable in the regression model (Gujarati 2003: 207f, Wooldridge 2006: 85f, Hair et al. 2010: 161f, Lynch 2013: 153f).
7.4 Structural equation modelling

Many multivariate analysis techniques such as factor analysis, multiple regression analysis, discriminant analysis, and multivariate analysis of variance (also known as the first generation of multivariate techniques) have important applications in different research areas and are considered as prevailing tools at addressing a wide array of research questions. These analysis techniques, however, have one limitation in common: each of them can deal with only one single equation at a time. In other words, when a model or theory includes more than one single relationship (i.e. at least two dependent variables), the abovementioned techniques cannot simultaneously address the whole model but rather only one single relationship (i.e. part of the model) at a time. In order to examine the entire model, taking into account all possible information at a time, structural equation modelling techniques (SEM) (also known as second generation of multivariate analysis techniques) were developed (Hair et al. 2010: 629f, Chin 2010: 655ff, Gefen et al. 2011: iii).

SEM is a powerful tool to test and examine theories including a series of causal dependence relationships (Hair et al. 2010: 629f). Thus, SEM has the ability to simultaneously estimate multiple dependence equations among theory constructs (i.e. a series of relationships similar to multiple regression equations) while also incorporating multiple measures for each construct (similar to factor analysis) (Chin 1998b: 7f, Roldán and Sánchez-Franco 2012: 194). SEM can be characterised by two components: the structural model and the measurement model.

First, the structural model of SEM, also known as the path model or the inner model, represents the path relationships among the latent variables (i.e. unobserved or abstract constructs). These path relationships are represented by arrows pointing from the independent latent variables (i.e. exogenous latent variables) into the dependent latent variables (i.e. endogenous latent variables) within a model or theory. Thus, the structural model can be perceived as regression models among independent (exogenous) and dependent (endogenous) latent variables. Second, the measurement model of SEM links the latent variables (whether independent or dependent) with their specified observed variables (also known as indicators or manifest variables). At the measurement model level, each of these latent variables can be

---

30 It should be indicated that SEM-related literature does not always employ the same terminology when referring to elements of the model. Most publications focusing on ‘covariance-based SEM’ (e.g. Hair et al. 2010) often refer to “measurement model” and “structural model” whereas publications addressing “variance-based SEM” (e.g. Lohmöller 1989) use the terms “outer model” and “inner model”, respectively.

31 Exogenous latent variables represent those constructs that explain other constructs (endogenous latent variables) in the SEM model.
viewed as a component or factor derived from its observed variables (Reinartz et al. 2009: 332f, Hair et al. 2010: 627f). Figure 7.1 gives a graphical representation of the structural and measurement models of SEM. A comprehensive overview of structural and measurement models will be provided below in section 7.4.2.1.

SEM has enjoyed increasing popularity in empirical research. That is mainly due to the model’s ability to assess the latent variables at the observational level (i.e. measurement model) and to estimate and test the relationships among latent variables at the unobserved theoretical level (i.e. structural model) (Cudeck et al. 2001, Kaplan 2008, Kline 2010, Hair et al. 2012a, Hoyle 2012, Reinecke 2014). Thus, SEM has become one of the most prominent methods employed in many areas including psychology, management research, marketing and consumer behaviour “for validating instruments and testing linkages between latent constructs” (Gefen et al. 2000: 6).
**Figure 7.1: Simple structural equation model**

η = dependent (i.e. endogenous) latent variable; ξ = independent (i.e. exogenous) latent variable; ζ = random disturbance term of dependent latent variable (η); γ = path coefficient from independent latent (ξ) to dependent latent variable (η); β = path coefficient between two dependent latent variables (η); φ = non-causal relationship between two independent latent variables (ξ); y = indicators of dependent latent variables (η); x = indicators of independent latent variables (ξ); λ = loadings of indicators of dependent latent variables; y = measurement errors for indicators of dependent latent variables (η); δ = measurement errors for indicators of independent latent variables.

According to the approach used in estimating the structural equation model, two families of SEM techniques can be distinguished: covariance-based techniques (CBSEM), of which Linear Structural RELations (LISREL) is the most well-known representative, and variance-based techniques (VBSEM), as represented by Partial Least Squares Structural Equation Modelling (PLS-SEM) (Chin 1998a, Gefen et al. 2000, Henseler et al. 2009, Reinartz et al. 2009, Hair et al. 2012b). CBSEM and PLS-SEM can be viewed as two different approaches to deal with the same research problem. Though both approaches start with the same set of theoretical and measurement models, they differ in how they calculate the SEM parameters (Reinartz et al. 2009: 334, Hair et al. 2014: 14ff).

The following sub-sections shed light on SEM approaches in more detail. While the first sub-section (7.4.1) gives a brief explanation of what covariance-based structural equation modelling is standing for, the second sub-section (7.4.2) comprehensively elaborates variance-based structural equation modelling with a particular focus on PLS-SEM. The choice of PLS-SEM is then justified to explore and examine the paths within the TPB model applied in the current study. The application of PLS-SEM to the TPB model of Syrian farmers of FFV to adopt organic farming is further explained in Chapter 9.

### 7.4.1 Covariance-based structural equation modelling

Covariance-based structural equation modelling (CBSEM), also known as the traditional approach of SEM, was developed by Jöreskog (1967) in his work on maximum likelihood, and the later extension on the estimation of the SEM parameters (Jöreskog 1973, 1978, 1993). Using LISREL software (Jöreskog and Sörbom 1982), CBSEM has become an important methodological approach in wide range of empirical research including for instances marketing (e.g. Baumgartner and Homburg 1996, Chin et al. 2008), management (e.g. Williams et al. 2003), psychology (e.g. MacCallum and Austin 2000), information systems research (e.g. Gerow et al. 2010, Edgington and Bentler 2012), and social sciences (e.g. Reinecke 2014).

The key issue that distinguishes CBSEM from other SEM techniques is that this approach attempts to minimise the difference between the sample covariances and those predicted by

---

32 The techniques will be discussed later in this chapter under the sub-section: variance-based SEM.
the theoretical model, (...) Therefore, the parameter estimation process attempts to reproduce the covariance matrix of the observed measures” (Chin and Newsted 1999: 309). Thus, the main objective of CBSEM is to replicate the theoretical covariance matrix, and to test and confirm existing theories rather than focusing on the prediction of endogenous latent variables as in VBSEM approach (Roldán and Sánchez-Franco 2012: 193f, Monecke and Leisch 2012: 2, Hair et al. 2014: 14f).

Since covariance-based SEM is estimated using maximum likelihood (ML) or generalised least squares (GLS), a set of assumptions about the observed variables must be satisfied before estimating CBSEM. These assumptions are the adequate number of indicators per latent variable, sufficient sample size, normal distribution of indicators, and high indicator loadings on the latent variables (Jöreskog and Wold 1982, Reinartz et al. 2009: 332ff):

I. CBSEM requires a minimum number of observed variables per construct (at least three to four) to insure that CBSEM goodness-of-fit criteria are achieved (Long 1983, Baumgartner and Homburg 1996: 139ff, Reinartz et al. 2009: 335). Increasing the number of indicators per construct is assumed to have positive effects on the estimation of the CBSEM model (Marsh et al. 1998: 181). However, using too many indicators may cause a misspecification of CBSEM model and consequently an overestimation of the model’s goodness-of-fit criteria (Haenlein and Kaplan 2004: 283f).

II. Both ML- and GLS-based CBSEM require a minimum sample size (usually exceeding 200 cases in most research situations) in order to get robust solutions. Therefore, a threshold of sample size is essential to obtain results with sufficient accuracy from the CBSEM model (i.e. the standard errors of estimated parameters will be smaller as the sample size increases) (Long 1983, Boomsma and Hoogland 2001: 140f, Reinartz et al. 2009: 335).

III. Normality of data distribution is also required in CBSEM, both normal distribution for each individual indicator and multi-normal distribution for a set of indicators that belongs to the same latent construct (Jöreskog 1967). However, it is unlikely in many empirical research areas to achieve a perfect normal distribution of data (Micceri 1989: 156f). Many studies applied CBSEM with data which have
no normal distribution, resulting in inflated standard errors of parameter estimates. Thus, a model with poor solution was obtained. However, using a large sample in CBSEM can overcome the issue of non-normal distribution patterns (Babakus et al. 1987: 220ff, Reinartz et al. 2009:335).

IV. A high indicator loading on a given construct in a CBSEM model is also an important assumption to be fulfilled. Indicator loadings can be easily understood in terms of construct reliability and construct validity of indicators used to measure a given construct (Churchill 1979: 64ff). The construct reliability increases when the associated random error decreases. Thus, reliable indicators can be expressed by their high loadings on the construct that they belong to (Gerbing and Anderson 1988: 186f). On the other hand, construct validity refers to how well the constructs are operationalised by their observed measures. The average variance extracted (AVE) from the observed indicators of a given construct can serve as a good proxy for construct validity. Though indicator loadings should be high to reach acceptable levels of construct reliability, the loadings should be unequal in order to ensure the construct validity of the concept under investigation (Fornell and Larcker 1981: 39ff, Reinartz et al. 2009: 335).

7.4.2 Variance-based structural equation modelling: Partial least squares structural equation modelling

Partial least squares structural equation modelling (PLS-SEM)\(^{33}\), also known as variance-based structural equation modelling, is a prediction-oriented structural equation modelling technique which represents an extension of principal component analysis and canonical correlation analysis\(^{34}\) (Henseler et al. 2009: 284). Unlike CBSEM, PLS-SEM attempts to maximise the variance of the dependent latent variables which can be explained by the independent latent variables in the model. Thus, the main objective in PLS-SEM is prediction rather than reproduction of the empirical covariance matrix of the manifest variables as in CBSEM. The method used to estimate PLS-SEM parameters is ordinary least squares (OLS). This method estimates the model parameters from the available data in a way that minimises the residual variance (i.e. unexplained variance), and thus maximises the coefficient of

\(^{33}\) In some literature of SEM, the term Partial Least Squares Path Modelling (PLS-PM) is also used to refer to PLS-SEM (e.g. Tenenhaus et al. 2005).

\(^{34}\) Readers are referred to Hair et al. 2010 for a comprehensive view of what canonical correlation analysis is standing for.
determination ($R^2$) of the endogenous latent variables in the SEM model (Haenlein and Kaplan 2004: 290, Roldán and Sánchez-Franco 2012: 205, Hair et al. 2014). The linear algorithm used by most PLS-SEM methods was developed by Wold (1975, 1982, 1985) and its extensions by Lohmöller (1989) for the analysis of dimensional data (i.e. latent variables) under ‘soft’ statistical assumptions (Wold 1982). PLS-SEM is a robust technique characterised by distributional requirements and assumptions that are generally less restrictive compared to the covariance-based SEM techniques. However, the term “soft assumptions” of PLS-SEM “should not be taken as carte blanche to disregard standard psychometric assessment techniques” (Hair et al. 2012a: 430).

Like other statistical methods, PLS-SEM “requires several choices that, if not made correctly, can lead to improper findings, interpretation, and conclusions” (Hair et al. 2012a: 415). With comparison to CBSEM, PLS-SEM has however minimal demands on data distributions, sample size and measurement scales (Wold 1985: 581f, Chin 1998a: 295). PLS-SEM does not assume that data should be normally distributed as an important prerequisite to proceed as the case of CBSEM, since PLS-SEM is a non-parametric technique which can perform well with non-normal distributed data. Regarding sample size, PLS-SEM has no identification problems and can achieve a high level of statistical power even with small samples less than 50. However, it is recommended to have a sample size greater than 250 to increase the precision of estimated parameters of a PLS model (Hair et al. 2013: 2ff). PLS-SEM is also more flexible than CBSEM with the number and type of indicators required to each construct in the model. Accordingly, PLS-SEM can be employed with a model that has fewer indicators (1 or 2) per latent construct compared to CBSEM, or even with a complex model including a large number of indicators and structural paths, which is difficult to estimate by CBSEM when the total number of indicators in such model exceeds 50. PLS-SEM also allows different types of measurement scales to be used, so that beside metric data, PLS-SEM may also use quasi-metric scaled and binary data, particularly for the exogenous latent constructs in the model. Furthermore, PLS-SEM more readily allows for using formative measurement scales\textsuperscript{35} to represent the constructs under investigation, while using such scales in CBSEM is challenging and may create identification problems in the model (Chin et al. 2003, Treiblmaier et al. 2011, Gefen et al. 2011). It consequently leads to bias in estimating CBSEM parameters and thus leading to a model with poor fit (Rigdon 1994, Jarvis et al. 2003, Petter et al. 2007).

\textsuperscript{35} Formative measurement scales and its difference from reflective measurement scales will be explained below in this chapter.
Finally, it should be stated that PLS-SEM does not have, so far, a global goodness-of-fit criterion like that one used in CBSEM. Therefore, many researchers have applied CBSEM approach more frequently than PLS-SEM. Consequently, the applications of PLS-SEM for theory testing and confirmation can be unsatisfactory, since CBSEM adherences frequently claim that the PLS-SEM parameter estimates can be biased and inconsistent (Hair et al. 2014: 17f). However, many simulation studies rejected such claims and figured out that the differences of parameter estimates in PLS-SEM and CBSEM are very small (e.g. Reinartz et al. 2009, Ringle et al. 2009, Sharma and Kim 2013, Henseler et al. 2014)\footnote{For a comprehensive overview of the key characteristics of PLS-SEM, readers are referred to Hair et al. 2014: 16f and Henseler et al. 2014: 17ff.}.

Despite the popularity and wide application of CBSEM in business and social sciences, the use of PLS-SEM in such areas has gradually increased. The main driver to such increase was the ability of PLS-SEM to predict the likely behaviour of endogenous latent variables and to estimate and test the causal relationships between latent variables in the theoretical model (Hair et al. 2012a: 415f). After the recent development in PLS-SEM software packages (e.g. PLS-Graph: Chin 2001, 2003 & SmartPLS: Ringle et al. 2005), many studies in different research areas have applied PLS-SEM technique as the main multivariate analysis tool, for instances in marketing research (e.g. Babin et al. 2008, Hair et al. 2012a), international marketing (Henseler et al. 2009), international advertising research (e.g. Henseler et al. 2012), customer satisfaction (Rigdon et al. 2011), management information systems (Gefen et al. 2011, Ringle et al. 2012), human resource management (Becker et al. 2012), operations management (Peng and Lai 2012), accounting (Lee et al. 2011), information system research (Urbach and Ahlemann 2010) and strategic management (Hulland 1999, Hair et al. 2012b).

After this concise discussion of CBSEM and PLS-SEM, the decision to choose one of these methods for the current study should be made. Despite their similarities, each of these methods is appropriate under different research objectives and contexts. Researchers need to recognise the dissimilarities in order to employ the correct method (Hair et al. 2014: 14ff). Since the objective of the current study is mainly the prediction of the intentions of Syrian farmers of FFV and their decisions to convert to organic farming within the next five years, the choice of PLS-SEM, rather than CBSEM, for the prediction of the endogenous constructs of the applied TPB model would be appropriate. Additionally, the methodological advances of PLS-SEM can “provide researchers much more flexibility in modeling relationships and
thus allow for a more nuanced testing of theoretical concept” (Hair et al. 2013: 1). Accordingly, the application of PLS-SEM technique would be valuable and appreciated for exploratory research contexts like the current investigation, given PLS-SEM capability to provide estimates of model parameters even in situations in which other methods fail or are unable to attain robust estimates (Henseler et al. 2014: 201). Henceforth, the main focus of the following sub-sections will be therefore shifted to deeply discuss the PLS-SEM technique and to explain how this method can be adopted and applied for investigating and examining the parameters of the TPB model.

7.4.2.1 PLS-SEM specification

Like other SEM models, PLS model can be split into two sub-models: First, the measurement model including relationships between latent constructs and their observed indicators, and second the structural model including relationships between latent constructs. PLS-SEM is based on an algorithm that calculates latent variables scores for each observation in the data set. PLS-SEM coefficients are then estimated using OLS regressions. The following two sub-sections introduce the basic concepts of the measurement model and the structural model of PLS-SEM, including a brief description of how PLS-SEM can be used to estimate and test the path coefficients within the TPB framework. While the third and fourth sub-sections are dedicated to explain the algorithm and bootstrapping procedures of PLS-SEM, the last sub-section is devoted to reliability and validity criteria used in PLS-SEM.

7.4.2.1.1 Measurement model of PLS-SEM

The measurement model usually comprises latent constructs (i.e. latent variables) and their manifest variables together with a set of relationships linking each of those constructs with its pre-specified manifest variables. Additionally, the measurement model includes error terms that are associated with manifest variables in the model (Hair et al. 2014: 27). The latent constructs (such as attitude towards and intention to perform a specific behaviour) can only be detected indirectly, and imperfectly, through their effects on the manifest variables. That is because latent constructs are abstract theoretical concepts which cannot be directly observed. Thus, the measurement model specifies and determines how those constructs are measured (Henseler et al. 2009: 289, Hair et al. 2014: 11). In graphical terms, the latent constructs are usually represented by circles or ovals in the SEM diagrams, while the manifest variables are
Methodology: Data analysis

In PLS-SEM, the measurement model may include two different types of block measurement, reflective and/or formative measurement models, also referred to as Mode A and Mode B measurement models, respectively (see Figure 7.2). The main difference between these two measurement models is the shape of the causal relationship between the latent construct (whether exogenous or endogenous) and its assigned manifest variables. In a reflective measurement model, the causal relationships are represented by single-headed arrows pointing from the latent construct to the manifest variables (Figure 7.2: a and b), while these arrows, in the formative measurement model, point from the manifest variables to the latent construct (Figure 7.2: c and b). The relationships between latent constructs and their specified manifest measures are represented by outer loadings for reflective constructs, whereas the same relationships for formative constructs are embodied by outer weights (Hair et al. 2014: 42f). As a consequence, reflectively measured constructs differ from formatively measured ones in that the manifest measures are considered observable consequences of the latent construct while formative manifest measures can be viewed as causes of the latent construct (Jiang et al. 2012: 2).
**Figure 7.2: Measurement model in PLS-SEM: An illustrative example**

(a) Reflective measurement model (Mode A):
- Reflective indicators depend on the latent construct and should be highly positively correlated.

(b) Formative measurement model (Mode B):
- Formative indicators cause the latent construct and can have positive, negative or no correlation.

(a): Reflective measurement model with exogenous latent construct (\( \xi^R_i \)) including \( n \) reflective indicators (\( x_i \)).
(b): Reflective measurement model with endogenous latent construct (\( \eta^R_j \)) including \( m \) reflective indicators (\( y_j \)).
(c): Formative measurement model with exogenous latent construct (\( \xi^F_i \)) including \( n \) formative indicators (\( x_i \)).
(d): Formative measurement model with endogenous latent construct (\( \eta^F_j \)) including \( m \) formative indicators (\( y_j \)).

In a reflective measurement model (Mode A), the latent construct is assumed to cause the covariation of its own manifest measures. Hence, any change in the latent construct will lead to changes in all of its measures (Hair et al. 2014: 13). The causal relationship in the reflective measurement model is therefore similar to factor analysis, where the manifest variables of reflective blocks are loading highly on one factor (i.e. latent construct). Thus, each manifest variable in a specific reflective measurement model can be assumed as a linear function of that latent construct (see Figure 7.2: a and b). Written in mathematical terms, the first set of equations depicts the relationship between the manifest indicators \((x_{ik})\) and its associated reflective exogenous latent construct \((\xi_i)\):

\[
\begin{align*}
    x_{i1} &= \lambda_{x_{i1}} \xi_i + \delta_{x_{i1}} \\
    x_{i2} &= \lambda_{x_{i2}} \xi_i + \delta_{x_{i2}} \\
    \vdots \\
    x_{in} &= \lambda_{x_{in}} \xi_i + \delta_{x_{in}}
\end{align*}
\]

\(k = [1, \ldots, n]\) is the number of reflective manifest variables \((x_{ik})\) of the exogenous latent construct \((\xi_i)\); \(\lambda_{x_{ik}}\) are loadings of reflective manifest variables \((x_{ik})\) on the exogenous latent construct \((\xi_i)\); and \(\delta_{x_{ik}}\) represent measurement errors for each manifest variables \((x_{ik})\) on the exogenous latent construct \((\xi_i)\).

By using matrix algebra, the above stated equations can be rewritten:

\[
X_x = \Lambda_x \ast \xi_i + \Delta_x \tag{7.2}
\]

\(\Lambda_x\) is a matrix of the loading coefficients \((\lambda_{x_{ik}})\) and \(\Delta_x\) is a matrix of the measurement errors \((\delta_{x_{ik}})\) associated with reflective manifest variables \((x_{ik})\) of the exogenous latent construct \((\xi_i)\) (Reinartz et al. 2009: 335, Henseler et al. 2009: 284f).

In a similar manner, the manifest variables \((y_{ij})\) associated with reflective endogenous latent construct \((\eta_j)\) can be described by the following set of equations:

\[
\begin{align*}
    y_{j1} &= \lambda_{y_{j1}} \eta_j + \epsilon_{y_{j1}} \\
    y_{j2} &= \lambda_{y_{j2}} \eta_j + \epsilon_{y_{j2}} \\
    \vdots \\
    y_{jm} &= \lambda_{y_{jm}} \eta_j + \epsilon_{y_{jm}}
\end{align*}
\]

\(l = [1, \ldots, m]\) is the number of reflective manifest variables \((y_{ij})\) of the endogenous latent construct.
7 Methodology: Data analysis

construct \((\eta_j)\); \(\lambda_{y_{jl}}\) are loadings of reflective manifest variables \((y_{jl})\) on the endogenous latent construct \((\eta_j)\); and \(\varepsilon_{y_{jl}}\) represent measurement errors for each reflective indicator of the endogenous latent construct \((\eta_j)\).

By using matrix algebra, these equations can be written:

\[
Y_y = A_y \cdot \eta_j + E_y
\]  

\((7.3)\)

\(A_y\) is a matrix of the loading coefficients \((\lambda_{y_{jl}})\) and \(E_y\) is a matrix of the measurement errors \((\varepsilon_{y_{jl}})\) associated with reflective manifest variables \((y_{jl})\) of the endogenous latent construct \((\eta_j)\) (Reinartz et al. 2009: 335, Henseler et al. 2009: 284f).

With respect to the formative measurement model (Mode B), the formative manifest variables are not reflected by, but rather define and determine the latent construct (see Figure 7.2: c and d). Thus the causal relationship between the latent construct (exogenous \((\xi_i)\) or endogenous \((\eta_j)\)) with its associated formative indicators can be seen as multiple regression analysis. In mathematical terms this can be expressed as follows:

\[
\begin{align*}
\xi_i &= y_{x_{1i}} \cdot x_{1i} + y_{x_{2i}} \cdot x_{2i} + \ldots + y_{x_{ni}} \cdot x_{ni} + \vartheta_{\xi_i} \\
\eta_j &= y_{y_{1j}} \cdot y_{1j} + y_{y_{2j}} \cdot y_{2j} + \ldots + y_{y_{mj}} \cdot y_{mj} + \zeta_{\eta_j}
\end{align*}
\]

\(y_{x_{ki}}\) and \(y_{y_{ij}}\) are regression weights of formative manifest variables \((x_{ki})\) and \((y_{ij})\) used to predict the latent constructs \((\xi_i)\) and \((\eta_j)\), respectively and \(\vartheta_{\xi_i}\) and \(\zeta_{\eta_j}\) are random measurement errors which indicate that the latent constructs \((\xi_i)\) and \((\eta_j)\), respectively, are not perfectly measured by their associated formative manifest variables \((x_{ki})\) and \((y_{ij})\).

By using matrix algebra, these equations can be written:

\[
\begin{align*}
\xi_i &= \Gamma_x \cdot X_x + \Theta_i \\
\eta_j &= \Gamma_y \cdot Y_y + Z_j
\end{align*}
\]  

\((7.4)\)  

\((7.5)\)

\(\Gamma_x\) and \(\Gamma_y\) are the matrices of regression weights of formative manifest variables \((x_{ki})\) and
(\(y_{ij}\)) used to measure latent constructs (\(\xi_i\)) and (\(\eta_j\)), respectively. \(\Theta_i\) and \(Z_j\) are matrices of random measurement errors (\(\vartheta_{\xi_i}\) and \(\zeta_{\eta_j}\)) (Reinartz et al. 2009: 335, Henseler et al. 2009: 285f).

### 7.4.2.1.2 Structural model of PLS-SEM

After presenting the relationships between the latent constructs and their specified indicators, the attention is now shifted to discuss the path relationships that connect the latent constructs to each other. The structural model of PLS-SEM is made of the latent constructs and a set of paths connecting those constructs. Two types of latent constructs (exogenous (\(\xi_i\)) and endogenous (\(\eta_j\))) can be included into the structural model. These can be distinguished through the shape and direction of the causal relationships (i.e. paths) among the latent constructs in the structural model (see Figures 7.1 and 7.3). In graphical terms, the exogenous latent constructs (\(\xi_i\)) have no paths pointing to them, but rather have paths going from them to the endogenous latent constructs (\(\eta_j\)). In such manner, the path between an exogenous and an endogenous latent construct can be understood as a cause-effect relationship in a regression analysis model. In mathematical terms, the exogenous latent constructs can be viewed as independent variables in all path equations in which they appear, whereas the endogenous latent constructs are dependent variables in at least one path equation. Some of the endogenous constructs may also be independent variables in other path equations which link between two endogenous latent constructs (Henseler et al. 2009: 284f, Hair et al. 2014: 148).

Figure 7.3 shows a graphical representation of the PLS structural model, as applied in the current study, to portray the path hypotheses in the TPB. Within the structural model of TPB, two types of path estimates should be distinguished: \(\gamma_{ji}\) and \(\beta_{jj}\). While the path coefficient \(\gamma_{ji}\) represents the strength of the causal relationship between an independent latent construct (\(\xi_i\)) and a dependent latent construct (\(\eta_j\)), path coefficient \(\beta_{jj}\) is standing for the relationship between two endogenous constructs (\(\eta_j\)). In Figure 7.3 for instance, \(\gamma_{11}\) is a path coefficient that links between an exogenous latent construct (\(\xi_1\)) (i.e. bsoe: behavioural beliefs on the likely benefits from the adoption of organic farming) and an endogenous latent construct (\(\eta_1\)) (i.e. ATT: attitudes towards the adoption of organic farming). The path coefficient \(\beta_{14}\) denotes the causal relationship between two endogenous latent constructs (\(\eta_1\) and \(\eta_4\)) in the TPB model (i.e. ATT and BI: the attitudes towards, and intention to adopt organic farming, respectively). Though attitudes towards adoption of organic farming are an endogenous
dependent construct in the TPB model, attitudes can also serve as an independent variable in a higher-order relationship among the endogenous constructs (as it is depicted in $\gamma_{11}$ and $\beta_{14}$). This also holds true for the other endogenous latent constructs in the TPB framework, the subjective norm towards adoption of organic farming (SN), the perceived behavioural control over adoption of organic farming (PBC), and the intention to adopt organic farming (BI) (see Figure 7.3). In other words, the endogenous latent constructs ATT, SN and PBC are fully mediating the relationships among the exogenous latent variables (i.e. the set of salient beliefs: behavioural, normative and control beliefs to adopt organic farming, respectively) and the higher-order endogenous latent variables (i.e. the intention to adopt organic farming). Accordingly, the effects of these salient beliefs on the behavioural intention are assumed to be indirect. Moreover, the behavioural intention can also be perceived as a mediator of the relationships of each of the endogenous constructs ATT, SN and PBC with the higher-order endogenous construct (i.e. CONV: the decision to adopt organic farming). While BI is a full mediator of the relationships of ATT and SN with CONV, it is only a partial mediator of the relationship of PBC and CONV, since the PBC has also a direct influence on the CONV beside its indirect effect on that CONV through behavioural intention\(^\text{37}\) (Ajzen 2012: 438ff).

\(^{37}\) A comprehensive discussion of the mediation, indirect and total effects of the TPB constructs on the behaviour (CONV) are given in Chapter 9.
Figure 7.3: PLS structural model of the Theory of Planned Behaviour

\[ \eta_j = \text{endogenous latent construct; } \xi_i = \text{exogenous latent construct; } \zeta_j = \text{random disturbance term associated with prediction of the endogenous latent construct (} \eta_j \text{) from exogenous latent variable (} \xi_j \text{);} \gamma_{ij} = \text{path coefficient of the causal relationship between exogenous latent construct (} \xi_j \text{) and endogenous latent construct (} \eta_j \text{);} \beta_{ij} = \text{path coefficient of the causal relationship between two dependent latent construct (} \eta_j \text{);} \text{ and } \phi_{ii} = \text{non-causal relationship between two exogenous latent construct (} \xi_j \text{).} \]

Source: Own model adopted from combining the TPB (Ajzen 1991) & the structural model of PLS-SEM (Hair et al. 2014).
To provide a better understanding of the structural model of PLS-SEM and its application for the TPB, a set of equations representing the path relationships is given below (see Figure 7.3). First, the causal relationships among the independent latent constructs ($\xi$) and the dependent latent constructs ($\eta$) can be represented by three *simple regression equations*. These equations can be mathematically written as follows:

$$
\eta_1 = \gamma_{11} \xi_1 + \zeta_1 \\
\eta_2 = \gamma_{22} \xi_2 + \zeta_2 \\
\eta_3 = \gamma_{33} \xi_3 + \zeta_3
$$

$\eta_1$, $\eta_2$ and $\eta_3$ represent the attitudes, subjective norm and perceived behavioural control towards adoption of organic farming; $\xi_1$, $\xi_2$ and $\xi_3$ are the set of salient beliefs: behavioural, normative and control beliefs to adopt organic farming; and $\zeta_1$, $\zeta_2$ and $\zeta_3$ represent random disturbance terms associated with the prediction of the endogenous latent constructs ($\eta_1$, $\eta_2$, $\eta_3$) from the exogenous latent constructs ($\xi_1$, $\xi_2$, $\xi_3$).

By using matrix algebra, these equations can be summarised:

$$
\eta_j = \Gamma_{ij} \times \xi_i + Z_j
$$

(7.6)

$\Gamma_{ij}$ and $Z_j$ represent the matrices of $\gamma_{ij}$ and $\zeta_j$, respectively (Reinartz et al. 2009: 335, Henseler et al. 2009: 284f, Ajzen 2012: 438ff).

Second, the path coefficients $\beta_{ij}$ which determine the causal relationships among the endogenous latent constructs ($\eta$), but from different orders within the TPB model, are depicted by two multiple regression equations. These equations can be mathematically written as follows:

$$
\eta_4 = \beta_{14} \eta_1 + \beta_{24} \eta_2 + \beta_{34} \eta_3 + \zeta_4 \\
\eta_5 = \beta_{35} \eta_3 + \beta_{45} \eta_4 + \zeta_5
$$

$\eta_4$ and $\eta_5$ represent the intention to adopt organic farming and the decision of adoption of organic farming. $\zeta_4$, and $\zeta_5$ are random disturbance terms associated with prediction of the
high-order endogenous latent variables \((\eta_4, \eta_5)\) from their predictor constructs within TPB model.

By using matrix algebra, these equations can be rewritten:

\[
\eta_{\text{higher-order}} = B_{jj} \times \eta_j + \Gamma_{ij} \times \xi_i + Z_{\text{higher-order}}
\]  

\((7.7)\)

\(\eta_{\text{higher-order}}\) are higher-order endogenous latent constructs within the TPB model; \(B_{jj}\) is the matrix of \(\beta_{jj}\) path coefficients; and \(Z_{\text{higher-order}}\) represents the matrix of random disturbance terms associated with prediction of higher-order endogenous latent constructs \((\eta_{\text{higher-order}})\) (Reinartz et al. 2009: 335, Henseler et al. 2009: 284f, Ajzen 2012: 438ff).

Additionally in the TPB model, there are also non-causal relationships \((\phi_{ii})\) among the exogenous latent constructs \((\xi_i)\). These relationships are not estimated as other PLS path coefficients of TPB model, but rather they are calculated as correlation coefficients among the exogenous latent constructs. In Figure 7.3 for instance, \(\phi_{21}\) represents the correlation coefficient of the relationship between the behavioural beliefs on likely benefits from the adoption of organic farming \((\text{bsoe})\) and the normative beliefs towards the adoption of organic farming \((\text{nbmc})\) (Ajzen 2010: 1).

Finally, the aforementioned path coefficients \((\gamma_{ij} \text{ and } \beta_{jj})\), which represent the hypothesised relationships in the structural model of PLS-SEM, will only be as reliable and valid as the measurement model of the latent constructs is also reliable and valid (Hair et al. 2014: 44). In the current study, the researcher tried to operationalise those latent constructs (i.e. the components of the TPB) by using a measurement model that covers the different aspects of the measured constructs. Chapter 5 provides an overview of the measurement model of the TPB components as well as the hypotheses within the TPB framework (i.e. the set of equations 7.6 and 7.7) which had been tested by the empirical data obtained from Syrian farmers of FFV.
7 Methodology: Data analysis

7.4.2.1.3 Algorithm of PLS-SEM

Once the input data are checked for missing values and outliers, and the measurement and structural models of PLS-SEM are specified, the PLS-SEM algorithm (also known the PLS algorithm) can be calculated. The PLS-SEM algorithm (Wold 1975 and extended by Lohmöller 1989) uses an OLS regression based technique for estimating the model parameters. Thus, the parameters are estimated in such a way that maximise the explained variances of the predicted constructs ($\eta_j$) within PLS path model. Studies of Tenenhaus et al. 2005, Henseler et al. 2009, and Henseler and Ringle 2012 provided a comprehensive overview on the basic approach used in the PLS-SEM algorithm. To understand how the basic algorithm of PLS-SEM works, the description of Henseler et al. 2009 will be hereafter followed.

By means of a PLS-SEM algorithm, the estimation process of PLS-SEM parameters can be viewed as an iterative procedure including two stages. While the iterative estimation of latent variable scores is calculated in the first stage of the PLS-SEM algorithm, the PLS-SEM parameters are then estimated in the second stage. A comprehensive elucidation of these two iterative stages of the PLS-SEM algorithm is provided as follows:

**Stage 1: Iterative estimation of latent variable scores**

The PLS-SEM algorithm uses the raw data (i.e. observed or manifest variables) to estimate the unknown parameters of the model. However, the raw data should be first standardised with mean of zero and standard deviation of 1. Then the latent construct scores (unobserved values) are estimated as linear combinations of their standardised manifest variables. Calculating these scores is an indispensable part of the PLS-SEM algorithm, and thus building a PLS-SEM data matrix which is considered the core point at estimating all parameters in PLS-SEM model. The iterative cycles of PLS algorithm usually consist of four steps (steps 1 to 4). However, the first cycle has one extra step (i.e. initialisation step) which the PLS-SEM algorithm begins with (Henseler et al. 2009, Hair et al. 2014):

- **Step 0: Initialisation of PLS-SEM algorithm**

  In the first iteration of the PLS-SEM algorithm, initial construct scores can be obtained from any arbitrary non-trivial linear composites of the manifest variables. For instance, to calculate the initial scores of latent constructs in SmartPLS software
(Ringle et al. 2005), the algorithm specifies (+1) as initial outer weights for all the relationships among the latent constructs and their assigned indicators (i.e. observed or manifest variables). This procedure can be described in the following equations:

\[
\begin{align*}
\xi_i^{\text{outer}} &= +1 \cdot \chi_{i1} + 1 \cdot \chi_{i...} + 1 \cdot \chi_{in} \\
\eta_j^{\text{outer}} &= +1 \cdot y_{j1} + 1 \cdot y_{j...} + 1 \cdot y_{jm}
\end{align*}
\]

\(\chi_i\) and \(y_j\) are the values of the observed indicators; \(\xi_i^{\text{outer}}\) and \(\eta_j^{\text{outer}}\) represent initial outer proxies of latent constructs (\(\xi_i, \eta_j\)), respectively. These initial values of construct scores, however, will be changing throughout the subsequent iterative cycles of the PLS-SEM algorithm until stable and reliable scores for those constructs (\(\xi_i, \eta_j\)) are obtained.

- **Step 1: Inner weights estimation**

Using the score values obtained from step 0, the initial inner weights (\(e_{ij}\)) among the latent constructs are estimated. The covariance matrix among the initial outer proxies of adjacent latent constructs (\(\xi_i^{\text{outer}}, \eta_j^{\text{outer}}\)) represents the initial approximation of the relationships between these adjacent latent constructs in the PLS path model. The initial inner weights estimates can be obtained from the following equation:

\[
e_{ij} = \text{Cov} (\xi_i^{\text{outer}}, \eta_j^{\text{outer}}) \text{ when } (\xi_i, \eta_j) \text{ are adjacent constructs} \& e_{ij} = 0, \text{ otherwise}
\]

\(e_{ij}\) is a matrix of the initial inner weights estimates between adjacent latent variables; \(\xi_i^{\text{outer}}, \eta_j^{\text{outer}}\) are initial outer proxies of the latent constructs (\(\xi_i, \eta_j\)), respectively; and \(\text{Cov} (\xi_i^{\text{outer}}, \eta_j^{\text{outer}})\) represents the standardised covariance matrix among (\(\xi_i^{\text{outer}}, \eta_j^{\text{outer}}\)).

Given that data are standardised, the covariance matrix is equal to the correlation matrix of (\(\xi_i^{\text{outer}}, \eta_j^{\text{outer}}\)). Therefore the matrix of the initial inner weights (\(e_{ij}\)) can be viewed as the correlative relationships between (\(\xi_i^{\text{outer}}, \eta_j^{\text{outer}}\)). Matrix values can vary from (-1 to +1), indicating the strength and direction of relationships between those two adjacent latent constructs (\(\xi_i, \eta_j\)).
• Step 2: Inside approximation of inner proxies
Taking into account the initial inner weights \( (e_{ij}^\text{inner}, h_{ij}^\text{inner}) \), the initial inner proxies of the adjacent latent constructs \( (\eta_j^\text{outer}, \xi_i^\text{outer}) \) are calculated from the initial outer proxies \( (\eta_j^\text{outer}, \xi_i^\text{outer}) \), respectively. Unlike the initial outer proxies of latent construct, the initial inner proxies (such as \( h_{ij}^\text{inner} \)) are based on data obtained from other adjacent latent constructs (such as \( \xi_i^\text{outer} \)) within the structural model of PLS-SEM. In other words, the initial inner proxies are estimated through a chain of (simple and multiple) regression models from the initial outer proxies of the other adjacent latent constructs. Hence, the initial inner proxies can be viewed as improved and revised estimates of the latent construct scores. They are then closer to the true values of construct scores than the initial outer proxies do. The process of inside approximation can be mathematically expressed as follows:

\[
\eta_j^{\text{inner}} = \sum_i e_{ij} \cdot \xi_i^{\text{outer}} \\
\xi_i^{\text{inner}} = \sum_j e_{ij} \cdot \eta_j^{\text{outer}}
\]

• Step 3: Estimation of the outer weights
After obtaining the initial inner proxies of latent scores, a second chain of (simple and multiple) regression models among those initial inner proxies \( (\xi_i^{\text{inner}}, h_{ij}^{\text{inner}}) \) and their specified observed indicators \( (\chi_i, y_j) \) are performed. The aim of this step is to refine the estimates of initial outer weights (which were arbitrary set as \(+1\) in the initialisation step 0) and thus, to obtain new outer weights estimates that represent better the relationships between the latent constructs and their assigned indicators.

The new estimates of the outer weights \( (w) \) can be mathematically calculated from a set of regression equations. However, in this step, it is important to distinguish between the two types of the PLS-SEM measurement model: reflectively and formatively measured constructs.

If the measurement model of the latent construct is reflective (Mode A), simple regression models are applied in order to obtain the new outer weights.
If the measurement model of the latent construct is formative (Mode B), multiple regression models are used to calculate the new outer weights

\[ \chi_i = w_i \cdot \xi_i^{inner} + \varepsilon_i \]
\[ y_j = w_j \cdot \eta_j^{inner} + \varepsilon_j \]

1. **Step 4: Outside approximation**

In this step the new outer proxies of the latent construct scores are calculated as linear combination of their respective indicators and the new outer weights obtained from the previous step 3:

\[ \xi_i^{outer} = \sum w_i \cdot \chi_i \]
\[ \eta_j^{outer} = \sum w_j \cdot y_j \]

With this step, the first cycle of the PLS-SEM algorithm is completed. However, these new values of \((\xi_i^{outer}, \eta_j^{outer})\) will serve as input data for the step 1 in the second iterative cycle of the PLS-SEM algorithm. The outer proxies obtained from the second iterative cycle will be used as input data for the third iterative cycle and so forth. These iterative cycles of the PLS-SEM algorithm are designed to run until they converge to stabilised values for construct scores.

The iterative process of the PLS-SEM algorithm will be stopped, if the convergence criterion is achieved. The convergence criterion is based on the sum of the outer weights \((w^{k-1}, w^k)\) between two successive iterative cycles \((k-1, k)\), respectively. Mathematically speaking, convergence is reached, when the difference in the absolute values between \((w^{k-1}, w^k)\) drops below a predefined threshold value \((10^{-5})\). Subsequently, the iterative process is quitted and the PLS-SEM algorithm proceeds into the second stage. Thus, the final outer weights \((w_i, w_j)\), which are obtained from
the last iterative cycle, reflect the true relationships among the adjacent latent constructs \((\xi_i, \eta_j)\). As a consequence, the score values of the *inner and outer proxies* for each latent construct, in the last iterative cycle of the PLS-SEM algorithm are almost identical, and thus they represent the *optimum values* of the latent construct scores that maximise the R-squared explained by PLS-SEM model \( (\xi_{i_{k_{optimum}}} = \xi_{i_{k_{outer}}} \approx \xi_{i_{k_{inner}}} \& \eta_{j_{optimum}} = \eta_{j_{outer}} \approx \eta_{j_{inner}}) \). These optimum scores are then used in the *second stage* to run OLS regressions among the latent constructs to determine the path coefficients in the structural model, and to estimate loadings and weights in the measurement model (Henseler et al. 2009, Hair et al. 2014).

Convergence criterion of stopping the iterative process in the PLS-SEM algorithm is given by:

\[
\sum |w^k - w^{k-1}| < 10^{-5}
\]

\[
w^k = \sum_{i}^k w_i + \sum_{j}^k w_j
\]

\[
w^{k-1} = \sum_{i}^{k-1} w_i + \sum_{j}^{k-1} w_j
\]

\(k\) refers to the total number of the iterative cycles that the PLS-SEM algorithm need to run until reaching robust estimates of the latent construct scores \( (\xi_{i_{k_{optimum}}}, \eta_{j_{optimum}}) \); within the last iterative cycle \((k)\) of the PLS-SEM algorithm, \(w^k\) is calculated by summing up all of the outer weights estimates obtained from two adjacent latent constructs \( (\xi_i, \eta_j) \) and their observed indicators \((\chi_i, y_j)\); and \(w^{k-1}\) represents the sum value of the outer weights estimates obtained from the previous iterative cycle \((k - 1)\).

**Stage 2: Final estimation of PLS-SEM algorithm parameters**

After the convergence criterion is matched and latent scores are stable and unchanged, the PLS-SEM algorithm proceeds to generate a data matrix. The data matrix is made of the latent scores \( (\xi_{i_{k_{optimum}}}, \eta_{j_{optimum}}) \) and their observed measures \((\chi_i, y_j)\). Using the chain of simple and multiple regression models (i.e. the set of equations 7.2 to 7.7 presented above in sub-
section 7.4.2.1), the PLS-SEM algorithm proceeds to calculate the final model parameters (i.e. outer loadings and weights of the measurement model, path coefficients of the structural model and R-squares for the predicted latent variable within the PLS-SEM model). Finally, it should be stated that the PLS-SEM algorithm does not provide any significance tests for the estimated parameters. Nevertheless, these significance tests will be performed by means of a PLS-SEM bootstrapping procedure, which will be explained below in the next sub-section.

In summary, the PLS-SEM algorithm uses iterative (single and multiple) partial least squares procedure within the path model to estimate the outer proxies of the latent constructs and the inner proxies of those constructs until they converge to unchanging and stable values of latent construct scores. The subsequent iterative cycles, from step 1 to step 4 in the first stage of the PLS-SEM algorithm, always gain benefits from the new information obtained from the preceding cycles. In other words, the outer and inner proxies are always refined and improved until they converge to the optimum values of latent scores that maximise the variance (in the endogenous latent constructs) that can be explained by the PLS-SEM model. Once the latent construct scores have been calculated, these scores are then used to estimate each partial regression model in the structural model (i.e. the path coefficients), and to obtain the estimates for all relationships in the measurement models (i.e. the indicator loadings and weights) (Hair et al. 2014: 74f).

7.4.2.1.4 Bootstrapping procedure of PLS-SEM

Since PLS-SEM does not assume that data should be normally distributed as initial prerequisite to estimate the model parameters, PLS-SEM model is incapable to perform any parametric significance tests to examine whether obtained parameters such as path coefficients are statistically significant (Hair et al. 2014: 130). As an alternative solution, PLS-SEM employs a non-parametric bootstrapping procedure (Davison and Hinkley 2003: 22f) to provide confidence intervals for all parameter estimates and thus to test these parameters for their significance. Generally speaking, a bootstrapping procedure provides an approximation of the “shape, spread, and bias of the sampling distribution” of any given parameter estimate (Henseler et al. 2009: 305). The PLS-SEM bootstrapping procedure draws a large number of subsamples (i.e. bootstrap samples) from the available sampling population (i.e. original sample) with replacement. Each time an observation is drawn at random out of the original sample, it is returned back to the original sample before the next observation is
selected (Chin 2010: 675, Hair et al. 2014: 130). This implies that an observation can be drawn for more than one time in a given bootstrap sample. However, it may not be chosen for another bootstrap sample. The size and number of bootstrap samples must be explicitly specified. As a rule of thumb, the number of bootstrap samples must be greater than the number of valid observations in the original sample. Generally speaking, 5,000 bootstraps are recommended to be selected. The size of each bootstrap sample should be also at least as large as the number of valid observations in the original sample (Hair et al. 2014: 138).

Once the recommended size and number of bootstraps in the PLS-SEM software (such as SmartPLS) are specified, the bootstrapping procedure can be performed. Bootstrapping then provides PLS-SEM coefficient estimates for each bootstrap sample as well as for the original sample from which these bootstraps were drawn. The output report of the bootstrapping procedure provides mean values, standard errors, and empirical t-values for all estimated coefficients in the PLS-SEM model (i.e. path coefficients in the structural model, and weights and loadings in the measurement models). These t-values represent means of testing the significance of the estimated parameters in the original sample. Bootstrapping procedure also provides other criteria to test the internal reliability, convergent validity and discriminate validity of the latent constructs and their associated observed indicators. A discussion of these tests will be given in the next sub-section.

7.4.2.2 Evaluation criteria of PLS-SEM

Unlike covariance-based SEM, the partial least squares approach does not provide any global goodness-of-fit criteria to assess the results obtained from the PLS-SEM model. Alternatively, a set of non-parametric evaluation criteria can be used as quality criteria to judge the output of the PLS-SEM model (Henseler et al. 2009: 298, Hair et al. 2014: 96). A list of these criteria, proposed by Chin (1998a), is often used to evaluate the partial model structures. The application of this criteria list includes two distinctive steps. While the first step concerns the assessment of the measurement model of PLS-SEM, the second focuses on the assessment of the structural model. The following two sub-sections provide an overview about the criteria used to assess the PLS model’s quality.

7.4.2.2.1 Assessment of the PLS-SEM measurement model
The evaluation process of the PLS model output starts with examining the quality of the measurement model before appraising the quality of the structural model. The evaluation criteria of the PLS measurement model depend on the type of the measurement being employed (i.e. reflective and/or formative, see also 7.4.2.1.1). A reflectively measured model should be assessed in terms of reliability and validity criteria, whereas only validity criteria are relevant in the case of formatively measured constructs.

### 7.4.2.1.1 Assessment of the reflective measurement model

In the evaluation process of a reflective measurement construct, the following set of criteria should be taken into account: internal consistency reliability, indicator reliability, convergent validity, and discriminant validity.

**a. Internal consistency reliability**

Internal consistency reliability indicates the extent to which indicators of a given construct are consistent in their values (Hair et al. 2014: 116). Internal consistency reliability is traditionally measured by Cronbach’s alpha (Cronbach 1951), which is based on examining the indicator inter-correlations of a given construct. Cronbach’s alpha postulates that all measures of a given construct should be *equally reliable* and they should also have *equal weights*. However, in the context of PLS-SEM, a different approach (so-called composite reliability, see Werts et al. 1974) is considered a more suitable criterion to estimate the reliability of a reflectively measured construct (Chin 2010: 671, Urbach and Ahlemann 2010: 19). Though composite reliability \( \rho_c \) also uses indicator inter-correlations as the basis to estimate the reliability, it does not assume that all indicators are equally reliable but rather “*prioritises indicators according to their reliability*” (i.e. indicator reliability), resulting in a more reliable construct (Henseler et al. 2009: 298f). High inter-correlations among the observed measures will be reflected in a high composite reliability of their associated construct and vice versa (Hair et al. 2014: 101f). The following formula shows how the composite reliability of a given reflectively measured construct (regardless whether exogenous or endogenous) can be calculated (Henseler et al. 2009: 300, Götz et al. 2010: 695):

\[
\rho_c = \frac{\sum_i \lambda_i^2}{\sum_i \lambda_i^2 + \sum_i \text{Var}(e_i)}
\]
\[ Var(e_i) = 1 - \lambda_i^2 \]

\( \rho_c \) refers to the composite reliability of a given construct; \( \lambda_i \) is the standardised outer loading of an observed indicator \( (i) \) associated with a specific construct; \( e_i \) is the measurement error of an observed indicator \( (i) \); and \( Var(e_i) \) represents the variance of the measurement error \( (e_i) \).

From the formula, it can be seen that the value of composite reliability can vary between 0 and 1. Relatively high values of \( \rho_c \) indicate a high composite reliability of a certain construct. As a rule of thumb, composite reliability values of 0.70 to 0.90 are considered satisfactory in advanced stages of research; however, values between 0.60 and 0.70 are regarded as acceptable under exploratory research conditions. Low values of \( \rho_c \) (less than 0.60) refer to the absence of internal reliability. Furthermore, very high values of composite reliability (particularly above 0.95) are also not desirable, since they show that all the manifest indicators are measuring the same thing of their specified latent construct. As a consequence, these indicators are unlikely to be valid measures of the construct under investigation. This can particularly happen if the manifest indicators of a specific construct are semantically redundant (i.e. the statements of the manifest indicators are formulated by “slightly rephrasing the very same question”) (Hair et al. 2014: 102). Thus, content validity of the redundant indicators can be adversely affected (Rossiter 2002: 311, Hair et al. 2014: 102) or the error term correlations may be further increased when using redundant items (Drolet and Morrison 2001: 198f, Hayduk and Littvay 2012: 1f, Petrescu 2013: 100f, Hair et al. 2014: 102).

b. Indicator reliability

Indicator reliability should also be considered since reliable indicators are substantial to ensure the internal consistency reliability and the validity of the construct under investigation. The minimum prerequisite of indicator reliability supposes that the indicators loading on their associated construct should be at least statistically significant. Generally speaking, the loading of an observed indicator associated with a certain reflective construct should be greater than 0.708 in order to be a reliable indicator of that construct. Therefore, indicators with weaker loadings (below 0.708) on their specified reflective construct are candidates to be disregarded from the model (Hair et al. 2014: 103). However, in many social research studies, weaker indicator loadings can be expected. That particularly occurs when newly established measures
are employed (Hulland 1999: 198f, Hair et al. 2014: 103). Therefore, the decision to disregard any indicator with weaker loading should be cautiously examined, since the construct’s content validity and composite reliability can be adversely affected. As a rule of thumb, eliminating an indicator with a loading between 0.40 and 0.70 from the model can be justified, if the removal of this indicator leads to a substantial increase of the composite reliability and the average of variance extracted from a certain construct. Moreover, reflective indicators with very low loadings (less than 0.40) are recommended to be disregarded from the measurement model (Churchill 1979: 64ff, Hair et al. 2014: 103).

c. Convergent validity
Convergent validity refers to the degree to which an observed indicator positively correlates with other indicators of the same construct (Hair et al. 2014: 102). To ensure the convergent validity, the reflective indicators of a given construct should be highly correlated, and thus, they should share a high proportion of the variance of their associated construct. The convergent validity can be better understood in terms of indicator loadings ($\lambda_i$) and average variance extracted ($AVE$). From the given formula below (Fornell and Larcker 1981: 45), any increase in indicator loadings on a given construct will necessarily lead to an increase in the value of $AVE$:

$$AVE = \frac{\sum_i \lambda_i^2}{\sum_i \lambda_i^2 + \sum_i Var(e_i)}$$

$$Var(e_i) = 1 - \lambda_i^2$$

The convergent validity of a given construct can be established if the value of $AVE$ is greater than 0.50. In other words, a reflective construct should explain at least 50 % of the variance of its associated indicators on average. On the other hand, an $AVE$ value lower than 0.50 indicates a lack of convergent validity, since the unexplained proportions of variance (i.e. error terms) in the observed measures are greater than the variance that can be explained by the associated reflective construct (Fornell and Larcker 1981: 45f, Henseler et al. 2009: 300, Götz et al. 2010: 696f, Hair et al. 2014: 103).

d. Discriminant validity
Discriminant validity refers to the degree to which a given construct can be truly distinctive from other constructs in the model. Thus, each construct should be unique and exhibits sufficient difference from the other latent variables in the model (Chin 2010: 670, Hair et al. 2014: 105). The discriminant validity of the PLS measurement model can be assessed by two measures: the cross loadings test and the Fornell-Larcker criterion. The cross loadings test means that the loading of a given indicator on its specified construct should be greater than all of its cross loadings on any other construct in the model (Chin 2010: 671). On the other hand, the Fornell-Larcker criterion (Fornell and Larcker 1981) assumes that a given construct should share more variance with its associated reflective indicators than with any other construct in the theoretical model. This implies that the AVE value of a given reflective construct should be greater than the construct's highest squared correlation with any other construct in the model (Fornell and Larcker 1981: 46, Henseler et al. 2009: 299f, Götz et al. 2010: 696). With comparison to the cross loading test, the Fornell-Larcker criterion can be viewed as a conservative measure of the discriminant validity (Hair et al. 2014: 105). In the current study, both criteria were used to determine the discriminant validity of TPB components since the cross loading test provides an evaluation of discriminant validity on the indicator level and the Fornell-Larcker criterion allows this kind of assessment on the construct level (Henseler et al. 2009: 299f)

7.4.2.2.1.2 Assessment of the formative measurement model

Regarding the evaluation process of the formative measurement model, the internal reliability measures are not applicable, since the formative indicators are capturing different parts of the content domain of their respective formative constructs (i.e. multiple regression analysis). Formative indicators are also not necessarily covarying together to reflect their respective construct as in the case of the indicators of a reflectively measured construct (see 7.4.2.1 for a comprehensive overview of a formative construct). Thus, the shared variance among formative indicators is expected to be much smaller than the shared variance obtained from reflective indicators of a given construct (Hair et al. 2014: 118f). Moreover, the construct validity (i.e. discriminant and convergent validity) is also irrelevant in the case of formatively measured constructs. The inapplicability of construct validity for formative constructs can be explained by the lack of internal reliability of formative indicators together with the low value of AVE which can be extracted from these formative indicators (Diamantopoulos 2006: 11f, Henseler et al. 2009: 300f). Nevertheless, other types of validity are highly important to be
evaluated when employing formative constructs: nomological validity and external validity. Indicators’ validity in terms of collinearity and significance levels should also be considered. The following two sub-sections provide a brief explanation of how to proceed in examining the validity of formatively measured construct:

a) **Nomological validity and external validity of the formative construct**

Nomological validity refers to the extent to which the path relationships between a given formative construct and other latent constructs within the PLS model, which are adequately identified from prior research, are sufficiently strong and significant. Thus, the nomological validity provides evidence about the degree to which formative constructs are behaving in a given theoretical model as they are hypothesised to be. External validity indicates the extent to which a given formative construct is highly correlated with alternative reflective measures of the same construct (Henseler et al. 2009: 301f). The external validity is also referred to as *redundancy analysis* in Chin (2010: 683) and *convergent validity* of formative construct in Hair et al. (2014: 121). Regardless of the nomenclature, the basic idea of external validity is to regress the formatively measured construct (as predictor) on a reflective measure of the same construct (as predicted variable). The strength of the path coefficient then indicates the external validity of the formative construct. As a rule of thumb, a path coefficient (i.e. equal to correlation value since the data are standardised) of 0.90 or at least 0.80 is required to ensure the validity of the chosen set of formative indicators. Thus, 0.81 or at least 0.64 of the variance of the reflective measure of the construct should be explained by the formative set of the same construct (Chin 1998a: 295ff, Hair et al. 2014: 121). This can be mathematically represented by the following formula (Henseler et al. 2009: 301):

\[
EV_{\xi_F} = 1 - Var(v)
\]

\[
Var(v) = 1 - \frac{\gamma^2}{\eta_R}
\]

\(EV_{\xi_F}\) symbolises the external validity of a formative set of indicators of the construct under consideration \((\xi_F)\); \(v\) is the formative construct’s error term; \(Var(v)\) indicates the variance of formative construct’s error term (i.e. uncaptured proportion of formative construct’s variance by its formative set of indicators); \(\eta_R\) represents the reflective measure of the construct under
investigation ($\xi_f$); $\gamma$ is the path coefficient of the relationship between the formative index and the reflective measure of the same construct.

b) **Formative indicators’ validity**

Beside nomological and external validity of the formative construct, the validity of the formative indicators should also be considered. That can be done through assessing the collinearity level among the formative indicators as well as the significance level of each formative indicator (Henseler et al. 2009: 301f, Hair et al. 2014: 123ff). This sub-section provides an explanation of how to proceed in the assessment of the collinearity issue and significance level for each indicator in a formatively measured construct.

First, collinearity basically indicates that two formative measures of a given construct exhibit a high level of correlation among each other, and hence, demonstrates problematic issues in identifying and interpreting their associated formative construct (when more than two formative indicators of the same construct are highly correlated, this situation is referred to as multicollinearity). Collinearity implies that one (or more) formative indicators of a given construct can be written as a linear combination of one (or more) formative indicators of the same construct. A severe level of collinearity can particularly occur if two (or more) formative measures, having the same piece of information (i.e. so that at least one item is redundant), are inserted into the same latent formative construct (Henseler et al. 2009: 302, Hair et al. 2014: 123). To test the collinearity issue, each formative indicator is regressed on the other formative indicators of the same construct and subsequently, the variance inflation factor ($VIF$) is calculated from the following formula (Hair et al. 2014: 124):

$$VIF = \frac{1}{1 - R_{aux}^2}$$

$VIF$ indicates the variance inflation factor of the regressed formative indicator (i.e. predicted variable) on the rest of formative indicators (i.e. predictors) of the same formative construct; and ($R_{aux}^2$) is the explained variance of the predicted indicator from its predictors.

The square root of variance inflation factor ($\sqrt{VIF}$) refers to the extent to which the standard error of a given formative coefficient has been inflated due to the existence of collinearity. As a rule of thumb, a $VIF$ value of 5 or greater represents a potential problematic level of
collinearity. This implies that 80% of the variance of a given formative indicator can be explained by the rest of the formative measures of the same construct (i.e. $R^2_{x_{aux}} = 0.80$) (Hair et al. 2011: 146f). To solve the collinearity problem, one or more formative indicators should be eliminated from the PLS model. Such a procedure, however, should be done with caution since the elimination of one or more indicators may severely affect the content validity of the formative construct. Alternatively, researchers should consider merging other collinear indicators to a single formative index. This can be done by taking average values of, weighted average values of, or factor analysis scores of the collinear indicators. Researchers may also consider creating a higher-order construct by splitting the formative indicators of a construct, which has collinearity problem, into two or more sub-constructs based on a theoretical and conceptual basis (Hair et al. 2014: 125ff).

Second, the significance level of the formative indicators’ weights and loadings can be calculated through bootstrapping procedure. This provides empirical means to examine whether the indicator’s weight (i.e. relative importance) and indicator’s loading (i.e. absolute importance) are significant as determinants of the formative construct under consideration. As a rule of thumb, if the indicator’s weight is significant, regardless the value and significance level of the indicator’s loading, there is empirical support to keep the indicator in the analysis. When an indicator’s weight is not significant but the loading is greater than 0.50, the formative indicator should also be retained in the model. However, if both the indicator’s weight and loading are not statistically significant, this formative indicator should be disregarded from the PLS model (Hair et al. 2014: 129ff).

7.4.2.2.2 Assessment of the PLS structural model

After examining the measurement model for its reliability and validity and the appropriateness of the measures is being established, the attention is shifted to evaluate the results obtained from the PLS structural model (Chin 2010: 674). Such evaluation gives an idea of how well the theory’s constructs are operationalised by the empirical data, and thus, the decision can be made whether the theory under consideration has been practically proven (Hair et al. 2014: 167f). In this context, the main results of the PLS algorithm on the structural level (i.e. the path coefficients and $R^2$ values) should be assessed. The path coefficients among the latent constructs should be first examined for their statistical significance and collinearity issues, and then the predictive capability of PLS-SEM is examined through the
assessment of the $R^2$ values of the endogenous latent constructs. Finally, the PLS model’s predictive relevance can be explored.

a. **Collinearity issues**

Since PLS-SEM employs an OLS regression procedure at calculating the path parameters, it is important to begin with investigating the collinearity issues among the predictor and predicted constructs on the structural level. As the structural model of PLS-SEM may include a series of simple and/or multiple regression equations, significant levels of collinearity among each set of predictor constructs (usually VIF values greater than 5) can lead to substantial biases in the path coefficient estimates of the structural model, and as a consequence, a poor PLS solution with low predictive capability is obtained (Hair et al. 2014: 168ff, see also 7.4.2.1). The collinearity test among a set of predictor constructs on the structural level can be performed in a similar manner as the aforementioned test of collinearity issues among formative indicators (see sub-section 7.4.2.2.1.2). For instance, in the PLS structural model of the TPB (Figure 7.3) two tests of collinearity issues can be performed. The first test is on collinearity levels among the predictor constructs of behavioural intention to convert to organic farming (BI): attitudes towards, subjective norm towards, and perceived behavioural control over conversion to organic farming. The second test examines collinearity among the predictor constructs of the decision on conversion to organic farming (CONV): behavioural intention to convert, and perceived behavioural control over conversion to organic farming.

b. **Significance of path coefficients**

Like the measurement model, the significance test of the path coefficients is also performed through bootstrapping procedure which provides means of testing PLS coefficient estimates (see bootstrapping procedure). As rule of thumb, if the empirical $t$-values of the path coefficients are greater than the critical $t$-values: 1.65, 1.96 or 2.57, these coefficients are then significant at probability error $\alpha = 10\%$, 5% or 1%, respectively (Hair et al. 2013: 173f). The interpretation of the obtained path coefficients can then be done in a similar manner to that one used to interpret the outer weights of formative indicators (see sub-section 7.4.2.2.1.2). However, the outer weights are only indicative measures of the relative contributions of the formative indicators to their assigned construct, whereas the path coefficients are indicative estimates of the hypothesised causal relationships among the latent constructs on the structural model level (see section 7.4.2.1). The significant path coefficients should be
additionally examined for their relative importance in predicting the endogenous latent constructs. In Figure 7.3, for instance, the relative importance for each of the predictor constructs ATT, SN and PBC at explaining the variance in the predicted construct (BI) should be compared through examining the values of the path coefficients and thus, the effects of these constructs on BI can be better estimated. This type of relationships represents the **direct effects** of a set of predictor constructs on a given predicted construct, since these predictors (i.e. ATT, SN and PBC) have direct paths connecting them to the predicted construct (BI). In Figure 7.3, there is also another type of relationships (so-called **indirect effects**), which should also be considered when evaluating the relative importance of path coefficients in the PLS structural model. For instance, the relationships between the set of salient beliefs (bsoe, nbmc and cbpc) and BI in the TPB model are **indirect and fully mediated** by ATT, SN and PBC, respectively. Seeking a comprehensive understanding of the PLS structural model, both the direct and indirect effects of each predictor construct on a given predicted construct should be considered. Consequently, by summing up the direct effect and indirect effects, the total effects of predictor constructs on its associated predicted constructs can be calculated. Ultimately based on the magnitude of the obtained total effect coefficients, the relevant importance of each predictor construct on the predicted constructs under consideration can then be determined (Ajzen 2010: 1, Albers 2010: 420ff, Hair et al. 2014: 174).

c. **Predictive relevance**

Beside the assessment of the predictive accuracy (i.e. $R^2$ values) of the endogenous latent constructs as well as the examination of the effect sizes of predictor constructs, the predictive relevance of the endogenous constructs should also be examined. The predictive relevance of the PLS structural model can be measured by means of the **predictive sample reuse technique** (also referred to as Stone-Geisser’s $Q^2$ criterion) developed by Stone (1974) and Geisser (1975). The $Q^2$ criterion assumes that the model should be able to provide a prediction for the indicators of endogenous latent constructs (Henseler et al. 2009: 305). Thus, a PLS-SEM is said to exhibit predictive relevance if the data points of the endogenous constructs’ indicators are accurately predicted by the PLS structural model. However, this procedure can only be applied with reflectively measured endogenous constructs, while it is not relevant in the case of formatively measured endogenous constructs (Hair et al. 2014: 178). The Stone-Geisser’s $Q^2$ criterion in PLS-SEM softwares (such as SmartPLS) can be calculated by means of a blindfolding procedure for a pre-specified omission distance (D) in the dataset (Chin 2010: 38).

---

All the input data used in PLS-SEM are standardised and thus the output parameters are also standardised and comparable.
7 Methodology: Data analysis

679f, Henseler et al. 2009: 305). As Hair et al. (2014: 178) pointed out, “Blindfolding is a sample reuse technique that omits every $d^{th}$ data point in the construct’s indicators and estimates the parameters with the remaining data points (...), the omitted data points are considered missing values and treated accordingly when running the PLS-SEM algorithm (...), the resulting estimates are then used to predict the omitted data points”. Using a blindfolding procedure, the predictive relevance value ($Q^2$) can be mathematically given by the following formula (Henseler et al. 2009: 303):

$$Q^2 = 1 - \frac{\sum D \cdot SEE_D}{\sum D \cdot SEO_D}$$

$Q^2$ represents a measure of PLS model’s predictive relevance. This measure indicates the extent to which the observed values of reflective endogenous indicators (which are omitted in blindfolding procedure) can be reproduced by the structural model of PLS-SEM. D is the omission distance of data points in the reflective indicators of the endogenous latent construct. $SEE_D$ represents the sum of squares of prediction errors, and $SEO_D$ is the sum of squares of observations. As a rule of thumb, a $Q^2$ value greater than zero indicates predictive relevance of the OLS structural model of the predicted construct under investigation, while a $Q^2$ value equal or lower than zero represents a lack of predictive relevance (Henseler et al. 2009: 303, Hair et al. 2011: 145).

With analogy to the way how effect size ($f^2$) is calculated from changes in $R^2$ values, the relative impact of predictive relevance ($q^2$) can be obtained from the changes in $Q^2$ values whether a given predictor construct is included in or excluded from the OLS path model of the predicted construct (i.e. reflectively measured endogenous construct)

$$q^2 = \frac{Q^2_{\text{included}} - Q^2_{\text{excluded}}}{1 - Q^2_{\text{included}}}$$

$q^2$ indicates the relative impact of a given predictor construct on the reflectively measured endogenous construct under investigation. $Q^2_{\text{included}}$ and $Q^2_{\text{excluded}}$ represent $Q^2$ values of a specific predicted construct in PLS structural model when a given predictor construct has been included in or excluded from the OLS structural model of that reflective endogenous construct, respectively. Similar to the interpretation of effect size values, $q^2$ values of 0.02,
0.15 and 0.35 are interpreted as threshold levels for whether the given predictor construct has a small, medium, and large effect on the predicted construct at the structural level (Henseler et al. 2009: 305, Hair et al. 2014: 184).

To understand how the PLS blindfolding procedure was employed in the current study to examine the PLS model’s predictive relevance of the TPB, the researcher draws on the example below based on the description of Chin (2010: 679f) and Hair et al. (2014: 178ff) who provided a comprehensive overview on the PLS blindfolding procedure. In Figure 7.4, a partial diagram from the PLS model of the TPB is exhibited. This diagram represents an OLS structural model and includes four constructs with their measurement models. The behavioural intention to convert to organic farming (BI) is an endogenous construct measured by two reflective indicators. The attitudes towards (ATT), subjective norm (SN) and perceived behavioural control over conversion to organic farming (PBC) were also measured reflectively, but by four, three and six indicators, respectively (as it is shown in Figure 7.4).

Before launching the PLS blindfolding procedure to calculate the $Q^2$ values of the OLS structural model of BI, the omission distance (D) should be specified. As a rule of thumb, selecting an integer value for D between 5 and 10 is recommended, but by dividing the total number of observations in the model on the chosen value of D should not be an integer number (Hair et al. 2014: 180). Since, in the current study the dataset included 266 observations, a D value of 5 was chosen (in the present study). This implies that every fifth data value of the two reflective indicators of BI would be omitted and then re-predicted by means of PLS blindfolding procedure. Thus, five rounds of blindfolding procedure were required until all data points of $y_{41}$ and $y_{42}$ were eliminated and then re-estimated. If the PLS blindfolding procedure in a given round (out of the 5 rounds) omitted for instance the following data points of $y_{41}$: (1, 6, 11, 16, …), the omitted data points of the other indicator $y_{42}$ in this round should be different from those being omitted of $y_{41}$. This implies that the omitted data points of $y_{42}$ in this round of blindfolding procedure could be the following: (2, 7, 12, 17, …), (3, 8, 13, 18, …), (4, 9, 14, 19, …), or (5, 10, 15, 20, …).\(^{39}\)

After selecting a D value of 5, the PLS blindfolding can be run. The estimation of $Q^2$ values in PLS blindfolding is an iterative process that continues until each observed value of the two reflective indicators of BI has been omitted and then predicted by the OLS structural model.

---

\(^{39}\) Readers are referred to Hair et al. (2014: 178ff), where a comprehensive discussion of the omission distance (D) of the blindfolding procedure is given.
(that connects BI construct with its predictors: ATT, SN, and PBC). Each single round of PLS blindfolding included two stages. In the first stage, the latent construct scores ($\hat{\text{BI}} = \hat{\eta}_4$)\textsuperscript{40} were estimated from the OLS structural model of BI. These scores were calculated by multiplying the latent scores of predictor constructs (ATT, SN, and PBC) with the associated path coefficients ($\beta_{14}, \beta_{24}, \beta_{34}$), and then summing them up as it is depicted in the following equation:

$$\text{BI} = \hat{\eta}_4 = \beta_{41}\eta_1 + \beta_{42}\eta_2 + \beta_{43}\eta_3$$

In the second stage of the PLS blindfolding procedure, the predicted latent scores $\hat{\eta}_4$ of BI were then used in the estimation process of the omitted values in the reflective indicators $y_{41}$ and $y_{42}$ of BI (i.e. one-fifth of the data points in each of the 5 rounds of PLS blindfolding procedure). After obtaining the predicted values, the sum of squares of prediction errors ($\text{SEE}_D$) of BI was estimated, and since the sum of squares of observations ($\text{SEO}_D$) of BI can easily be obtained from the observed data of $y_{41}$ and $y_{42}$, consequently, the predictive relevance ($Q^2$) of BI was calculated by the abovementioned equation (Table 9.15 in Chapter 9 shows the results of blindfolding procedure). A $Q^2$ value greater than zero means that the OLS structural model of BI has predictive relevance, and a $Q^2$ value below zero indicates that this model exhibits a lack of predictive relevance. Furthermore, the relative impact ($q^2$) for each of the predictor constructs (ATT, SN, and PBC) can be calculated to determine their relative impacts on the prediction of the behavioural intention to convert to organic farming.

\textsuperscript{40} These predicted latent scores ($\hat{\text{BI}} = \hat{\eta}_4$) should be distinguished from the latent construct scores ($\text{BI} = \eta_4$) which are calculated from the measurement model of BI within the first stage of the PLS-SEM algorithm (see sub-section 7.4.2.1.3 for a review of how latent scores are obtained by the PLS-SEM algorithm procedure).
Figure 7.4: Simplified PLS-SEM of behavioural intention to convert to organic farming with its direct predictor constructs within the TPB framework

\[ y_{11} \quad \lambda_{y11} \quad \eta_1 \]
\[ y_{12} \quad \lambda_{y12} \quad \eta_2 \]
\[ y_{13} \quad \lambda_{y13} \quad \eta_3 \]
\[ y_{14} \quad \lambda_{y14} \quad \eta_4 \]
\[ y_{21} \quad \lambda_{y21} \quad (SN) \]
\[ y_{22} \quad \lambda_{y22} \quad (PBC) \]
\[ y_{23} \quad \lambda_{y23} \]
\[ y_{31} \quad \lambda_{y31} \]
\[ y_{32} \quad \lambda_{y32} \]
\[ y_{33} \quad \lambda_{y33} \]
\[ y_{41} \quad \lambda_{y41} \]
\[ y_{42} \quad \lambda_{y42} \]
\[ y_{43} \quad \lambda_{y43} \]
\[ y_{44} \quad \lambda_{y44} \]
\[ y_{45} \quad \lambda_{y45} \]

Source: own elaboration.

In a similar manner, the $Q^2$ and $q^2$ values of the conversion decision to organic farming (CONV) were calculated from the OLS structural model that connected CONV with its two predictor constructs: BI and PBC. The PLS blindfolding procedure was also applied to calculate the $Q^2$ and $q^2$ values of ATT, SN and PBC which can be obtained from the set of salient beliefs: bsoe, nbmc and cbpc, respectively (see Figure 7.3 for a review). Chapter 9 provides the results of PLS-SEM estimation of the TPB model.
8 Farmer survey: Descriptive analysis

8.1 Introduction

This chapter provides and discusses the primary results obtained from the farmer survey. The discussion begins with a section outlining the socio-demographic characteristics of the interviewed farmers of FFV. This section also outlines the farm characteristics. Second, results on the farmers’ current practices on their farms are provided. This section in particular gives an emphasis to whether farmers employ any type of non-chemical and organic practices to maintain soil fertility and pest control on their farms. The third section of this chapter explores the general attitudes of farmers about the different aspects of organic farming. Thus, this chapter provides a general overview over the respondents’ personal and contextual features. The results of this chapter are useful for deepening the understanding of farmers’ attitudes towards and intention to convert their FFV farms to organic farming within the next five years, as it is presented and discussed through the results of the TPB model in Chapter 9.

8.2 Farmers and farm characteristics

For understanding the key characteristics of the interviewed Syrian farmers of FFV, an analysis of descriptive statistics covering several socio-demographic and farm attributes was carried out. Farmers and farm characteristics are presented in Table 8.1. This table shows that 262 of interviewed farmers were males while only four were females. This huge difference can be explained as the profession of farming in many countries is dominated by males (e.g. Best 2008: 98, Farnworth and Hutchings 2009: 18ff, Subrahmanyeswari and Chander 2011: 13). The ratio can also be confirmed through the census performed by the Syrian Central Bureau of Statistics (2004) whereby about 96% of farms in Syria were hold by male farmers (CBS 2004, Al-Hasan and Al-Noaimy 2007: 10). Moreover, the Syrian inheritance law of properties discriminates between male and female children. The inherited property of a male child would be twice as much as the inherited property of a female child. This law is derived from Islamic religion and linked to the fact that in most cases men are responsible for earning the livelihood for their households, while women are less likely to have an own income. Nevertheless, this view about women has changed and Syrian women are actively involved in many jobs and competing with men in all work areas including agriculture (Al-Qash and Khleifawi 2007: 24).
The age of respondents was between 23 and 88 years, with an average of 50 (±13.5) years. Table 8.1 shows that more than 50% of farmers were in the age group between 40 and 60 years. This is feasible since the majority of Syrian farmers would only hand over their land properties into the second generation of the family (mainly to male children), when they are getting very old. This might also explain why in this survey only 11 farmers were older than 75 years and only 12 farmers younger than 30 years old. In correspondence to farmers’ age categories, farmer’s experience in farming had a mean value of 28.4 (±13.9) years. The older the farmers were, the more experience in farming they had. Table 8.1 shows that about 50% of respondents had at least 30 years of experience in farming and approximately 22% of farmers indicated an experience between 20 to 29 years. The last category includes about 27% of farmers who indicated an experience of less than 20 years in farming.

In terms of educational level, the results (Table 8.1) show that the majority of respondents had a formal education while only about 8% of them reported that they had no formal education (although most of them indicated that they were able to read and write). A significant negative correlation between the age of the farmer and the level of the education (r = - 0.243 and p-value =0.000) was found. This reverse relationship suggests that the younger the farmers were, the better the education level they had. This is plausible since the formal education in Syria, over the last 4 decades (before 2011), has been free of charge and compulsory until the age of 15 (ninth-grade school). Table 8.1 further indicates that around 60% of survey respondent had at least a high school level of education. Moreover, about 10% of farmers obtained an intermediate diploma (i.e. two years college after high school). Interestingly, about 34% of interviewed farmers had completed at least a university degree (four years college at least). The high level of education among farmers in the coastal region of Syria (i.e. the research area) can be attributed to the fact that many farmers were involved in some other off-farm works, which usually requires high qualification (such as the works at governmental institutions and non-governmental companies). Nevertheless, the relatively high level of education (at least high school) among farmers in this region may significantly differ from the education level of farmers in some other regions of Syria. For instance, in the Eastern and Northeastern regions of Syria, where the agricultural sector represents the main source of income for the vast majority of farmers, a relatively lower level of high formal education was found (CBS 2004, Al-Hasan and Al-Noaimy 2007: 8ff).
Farmers had on average a household size of 5.5 (±2.3) persons. This is in line with the average size of Syrian households of 5.7 persons as it was depicted by the population census in 2004. However, this value is higher than the average household size of 4.9 persons in the coastal region (CBS 2004). In this survey, in about 60% of farmer households up to five persons lived (this can be viewed as a small household), and 28% of respondents had a family size between 6 and 7 members. The remaining 12% of respondents indicated that they had households with more than 8 persons. A small number of these farmers stated that their households also included their parents and/or families of their children who had not yet moved out. These results can be confirmed by a study of Sweid et al. (2007) who investigated the household types in Syria and their development between 1994 and 2004. They found that about 14.8% of Syrian households (particularly in the rural areas), in addition to the single family nucleus, might include other members whose relationship were through blood or marriage (brothers, children wives and great children, etc.) (Sweid et al. 2007: 10f). Furthermore, the results indicate that there is a significant negative relationship between farmer household size and the level of education (r = - 0.237 and p-value = 0.000), suggesting that farmers with higher level of education are more likely to have a smaller household size compared to those farmers with lower educational level.

Table 8.1: Socio-demographic characteristics of farmers and farm attributes

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Male</td>
<td>262</td>
<td>98.5</td>
</tr>
<tr>
<td><strong>Age at the time of survey (years):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 39</td>
<td>62</td>
<td>23.3</td>
</tr>
<tr>
<td>40 – 49</td>
<td>61</td>
<td>22.9</td>
</tr>
<tr>
<td>50 – 59</td>
<td>73</td>
<td>27.4</td>
</tr>
<tr>
<td>60 and above</td>
<td>70</td>
<td>26.3</td>
</tr>
<tr>
<td><strong>Experience in farming (years):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 19</td>
<td>73</td>
<td>27.4</td>
</tr>
<tr>
<td>20 – 29</td>
<td>59</td>
<td>22.2</td>
</tr>
<tr>
<td>30 – 39</td>
<td>55</td>
<td>20.7</td>
</tr>
<tr>
<td>40 and above</td>
<td>79</td>
<td>29.7</td>
</tr>
<tr>
<td><strong>N=266</strong></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

(continued)
### Farmer survey: Descriptive analysis

#### Characteristic

<table>
<thead>
<tr>
<th>Highest education level completed:</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than elementary level (No formal education)</td>
<td>23</td>
<td>8.6</td>
</tr>
<tr>
<td>Elementary to less than high school</td>
<td>90</td>
<td>33.8</td>
</tr>
<tr>
<td>High school</td>
<td>37</td>
<td>13.9</td>
</tr>
<tr>
<td>Two years college (intermediate diploma)</td>
<td>26</td>
<td>9.8</td>
</tr>
<tr>
<td>University or above (at least 4 years college)</td>
<td>90</td>
<td>33.8</td>
</tr>
</tbody>
</table>

#### Household size (persons): (N=251)

<table>
<thead>
<tr>
<th>Household size (persons)</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 3</td>
<td>33</td>
<td>13.1</td>
</tr>
<tr>
<td>4 – 5</td>
<td>116</td>
<td>46.2</td>
</tr>
<tr>
<td>6 – 7</td>
<td>72</td>
<td>28.7</td>
</tr>
<tr>
<td>8 and above</td>
<td>30</td>
<td>12.0</td>
</tr>
</tbody>
</table>

#### Ratio of income from FFV cultivation from total household income:

<table>
<thead>
<tr>
<th>Ratio of income from FFV cultivation from total household income:</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25 %</td>
<td>75</td>
<td>28.2</td>
</tr>
<tr>
<td>26 – 50 %</td>
<td>76</td>
<td>28.6</td>
</tr>
<tr>
<td>51 – 75 %</td>
<td>49</td>
<td>18.4</td>
</tr>
<tr>
<td>76 – 100 %</td>
<td>66</td>
<td>24.8</td>
</tr>
</tbody>
</table>

#### Farm size (ha): (N=256)

<table>
<thead>
<tr>
<th>Farm size (ha)</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>65</td>
<td>25.4</td>
</tr>
<tr>
<td>1.0 – less than 2</td>
<td>85</td>
<td>33.2</td>
</tr>
<tr>
<td>2.0 – less than 4</td>
<td>61</td>
<td>23.8</td>
</tr>
<tr>
<td>4.0 and above</td>
<td>45</td>
<td>17.6</td>
</tr>
</tbody>
</table>

#### Farm size dedicated for FFV (ha): (N=235)

<table>
<thead>
<tr>
<th>Farm size dedicated for FFV (ha)</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.5</td>
<td>48</td>
<td>20.4</td>
</tr>
<tr>
<td>0.5 – less than 1</td>
<td>72</td>
<td>30.6</td>
</tr>
<tr>
<td>1.0 – less than 2</td>
<td>57</td>
<td>24.3</td>
</tr>
<tr>
<td>2.0 and above</td>
<td>58</td>
<td>24.7</td>
</tr>
</tbody>
</table>

#### Credits for FFV production (long term credits)

<table>
<thead>
<tr>
<th>Credits for FFV production (long term credits)</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>27</td>
<td>10.2</td>
</tr>
<tr>
<td>No</td>
<td>239</td>
<td>89.8</td>
</tr>
</tbody>
</table>

#### Access to governmental subsidies for FFV production

<table>
<thead>
<tr>
<th>Access to governmental subsidies for FFV production</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>154</td>
<td>57.9</td>
</tr>
<tr>
<td>No</td>
<td>112</td>
<td>42.1</td>
</tr>
</tbody>
</table>

#### Working collectively with other farmers to solve farming problems (e.g. production and marketing problems)

<table>
<thead>
<tr>
<th>Working collectively with other farmers to solve farming problems (e.g. production and marketing problems)</th>
<th>Frequency</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>227</td>
<td>85.3</td>
</tr>
<tr>
<td>No</td>
<td>39</td>
<td>14.7</td>
</tr>
</tbody>
</table>

N=266 100

Source: Own data.
With regard to household income obtained from cultivation of FFV, only about 25% of the respondents reported that more than 75% of their household income was gained from FFV cultivation. In contrast, about 28% of farmers indicated that the share of their income from FFV cultivation was less than 25% of their total household income. Between these two categories of income, about 28% and 18% of respondents stated that 26%-50% and 51%-75%, respectively of their household income were obtained from their cultivation of FFV (see Table 8.1). This variation in farmer income from FFV production is feasible, since many farmers (and/or their family members) were involved in some other agricultural activities such as the cultivation of olives, tobaccos and cereals, which were also produced in this region. Another reason for this variation in income can also be attributed to the fact that few farmers had only a small farm size and therefore they were likely to seek some other jobs for ensuring their livelihoods. Moreover, since many of the interviewed farmers possessed high qualifications, they were more likely to find some other (better-paid) off-farm work (e.g. having a job at governmental institutions). This latter case may also justify the significant negative relationship that was found between farmer income from FFV cultivation and their level of education ($r = -0.229$ and $p$-value$= 0.000$). A significant positive relationship was found between farmer income from FFV cultivation and the farm size dedicated for FFV ($r = 0.298$ and $p$-value$= 0.000$). This can implicitly be interpreted as farmers who own bigger farms of FFV, are likely to spend more time in FFV cultivation and thus receive a higher share of their household income from FFV production compared to those farmers who own smaller farms of FFV.

The farm sizes varied considerably from a very small size (less than 1 ha) to a relatively big farms of size 25 ha. On average, interviewed farmers had farms of 2.4 ($\pm3.0$) ha. The area dedicated to the cultivation of FFV had a mean value of 1.6 ($\pm2.5$) ha. However, only 235 out of the 266 interviewed farmers provided information about the area of their farms devoted to FFV production. Thus, the farm size of FFV cultivation might deviate from the numbers mentioned above. The majority of respondents indicated that their farms of FFV were smaller than 2 ha. Some further variation can still be distinguished: 20% of farmers had a relatively small farm size of FFV (less than 0.5 ha) and 31% of them indicated a farm size between 0.5 and less than 1 ha. About 24% of FFV farms were between 1 and less than 2 ha, and 25% had a size of 2 ha and above (see Table 8.1). 4 farmers from the last category had a very large FFV farm with an area more than 10 ha. This pattern of farm size is in line with available official statistics, in which the vast majority of farmers, whose land is located in the coastal
region, have a farm size of less than 2 ha and only few farmers have relatively large farms (CBS 2004). The results are also similar to those of other countries where the majority of FFV farms are relatively small compared with other crops (e.g. UNCTAD 2007, Maertens and Swinnen 2007, Kersting and Wollni 2012).

Further descriptive results of the farmer survey showed that only 10% of farmers indicated that they have received loans for FFV cultivation (mainly long term credits at the early stages of establishing their farms). However, the majority of farmers had obtained short term credits. These loans and credits are usually obtained from the Cooperative Agricultural Bank (CAB) with low interest rates (Abou Ajeeb 2011, MAAR 2012b, NAPC 2015b). About 58% of farmers also indicated that they had received governmental subsidies for FFV cultivation over the past few years. These subsidies can be split into two types: in cash and in kind. In the former type of subsidies, farmers are provided with a specific amount of money per Donum (= 0.1 ha) according to the kind of crops being cultivated. In the latter type, farmers get sold some kinds of agricultural inputs (such as seeds, fertilizers and equipment of modern drip irrigation) with tangible discounts compared to the market prices (MAAR 2012b, NAPC 2015b). During the current war situation in Syria, the government suspended the first type of subsidies from mid-2012 onward, while the second type was still in action as it was stated by many of the interviewed farmers and MAAR experts (Experts at the Citrus Fruit Board, Interviewed farmers, NABC 2015c). About 85% of farmers indicated that they were working collectively with other farmers to solve farming problems, particularly those related to FFV production and marketing problems. Collective work is basically done through semi-governmental farmers’ cooperatives, which are located in different towns in the countryside of Syria. However, many interviewed farmers mentioned that these cooperatives still suffer of poor management, marginal financial and technical resources in addition to the routine at work.

In line with the results that were obtained from the expert interviews with Syrian wholesalers and exporters about the traditional value chain of Syrian FFV (see Chapter 4), the vast majority of interviewed farmers indicated that their FFV products were mainly sold on the wholesale markets in the coastal region. To some extent, farmers were collectively marketing their produce in the wholesale markets of the large Syrian cities like Aleppo and Damascus. About 13% of farmers stated that they also sold a part of their produce through Damman. This means that for a pre-specified amount of money per Donum, farmers sell their produce
(before harvesting) to one of the following stakeholders (other farmers, wholesalers, processors, exporters, etc.). Such practice is widely popular among farmers who are less dependent on agriculture for their household income. Only 7 farmers in this survey (less than 3% of farmers) indicated that they marketed their produce directly to the warehouses of exporters in the region, who usually export FFV to the Arabic region and the Eastern European markets. Few farmers also sold part of their produce directly to consumers, retailers and processors in the coastal region. Interestingly, only 1% of interviewed farmers indicated that they sold their FFV directly to the governmental corporation for storage and marketing of agricultural products (i.e. GEMAAP). Nevertheless, this governmental corporation is by far the largest wholesaler and retail chain in Syria for fresh agricultural products, and many wholesalers in the coastal region are directly trading with this company. This may explain the low rate of farmers who are directly marketing their produce to this corporation (see Table 8.2).

### Table 8.2: Channels for marketing FFV

<table>
<thead>
<tr>
<th>To whom do farmers sell their FFV?</th>
<th>Frequency¹</th>
<th>% of respondents¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesalers</td>
<td>261</td>
<td>98.1</td>
</tr>
<tr>
<td>Selling through Damman (N=265)</td>
<td>34</td>
<td>12.8</td>
</tr>
<tr>
<td>Directly to consumers</td>
<td>13</td>
<td>4.9</td>
</tr>
<tr>
<td>Retailers</td>
<td>13</td>
<td>4.9</td>
</tr>
<tr>
<td>Processors</td>
<td>9</td>
<td>3.4</td>
</tr>
<tr>
<td>Exporters</td>
<td>7</td>
<td>2.6</td>
</tr>
<tr>
<td>Governmental corporation for storage and marketing of agricultural products</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Other ways</td>
<td>1</td>
<td>0.4</td>
</tr>
</tbody>
</table>

¹ N=266. As multiple answers were possible, the total number of observations is more than 266 and the aggregate of percentages is greater than 100.

Source: Own data.
8.3 Farmers’ current practices for maintaining soil fertility and pest control

The results presented in Table 8.3 show that the most important practice for maintaining soil fertility is to apply fertilisers. Almost all respondents indicated the use of fertilisers (organic and/or chemical) for this purpose. Interestingly, 94% of the interviewed farmers used at least one type of organic fertiliser on their farms. The vast majority of farmers in this survey were basically applying livestock manure after composting. Nearly 30% of the farmers used poultry manure. Though farmers also reported the use of green manure, legumes cultivation, intercropping and/or crop rotation, these practices were still not very common among interviewed farmers to maintain soil fertility on their farm (see Table 8.3). With the combination of applying organic manure, about 85% of the interviewed farmers stated that they also applied chemical fertilisers to maintain soil fertility. About 80% of farmers indicated that they had applied chemical fertilisers only in low amounts over the past two years (before 2013), while traditionally their first option was to use livestock manure. The relative high prices of chemical fertilisers and the availability of organic manure may explain the minimum use of chemical fertilisers by farmers. Another explanation of the low use of chemical fertilisers can be that many interviewed farmers perceived the application of chemical inputs in agriculture as detrimental for environment and family health (see Table 8.4).

Table 8.3 further shows that 86% of farmers in this survey applied at least one kind of non-chemical methods for pest control. This was manifested by the widespread application of physical and pheromone traps (69%) together with the use of biological enemies of pests (60%). Moreover, 24% of farmers who detected pest infections in the early stages reported using some other mechanical ways as a main practice for pest control. The most frequently used mechanical way for pest control was collecting the infected fruits and/or cutting the infected parts of plants and then burning it out. That was in addition to the disposal of any host plant for pests on the farms. With respect to weed control, 64% of farmers stated using mechanical weeding ways (such as tillage, mowing and/or manual weeding) as the main practice for the disposal of weeds on their farms. Other non-chemical methods for weed control such as crop rotation and/or intercropping were not prevalent among farmers, since the majority of interviewed farmers had monoculture cultivations (citrus fruit and greenhouse vegetables).
Though many farmers stated that they used non-chemical practices on their farms, about 74% and 66% of farmers indicated using chemical pesticides (as treatment) in the case of intensive pest and weed infections, respectively. Generally speaking, the low use of chemical pesticides among farmers in the coastal regions, particularly those who mainly cultivate citrus fruit, can be viewed as a result of integrated pest management (IPM) projects which were launched at the beginning of 1990s in this region by the MAAR and GCSAR with the support of the FAO. 64% of interviewed farmers had also been participating in the IPM programs, mainly through IPM field schools. Since 1997, the most notable benefit of IPM programs in the coastal region was helping farmers to abandon the most harmful pesticides like organophosphates which had severe negative impacts on the environment, animal and human health. Moreover, IPM programs played a significant role at boosting the existing biological enemies alongside with introducing new biological enemies to combat the common pests of citrus fruit in the coastal region (Citrus Fruit Board 2013).
Seeking to achieve agricultural development in the horticultural sector and to minimise the negative impacts of chemical use on the environment, the MAAR and GCSAR frequently applied farmer field schools (each including between 15 to 25 farmers) as an approach to provide farmers with the knowledge and expertise needed to improve and empower good agricultural practices on the farms. These schools were field and educational based premises where a volunteer farmer provides a part of his farm (usually 0.1 to 1 ha for one year) to the
assigned experts of MAAR and GCSAR for experiment purposes. Those experts then taught farmers in the field schools how to conduct alternative practices that might help them to find efficient solutions for the existing problems they were facing on their own farms. Over the past two decades, many farmer field schools of IPM, specialised in certain crops such as olives, pistachios, wheat, citrus fruit, tomatoes, grapes and greenhouse vegetables, had been applied in different regions of Syria (MAAR 2014c).

During the FAO project (GCP/SYR/011/ITA between 2005 and 2013), which was dedicated to the institutional development of organic agriculture in Syria, MAAR and GCSAR together with the FAO experts of organic farming implemented the concept of organic farmers’ schools in different Syrian governorates. The aim of these schools was to promote organic practices among farmers in an array of crops, for instances cotton, olives, apples, grapes, citrus fruit and greenhouse tomatoes (FAO 2013, MAAR 2015a). Accordingly, such schools can be assumed to help farmers to establish and increase their knowledge about organic practices.

8.4 Farmers’ general attitudes about organic agriculture

Findings from the farmer survey showed that 60% of the farmers in this study had heard about the term ‘organic farming’ through different sources. These sources included their social environment (family, friends, and fellow farmers), organic field schools of MAAR and GCSAR, organic pioneers in the region as well as media reports pertaining to organic agriculture. Farmers’ knowledge about organic farming, however, varied from the basic idea of avoiding the use of chemical inputs in farming to fully understanding what ‘organic farming’ meant according to organic regulations. A significant positive correlation was found between the level of education and the statement of whether farmers had ever heard about the term ‘organic farming’ ($r = 0.294$ and $p$-value = 0.000). Accordingly, farmers with higher education were more likely to have a better knowledge about what exactly the term ‘organic farming’ meant.

In order to be sure that all interviewed farmers did fairly and correctly understand what was meant by the term ‘organic farming’ used in the subsequent sections of the questionnaire, a global definition of certified organic farming according to the EU regulations was orally presented by the interviewers. This definition of certified organic farming was directly given
after farmers had responded to the question whether they had ever heard about the term ‘organic farming’ and their knowledge about it.

At the beginning of the questionnaire section pertaining to the psychometric survey about organic farming and the conversion decision to organic farming, farmers were asked to give their opinions about 27 general attitudinal statements covering different aspects of organic farming. These statements were measured on a five-point Likert scale from 1 = strongly disagree to 5 = strongly agree. Table 8.4 shows farmers’ degrees of agreement with each of the 27 statements. The majority of farmers revealed positive attitudes about the different aspects of organic farming. Thus, farmers rated many statements positively regarding the environmental, health and economic aspects of organic agriculture (see Table 8.4).

Interestingly, the vast majority of interviewed farmers agreed that organic farming is a good alternative for protecting the environment and providing healthy food for family members. Table 8.4 shows, for instance, that all interviewed farmers were concerned about providing healthy food to their families and they perceived organic products as healthier than conventional ones (mean score of 4.86), and 94% of them perceived that using chemical inputs in agriculture have negative impacts on the health of both people and animals (mean score of 4.63). The majority of farmers also perceived organic farming as environmental friendly and supported the statement that organic farmers are living in harmony with nature (mean score of 4.37). Furthermore, 98% of farmers indicated that organic farming can play a significant role at mitigating the environmental problems through reducing the chemical outputs to nature (mean score of 4.70).

Attitudes towards economic and profitability aspects of organic farming were also positively rated, however with smaller mean scores and higher standard deviations than those which were related to the environmental and health consciousness. Thus, about 60% of farmers agreed that organic products can be sold for higher prices compared to conventional products (mean score of 3.63) and 57% of them also perceived organic farming as more profitable than its conventional counterpart (mean score of 3.47). About 59% of farmers indicated that yields in organic farming are not low and that they can be equivalent to the yields of conventional farming. In contrary, 60% of farmers indicated that conversion to organic farming may require high investment costs. This can be understood as many farmers perceived that some of the required inputs for organic farming (particularly organic seeds and organic pesticides)
might be either expensive or even not available in the local market. The availability of organic certification bodies and the costs of inspection and certification are also important factors that may hinder or discourage farmers to convert to organic farming. In this context, the majority of interviewed farmers stated that certification bodies for organic farming were not available in their region. Only about 18% of the farmers perceived the costs of inspection and certification in organic farming as relatively low. In contrast, 30% of farmers viewed those costs to be too high to afford, and the remaining 52% of farmers were uncertain about such costs. The lack of the certification and inspection bodies of organic farming in the research sites might be a reason that many farmers were not well informed about the costs of inspection and certification services.
Table 8.4: Farmers’ general attitudes about organic farming

<table>
<thead>
<tr>
<th>Farmers’ general attitudes about organic farming</th>
<th>Mean</th>
<th>SD</th>
<th>% of farmers agreed with the statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Environment, health and animal-welfare</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic products are healthier for the family</td>
<td>4.86</td>
<td>0.34</td>
<td>100.0</td>
</tr>
<tr>
<td>Organic farming reduces chemical output to the environment</td>
<td>4.70</td>
<td>0.61</td>
<td>98.1</td>
</tr>
<tr>
<td>Use of chemical inputs is negative for health of people and animals</td>
<td>4.63</td>
<td>0.80</td>
<td>94.4</td>
</tr>
<tr>
<td>Organic farmers live more in harmony with nature</td>
<td>4.37</td>
<td>0.76</td>
<td>90.6</td>
</tr>
<tr>
<td>Organic farming gives a positive image to a farm</td>
<td>4.18</td>
<td>0.91</td>
<td>83.8</td>
</tr>
<tr>
<td>Organic farming is a step back to farming of the past</td>
<td>4.07</td>
<td>1.11</td>
<td>82.3</td>
</tr>
<tr>
<td>Use of chemical inputs improves product appearance</td>
<td>3.79</td>
<td>1.26</td>
<td>75.6</td>
</tr>
<tr>
<td>Without using chemical pesticides, high pest infestation can happen</td>
<td>2.88</td>
<td>1.39</td>
<td>40.6</td>
</tr>
<tr>
<td>Use of chemical fertilisers improve product taste</td>
<td>1.67</td>
<td>1.09</td>
<td>10.5</td>
</tr>
<tr>
<td><strong>2 Economic aspects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic products can be sold for higher prices compared to conventional products</td>
<td>3.63</td>
<td>1.21</td>
<td>60.0</td>
</tr>
<tr>
<td>Inputs for organic farming are expensive (seeds, fertilisers and pesticides)</td>
<td>3.61</td>
<td>1.04</td>
<td>51.5</td>
</tr>
<tr>
<td>Organic farming is more profitable than conventional farming</td>
<td>3.47</td>
<td>1.11</td>
<td>57.5</td>
</tr>
<tr>
<td>Conversion into organic farming requires high investment costs</td>
<td>3.46</td>
<td>1.19</td>
<td>59.8</td>
</tr>
<tr>
<td>Organic farming requires high certification and inspection costs</td>
<td>3.15</td>
<td>0.87</td>
<td>29.7</td>
</tr>
<tr>
<td>Organic yields are too low</td>
<td>2.95</td>
<td>1.22</td>
<td>41.7</td>
</tr>
<tr>
<td>Organic farming is too labour intensive</td>
<td>2.90</td>
<td>1.24</td>
<td>43.2</td>
</tr>
<tr>
<td>Inputs for organic farming are available (seeds, fertilisers and pesticides)</td>
<td>2.55</td>
<td>1.21</td>
<td>29.3</td>
</tr>
<tr>
<td><strong>3 Market prospects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtaining information about export markets of organic products is difficult</td>
<td>3.65</td>
<td>1.11</td>
<td>67.5</td>
</tr>
<tr>
<td>It is hard to find business buyers (e.g. wholesalers) who pay higher prices for organic products</td>
<td>3.56</td>
<td>1.19</td>
<td>60.2</td>
</tr>
<tr>
<td>Local consumers would be willing to pay higher prices for organic products</td>
<td>3.25</td>
<td>1.25</td>
<td>57.1</td>
</tr>
<tr>
<td>Local markets for organic products are available</td>
<td>1.88</td>
<td>1.12</td>
<td>14.7</td>
</tr>
<tr>
<td><strong>4 Governmental role</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governmental support to organic farming is important</td>
<td>4.76</td>
<td>0.59</td>
<td>79.4</td>
</tr>
<tr>
<td>MAAR programs for organic farming are not sufficient</td>
<td>4.05</td>
<td>1.22</td>
<td>79.7</td>
</tr>
<tr>
<td>There is a lack of subsidies for organic farming</td>
<td>3.98</td>
<td>1.52</td>
<td>77.1</td>
</tr>
<tr>
<td>Organic certification bodies are available</td>
<td>1.73</td>
<td>1.11</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>5 Access to information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtaining information regarding organic farming is difficult</td>
<td>2.39</td>
<td>1.28</td>
<td>28.2</td>
</tr>
<tr>
<td>Obtaining consulting and advices regarding organic farming is difficult</td>
<td>2.28</td>
<td>1.13</td>
<td>22.6</td>
</tr>
</tbody>
</table>

Note: All statements are measured on five point Likert scale: 1 = Strongly disagree to 5 = Strongly agree with the statement. N = 266.
Source: Own data.
Market availability for organic products is also an essential factor that motivates or impedes farmers to convert their farms to organic agriculture. Though about 57% of farmers were convinced that local consumers would be willing to pay a price premium for organic products, only 15% of farmers perceived that local markets for organic products were available to some extent in the two largest metropolitan cities in Syria (Aleppo and Damascus). This is feasible, since Aleppo and Damascus are the major local markets for the FFV produced in the coastal region of Syria. This result is in line with a study of NAPC (2008) which indicated that many consumers in Lattakia and the major metropolitan cities of Syria were willing to pay a price premium for Baldi products (i.e. goods which are traditionally produced in the rural areas without using chemical fertilisers and pesticides) (NAPC 2008). More than 60% of farmers in this survey also agreed to the statement that it is hard to find business buyers (wholesalers, processors or exporters) who are willing to pay higher prices for organic products. Though the majority of farmers indicated that it is not difficult to obtain information and consulting regarding organic farming, about 68% of farmers perceived that obtaining information about and/or having access to export markets of organic products is relatively difficult. The lack of information about the organic market potential (either in the local or export markets) may to some extent explain the relative negative rating of the statements related to market prospects of organic products (see Table 8.4).

The governmental initiatives had so far played a substantial role in the development projects of the Syrian agricultural sector over the past four decades. Therefore, it is not surprising that the majority of interviewed farmers perceived the governmental support of organic farming as the main driver that may encourage and facilitate the development of the organic sector in Syria (mean score of 4.76). Though MAAR was successful in encouraging organic farming in some crops such as cotton and olives (which are export market oriented), about 80% of FFV farmers in this survey indicated that MAAR programmes are still not sufficient for promoting organic farming among FFV farmers. This can be confirmed by the lack of governmental subsidies available for organic farming, the lack of national certification bodies and the lack of business buyers who are willing to pay a price premium for organic products.
9 Farmer survey: TPB model results

9.1 Introduction

In the previous chapter, farmers’ attitudes towards organic farming were addressed in more general terms, whereas in this chapter the reasoned action approach was utilised. The approach focuses on attitudes that are compatible with a particular behaviour (i.e. conversion to organic production of FFV) in terms of target, action, context, and time elements known as principle of compatibility (Ajzen 2005: 85ff, Ajzen and Fishbein 2005: 182f). In the present study the four elements of the principle of compatibility were explicitly identified as follows: the action was defined as ‘producing fruit and vegetables organically’, the target was ‘organic fruit and vegetables’, the context was ‘the specific farm’ and the time frame was set as ‘five years’. The time frame of five years was feasible since the behaviour under investigation was the adoption of a new technique (i.e. conversion to organic production of FFV) which might require a longer time period to be performed (for details see Chapter 5).

This chapter is organised as follows: the first section provides the results of the TPB model of Syrian farmers towards producing FFV organically within the next five years. In this section the expectancy-value models of belief-based measures of behavioural intention are investigated. Then the separate and combined effects of the direct determinants of behavioural intention (attitudes, subjective norms and perceived behavioural control) are presented. The third section of this chapter is dedicated to the PLS-SEM results of the TPB model. In this section, a further discussion of the simultaneous direct and indirect effects of the set of salient beliefs, attitudes, subjective norms, and perceived behavioural control on behavioural intention and behaviour are given.

9.2 TPB model of FFV farmers

The TPB model for the adoption of organic FFV by Syrian farmers within the next five years is presented in Figure 9.1. This figure provides a detailed description of the components of the TPB model which were used in the current study. All observed variables of the TPB components were specified according to the abovementioned principle of compatibility. The first step to be considered before presenting and discussing the results of the TPB model was to check the internal consistency of the observed variables, which were used to measure each
of the TPB constructs. This procedure provides the initial examination of the adequacy of the observed variables prior to the model development. High internal consistency among the observed variables (i.e. indicators or items) of each construct is preferred. This is particularly important for the endogenous latent constructs (i.e. behaviour, behavioural intention and its direct determinants) while the exogenous latent constructs (i.e. the set of salient beliefs or belief-based measures) might have a relatively lower internal consistency. This is feasible because belief-based measures addressed different aspects that represent the cognitive foundation of the direct determinants of behavioural intention and behaviour under investigation (Ajzen 2006: 5, Fishbein and Ajzen 2010: 99).
Figure 9.1: Model of the theory of planned behaviour for the adoption of organic fruit and vegetables by Syrian farmers within the next five years

**Background Factors** include:
- Farmers’ characteristics
- Farm characteristics
- General attitudes about organic farming
- Farmers’ current practices on the farm
- Past experiences
- Knowledge

- Strength of beliefs on the likely outcomes from adoption of organic fruit and vegetable production ($bs_t$)
- Evaluation of outcomes from adoption of organic fruit and vegetable production ($oe_t$)
- Strength of beliefs on the social expectations from adoption of organic fruit and vegetable production ($nb_t$)
- Motivation to comply with social expectations regarding adoption of organic fruit and vegetable production ($mc_t$)
- Strength of beliefs on the factors that may support or impede adoption of organic fruit and vegetable production ($cb_t$)
- Power of control of the factors that may support or impede adoption of organic fruit and vegetable production ($pc_t$)

- Attitudes towards adoption of organic fruit and vegetable production ($ATT$)
- Subjective norm towards adoption of organic fruit and vegetable production ($SN$)
- Behavioural intention to adopt organic fruit and vegetable production ($BI$)
- Adoption of organic fruit and vegetable production ($CONV$)

Adopted from Fishbein and Ajzen 2010: 22
The first examination of the internal consistency of the TPB constructs was performed by means of Cronbach’s alpha. Cronbach’s alpha is generally the most widely used measure to assess the reliability of entire scales. The acceptable limit of Cronbach’s alpha is 0.70, however in exploratory research, this threshold can be decreased to 0.60 (Hair et al. 2010: 125). Table 9.1 shows Cronbach’s alpha for the TPB constructs. Most of the TPB constructs achieved acceptable levels of Cronbach’s alpha (above 0.70), Cronbach’s alpha of 0.67 for normative beliefs is also acceptable since the current study was exploratory research. The only exception is the scale of subjective norms for which Cronbach’s alpha was 0.52 suggesting a poor reliability of this construct. This problem was however overcome through disregarding the third item of this scale which showed low correlations with the other two items used to measure this construct. Disregarding such items from the measurement model of the TPB constructs, in order to improve the reliability and validity of the model, is further discussed in the third section of this chapter.

Table 9.1: Cronbach’s alpha for the TPB survey results

<table>
<thead>
<tr>
<th>Latent construct</th>
<th>Definition</th>
<th>Observed measures for each latent construct</th>
<th>Cronbach’s alpha based on standardised items</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONV</td>
<td>Adoption of organic FFV production on the farm within the next five years.</td>
<td>2 items</td>
<td>0.806</td>
</tr>
<tr>
<td>BI</td>
<td>Behavioural intention to adopt organic FFV production on the farm within the next five years.</td>
<td>2 items</td>
<td>0.805</td>
</tr>
<tr>
<td>ATT</td>
<td>Attitudes towards the adoption of organic FFV production on the farm within the next five years.</td>
<td>4 items</td>
<td>0.790</td>
</tr>
<tr>
<td>PBC</td>
<td>Perceived behavioural control to adopt organic production on the farm within the next five years.</td>
<td>6 items</td>
<td>0.795</td>
</tr>
<tr>
<td>SN</td>
<td>Subjective norms towards the adoption of organic FFV production on the farm within the next five years.</td>
<td>3 items</td>
<td>0.522</td>
</tr>
<tr>
<td>bsoe</td>
<td>Behavioural beliefs regarding adoption of organic FFV production on the farm within the next five years.</td>
<td>9 items</td>
<td>0.803</td>
</tr>
<tr>
<td>cbpc</td>
<td>Control beliefs on the factors that may support or impede adoption of organic FFV production on the farm within the next five years.</td>
<td>8 items</td>
<td>0.830</td>
</tr>
<tr>
<td>nbmc</td>
<td>Normative beliefs regarding adoption of organic FFV production on the farm within the next five years.</td>
<td>7 items</td>
<td>0.669</td>
</tr>
</tbody>
</table>

Note: The set of salient beliefs (bsoe, cbpc, and nbmc) are calculated through the expectancy-value model.

Source: Own data.
It should be noted that the value of Cronbach’s alpha relates positively to the number of items being used to measure each latent construct. Cronbach’s alpha further hypothesises that all measures of a given construct should be equally reliable and they should have equal weights (Hair et al. 2010: 125ff). This is however more likely not the case for the psychometric constructs which were used in the current study such as the set of salient beliefs. To cope with this problem, the composite reliability will therefore be used instead of Cronbach’s alpha as the appropriate measure for internal consistency. Construct’s composite reliability is presented below in this chapter within the context of PLS-SEM of the TPB model.

9.2.1 Belief-based measures of behavioural intention: Expectancy-value model

Salient beliefs generally represent the cognitive foundation an individual holds about an object or behaviour in question (Fishbein and Ajzen 2010: 99). Thus, belief-based measures (i.e. behavioural, normative, and control beliefs) are considered to be more accurate measures of the behavioural intention than the direct predictors (i.e. attitudes, subjective norms and perceived behavioural control), because belief-based measures can reveal why people hold certain attitudes, subjective norms or control perceptions (Fishbein and Ajzen 2010: 99; see Chapter 5 for an overview). Therefore, investigating this set of salient beliefs would further help to understand the cognitive process that underlies farmers’ decisions to convert their farms to organic FFV production.

In the present study, belief-based measures of behavioural intention were computed through the expectancy-value model (Peak 1955, Fishbein 1963, 1967a). A comprehensive overview of the expectancy-value model is given in Chapter 5. Tables 9.2, 9.3 and 9.4 exhibit the expectancy-value models of behavioural, normative and control beliefs and their relationships with attitudes, subjective norms and perceived behavioural control, respectively. These tables also depict the relationships among the abovementioned salient beliefs and the behavioural intention to convert to organic FFV as well as with the conversion to organic FFV production by Syrian farmers within the next five years.

9.2.1.1 Expectancy-value model of behavioural beliefs

Following the expectancy-value model (Peak 1955, Fishbein 1963, 1967a), the behavioural beliefs were calculated for each belief statement as the multiplicative composition of the
perceived likelihood that carrying out that behaviour will lead to a particular outcome and the evaluation of that outcome. The obtained multiplicative compositions of behavioural belief strength and outcome evaluation play a major role in determining the overall attitudes towards the behaviour under consideration, as neither belief strength nor outcome evaluation can solely be a good predictor of those attitudes (Fishbein and Ajzen 2010: 117). Table 9.2 presents the expectancy-value model of the belief-based measure of attitudes towards the adoption of organic FFV production within the next five years. Thus, each of the 9 behavioural beliefs was determined by multiplying belief strengths ($bs_i$) about the likely outcomes from adoption of organic FFV production with the evaluation of these particular outcomes ($oe_i$). Then, the obtained mean scores of expectancy-value products were aggregated over the total number of accessible behavioural beliefs.

The results of the expectancy-value model of the belief-based measure of attitudes show that behavioural beliefs about the likely consequences of the adoption of organic FFV production had an important role in the formation of attitudes towards this behaviour. In the sixth column of Table 9.2, the mean values of the multiplicative compositions of behavioural beliefs are presented. Almost all of these multiplicative compositions were positively rated and on average ($\sum bs_i \times oe_i)/i$ was +6.44 on a scale that ranged from -10 to +10 suggesting positive influence of behavioural beliefs at determining the attitudes towards producing organic FFV within the next five years. This can also be confirmed by the significant correlations among the behavioural belief statements and the observed measures\(^41\) of attitudes, behavioural intention, and conversion to organic FFV production (see Table 9.2). By regressing the direct measure of attitudes on the set of behavioural beliefs, the influence of behavioural beliefs on the formation of attitudes can be further understood. Increasing farm income, avoiding risk, providing family with healthy food, protecting the environment and improving soil fertility were the most important behavioural beliefs that played a major role for determining the attitudes towards the adoption of organic FFV production (see Table 9.2).

\(^{41}\) The factor scores, which were obtained from principle component analysis solution of the four attitudinal variables, were used to represent the direct measure of attitudes. In the same manner, the factor scores of behavioural intention and behaviour were obtained from their observed variables.
9.2.1.2 Expectancy-value model of control beliefs

The expectancy-value model was also used to calculate the control beliefs. Accordingly, the belief-based measure of perceived behavioural control was determined by weighting control belief strength with power of control and summing over the total number of accessible control beliefs (see Table 9.3). Control belief strength \((cb_i)\) represents the subjective probability that the control factor \((i)\) is present, and power of control \((pc_i)\) is the degree to which factor \((i)\) facilitates or impedes performance of a particular behaviour. Table 9.3 illustrates the expectancy-value model of the belief-based measure of perceived behavioural control towards the adoption of organic FFV production within the next five years. In this context, each of the control beliefs was determined by multiplying strength of control belief on the factors that may support or impede the adoption of organic FFV production with the power of control these factors have over producing organic FFV. These expectancy-value products were then summed over the total number of accessible control beliefs.

The multiplicative compositions of the control beliefs are exhibited in the sixth column of Table 9.3. The expectancy-value model demonstrated that all these multiplicative compositions were positively gauged with a mean score \(\frac{\sum cb_i \times pc_i}{i} = +5.09\) on a scale that ranged from -10 to +10. This positive mean value indicates that the set of control beliefs had an affirmative impact at determining the perceived behavioural control towards producing organic FFV within the next five years. Table 9.3 also shows that significant correlations were found among the set of control belief on the one hand and the observed measures\(^{42}\) of perceived behavioural control, behavioural intention and conversion to organic FFV production, on the other hand. Moreover, the obtained regression coefficients of the set of control beliefs provide further evidence about the prominence of control beliefs on the formation of perceived behavioural control. The last two columns of Table 9.3 indicate that FFV cultivation with organic instead of synthetic fertilisers, suitability of soil fertility on the farm, working collectively with other farmers to solve farming problems, and the possibility to get access to information about organic farming were the most important control factors that deem to have a leading role in the formation of perceived behavioural control towards the adoption of organic FFV production.

\(^{42}\) The factor scores, which were obtained from principle component analysis solution of the six statements of perceived behavioural control, were used to represent the direct measure of perceived behavioural control. In the same manner, the factor scores of behavioural intention and behaviour were obtained from their observed variables.
9.2.1.3 Expectancy-value model of normative beliefs

Parallel to the expectancy-value models of belief-based measures of attitudes and perceived behavioural control, subjective norms are assumed to follow this model as a function of normative beliefs, which represent perceptions of respected normative referents’ preferences about whether one should or should not perform a specific behaviour (Fishbein and Ajzen 2010: 130f, see also Chapter 5 for an overview). Accordingly, the belief-based measure of subjective norms is obtained from multiplying strength of normative belief with motivation to comply with the normative referents (i.e. important others such as family, friends, etc.). In the present study, strength of normative belief \( (nb_i) \) referred to farmer’s subjective probability that a specific normative referent \( (i) \) wants her or him to convert the farm to organic FFV production. Motivation to comply \( (mc_i) \) symbolised the degree to which that farmer complies with the perceived expectation of the normative referent \( (i) \). Table 9.4 indicates the results of the expectancy-value model of belief-based measure of subjective norms towards the adoption of organic FFV production within the next five years. Accordingly, each of the normative beliefs was calculated by multiplying strength of normative beliefs on the social expectations from adoption of organic fruit and vegetable production \( (nb_i) \) with the motivation to comply with the social expectations regarding this behaviour \( (mc_i) \). Consequently, the obtained expectancy-value products were added to the total number of accessible normative beliefs.

Table 9.4 shows that 6 out of the 7 multiplicative combinations of normative beliefs were positively evaluated. The obtained mean value score \( (\sum nb_i \times mc_i)/i = +3.52 \) on a scale that ranged from -10 to +10 show a positive effect of the normative beliefs on the subjective norms towards producing organic FFV within the next five years. Columns 7, 8, and 9 of Table 9.4 further demonstrate the importance of normative beliefs on its successive constructs within the TPB framework. Thus, almost all correlation coefficients were found to be significant among the set of normative belief on the one hand and the observed measures\(^{43}\) of subjective norms, behavioural intention and conversion to organic FFV production on the other hand. By the scrutiny of regression coefficients in the last two columns of Table 9.4, the influence of normative beliefs on the formation of subjective norms can be better understood. MAAR and GCSAR agronomists, family, fellow farmers and friends, and information events/field days were found as the most important normative referents that play a significant role in

\(^{43}\) The factor scores, which were obtained from principle component analysis solution of the three statements of subjective norms, were used to represent the direct measure of subjective norms. In the same manner, the factor scores of behavioural intention and behaviour were obtained from their observed variables.
the determination of subjective norms towards the adoption of organic FFV production (see Table 9.4).

Finally, it should be stated that those regression coefficients, which were found to be insignificant in the last two columns of Tables 9.2, 9.3 and 9.4, should be cautiously interpreted, since mutual correlations among the observed variables of each set of beliefs (i.e. behavioural, control and normative beliefs) should not be overlooked. In the third section of this chapter, the PLS-SEM solution of the TPB model provides a comprehensive overview of how to cope with such an issue.
Table 9.2: Expectancy-value model of behavioural beliefs of farmers towards producing organic fruit and vegetables within the next five years on their own farms

<table>
<thead>
<tr>
<th>Behavioural beliefs</th>
<th>Behavioural belief strength ($bs_i$)</th>
<th>Outcome evaluation ($oe_i$)</th>
<th>Behavioural belief strength × outcome evaluation ($bs_i \times oe_i$)</th>
<th>Correlation of $bs_i \times oe_i$ with ATT</th>
<th>Regression coefficients of $bs_i \times oe_i$ with ATT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td><strong>SD</strong></td>
<td><strong>Mean</strong></td>
<td><strong>SD</strong></td>
<td><strong>Mean</strong></td>
<td><strong>SD</strong></td>
</tr>
<tr>
<td>If you produce organic fruit and vegetables you will save on production costs</td>
<td>3.97 0.94</td>
<td>1.83 0.43</td>
<td>7.38 2.55</td>
<td>0.340**</td>
<td>0.230** 0.284** 0.009</td>
</tr>
<tr>
<td>If you produce organic fruit and vegetables you will receive higher prices (N=265)</td>
<td>3.78 1.02</td>
<td>1.83 0.47</td>
<td>7.01 2.69</td>
<td>0.415**</td>
<td>0.359** 0.369** 0.047</td>
</tr>
<tr>
<td>If you produce organic fruit and vegetables you will increase farm income</td>
<td>3.59 1.03</td>
<td>1.86 0.42</td>
<td>6.78 2.54</td>
<td>0.478**</td>
<td>0.326** 0.360** 0.252</td>
</tr>
<tr>
<td>If you produce organic fruit and vegetables you will get opportunities to reach other markets (e.g. markets with higher prices; markets with better prospects compared to the current market)</td>
<td>3.70 1.04</td>
<td>1.83 0.54</td>
<td>6.86 2.81</td>
<td>0.312**</td>
<td>0.276** 0.252** -0.011</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm is a modern way of farming (N=265)</td>
<td>3.04 1.30</td>
<td>1.50 0.88</td>
<td>4.63 3.45</td>
<td>0.220**</td>
<td>0.148 0.136 0.049</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm can improve soil fertility and soil structure</td>
<td>4.51 0.67</td>
<td>1.91 0.30</td>
<td>8.66 1.99</td>
<td>0.362**</td>
<td>0.286 0.301 0.141</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm will protect the environment</td>
<td>4.76 0.48</td>
<td>1.85 0.51</td>
<td>8.88 2.69</td>
<td>0.463**</td>
<td>0.490 0.453 0.182</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm will provide healthy food for your family</td>
<td>4.83 0.38</td>
<td>1.94 0.32</td>
<td>9.38 1.81</td>
<td>0.427**</td>
<td>0.457 0.427 0.167</td>
</tr>
<tr>
<td>For you, it would be risky to convert to organic fruit and vegetable production (bsoeT_9r)</td>
<td>2.49 1.07</td>
<td>-0.60 1.33</td>
<td>-1.70 3.62</td>
<td>-0.171**</td>
<td>-0.187 -0.102 0.156</td>
</tr>
<tr>
<td>$ATT \propto \sum bs_i \times oe_i$</td>
<td>34.67 7.94</td>
<td>13.96 5.21</td>
<td>+57.99 14.27</td>
<td>0.598**</td>
<td>0.486 0.514 **</td>
</tr>
<tr>
<td>Average of belief-based measure of attitudes (ATT) on a scale -10 to +10: $\left( \sum bs_i \times oe_i \right)/t$</td>
<td>3.85 0.88</td>
<td>1.55 0.58</td>
<td>+6.44 1.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N = 266, strength of behavioural belief ($bs_i$) is scored from 1 to 5 and outcome evaluation ($oe_i$) from -2 to +2; thus the multiplicative product of behavioural belief strength and outcome evaluation ($bs_i \times oe_i$) may range from -10 to +10, and ATT, BI, CONV are factor scores obtained from the standardised direct measures of attitudes towards, behavioural intention to adopt, and adoption of organic FFV production within the next five years, respectively. All statements of behavioural beliefs were defined according to the abovementioned principle of compatibility.

* Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).

Source: Own data.

193
Table 9.3: Expectancy-value model of control beliefs of farmers towards producing organic fruit and vegetables within the next five years

<table>
<thead>
<tr>
<th>Control beliefs</th>
<th>Control belief strength ($c_b_i$)</th>
<th>Power of control ($p_c_i$)</th>
<th>Control belief strength × power of control ($c_b_i × p_c_i$)</th>
<th>Correlation of $c_b_i × p_c_i$ with PBC</th>
<th>BI</th>
<th>CONV</th>
<th>PBC Coef.</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>You have the possibility to get access to information sources about organic farming</td>
<td>3.85 1.00</td>
<td>1.47 0.75</td>
<td>5.93 3.50</td>
<td>0.425**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil fertility on your farm is suitable for fruit and vegetable cultivation</td>
<td>3.82 1.03</td>
<td>1.47 0.76</td>
<td>5.82 3.54</td>
<td>0.424**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The size of your farm is big enough for making the cultivation of fruit and vegetables economically viable</td>
<td>3.47 1.13</td>
<td>1.15 1.05</td>
<td>4.07 4.21</td>
<td>0.305**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You have the possibility to cultivate fruit and vegetables with organic instead of chemical fertilisers</td>
<td>4.15 0.92</td>
<td>1.49 0.74</td>
<td>6.62 3.54</td>
<td>0.449**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You have the means to afford the certification and inspection costs of organic farming (N=265)</td>
<td>2.65 1.06</td>
<td>1.44 0.81</td>
<td>3.91 2.77</td>
<td>0.351**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You have access to credits for fruit and vegetable cultivation (N=265)</td>
<td>1.86 1.07</td>
<td>1.32 1.01</td>
<td>2.42 2.40</td>
<td>0.219**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You have access to governmental subsidies for fruit and vegetable cultivation</td>
<td>3.12 1.47</td>
<td>1.58 0.79</td>
<td>5.15 3.74</td>
<td>0.360**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You work collectively with other farmers to solve farming problems (production and marketing problems)</td>
<td>4.24 1.09</td>
<td>1.47 0.92</td>
<td>6.94 3.98</td>
<td>0.461**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$PBC \propto \sum c_b_i \times p_c_i$</td>
<td>27.16 8.78</td>
<td>11.38 6.83</td>
<td>$+40.75$ 18.91</td>
<td>0.560**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=266. Strength of control belief ($c_b_i$) is scored from 1 to 5 and power of control ($p_c_i$) from -2 to 2; thus the multiplicative product of control belief strength and power of control ($c_b_i × p_c_i$) may range from -10 to +10, and PBC, BI, CONV are factor scores obtained from the standardised direct measures of perceived behavioural control towards, behavioural intention to adopt, and adoption of organic FFV production within the next five years, respectively. All statements of control beliefs were defined according to the abovementioned principle of compatibility.

For the purpose of calculating regression coefficients in the last two columns of this Table, $c_b_i$ and $p_c_i$ were scored from 1 to 5, thus their products ($c_b_i × p_c_i$) may range from 1 to 25.

* Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).

Source: Own data.
### Table 9.4: Expectancy-value model of normative beliefs of farmers towards producing organic fruit and vegetables within the next five years

<table>
<thead>
<tr>
<th>Normative referents</th>
<th>Normative belief strength ($nb_i$)</th>
<th>Motivation to comply with normative referent ($mc_i$)</th>
<th>Correlation of $nb_i \times mc_i$ with $SB\times M$</th>
<th>Regression coefficients of $nb_i \times mc_i$ with $SB\times M$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Your family</td>
<td>0.70</td>
<td>1.20</td>
<td>2.79</td>
<td>1.32</td>
</tr>
<tr>
<td>Other farmers (fellow farmers and friends)</td>
<td>0.76</td>
<td>1.05</td>
<td>3.11</td>
<td>1.03</td>
</tr>
<tr>
<td>MAAR and GCSAR agronomists</td>
<td>1.27</td>
<td>0.97</td>
<td>3.78</td>
<td>1.19</td>
</tr>
<tr>
<td>Information events/field days</td>
<td>0.71</td>
<td>1.33</td>
<td>2.92</td>
<td>1.44</td>
</tr>
<tr>
<td>Agricultural press and news</td>
<td>0.99</td>
<td>1.09</td>
<td>3.42</td>
<td>1.31</td>
</tr>
<tr>
<td>Governmental support programs</td>
<td>1.44</td>
<td>0.96</td>
<td>3.91</td>
<td>1.35</td>
</tr>
<tr>
<td>Farm advisors (in case you have) (N=259)</td>
<td>-0.96</td>
<td>1.49</td>
<td>1.93</td>
<td>1.39</td>
</tr>
<tr>
<td>$SN \propto \sum nb_i \times mc_i$</td>
<td>4.91</td>
<td>8.09</td>
<td>21.86</td>
<td>9.04</td>
</tr>
</tbody>
</table>

Average of belief-based measure of subjective norm (SN) on scale -10 to +10: $(\sum (nb_i \times mc_i)/i)$

|                                           | Mean  | SD    | Mean  | SD    | 3.52 | 2.19 |

Note: N=266, strength of normative belief ($nb_i$) is scored from -2 to +2 and motivation to comply with normative referent ($mc_i$) from 1 to 5; thus the multiplicative product of normative belief strength and motivation to comply product ($nb_i \times mc_i$) may range from -10 to +10, and SN, BI, CONV are factor scores obtained from the standardised direct measures of subjective norms towards, behavioural intention to adopt and adoption of organic FFV production within the next five years, respectively.

All statements of normative beliefs were defined according to the abovementioned principle of compatibility.

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Source: Own data
9.2.2 Direct measures of behavioural intention and behaviour

In the context of the TPB conceptualisation, attitudes, subjective norms and perceived behavioural control are considered to be equally important in the prediction of an individual’s intention to perform a specific behaviour. However, depending on the individual and the situation, these three proximal predictors might have different influences on the behavioural intention. Thus, one or two of these three constructs might be more important to specific individuals than others (Fishbein and Ajzen 2010: 180, see Chapter 5). While in the previous section the role of salient beliefs on the formation of attitudes, subjective norms, and the perceived behavioural control was presented, in this section, the separate and combined effects of attitudes, subjective norms, and perceived behavioural control on the intention of Syrian farmers to adopt organic FFV production are provided.

9.2.2.1 Separate effects of direct measures of behavioural intention and behaviour

Before examining the entire TPB model by means of PLS-SEM, it was important to investigate of how well attitudes, subjective norms and perceived behavioural control solely correlate with and predict the behavioural intention. Tables 9.5, 9.6 and 9.7 demonstrate the correlation and regression coefficients of the relationships among the behavioural intention to produce organic FFV by Syrian farmers and their attitudes, subjective norms and perceived behavioural control towards the adoption of organic FFV production within the next five years, respectively. These tables also depict the relationship among those direct components of behavioural intention and the conversion to organic production of FFV within the next five years.

9.2.2.1.1 Separate effects of attitudes on behavioural intention

Results in Table 9.5 provide evidence that farmers generally drew positive attitudes towards the adoption of organic FFV production within the next five years, with a mean value of +1.00 on a scale that ranged from -2 to +2. With respect to the relationship between attitudes and behavioural intention, the results articulated significant correlations among all observed indicators of attitudes on the one hand and the behavioural intention on the other (r, > 0.47).
Table 9.5: Direct measures of farmers’ attitudes towards producing organic fruit and vegetables within the next five years on their own farms

<table>
<thead>
<tr>
<th>Attitudes</th>
<th>( ATT_i )</th>
<th>Correlation of ( ATT_i ) with</th>
<th>Regression coefficients of ( ATT_i ) with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>BI</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm within the next five years would be a good idea (Att_1)</td>
<td>1.23</td>
<td>0.74</td>
<td>0.541**</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm within the next five years would be possible (Att_2)</td>
<td>1.14</td>
<td>0.82</td>
<td>0.671**</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm within the next five years would be more profitable than the conventional farming (Att_3)</td>
<td>0.74</td>
<td>1.00</td>
<td>0.503**</td>
</tr>
<tr>
<td>Producing organic fruit and vegetables on your farm within the next five years would be wise (not foolish) compared to conventional farming (ATT_4T)</td>
<td>0.88</td>
<td>1.12</td>
<td>0.476**</td>
</tr>
<tr>
<td>ATT</td>
<td>0.00</td>
<td>1.00</td>
<td>0.702**</td>
</tr>
<tr>
<td>Average of direct measures of attitudes on scale -2 to +2: ( \sum(Att_i)/i )</td>
<td>1.00</td>
<td>0.72</td>
<td>0.691**</td>
</tr>
</tbody>
</table>

Note: N = 266. Attitudes towards the adoption of organic FFV production are scored from -2 to +2, and ATT, BI, CONV are factor scores obtained from the standardised direct measures of attitudes towards, behavioural intention to adopt, and adoption of organic FFV production within the next five years, respectively. VIF is variance inflation factor.

** Correlation is significant at the 0.01 level (2-tailed).

Source: Own data.

Furthermore, all attitudinal indicators expressed significant regression weights when they were used as the predictors of behavioural intention. However, the magnitudes of those regression weights do not necessarily reflect the real contribution of each of the attitudinal indicators in predicting the behavioural intention. This is feasible since these indicators were highly correlated and they were loading on one factor (i.e. attitudes: ATT). By regressing highly correlated items on a criterion variable, only few of these highly correlated items might receive significant regression weights (Fishbein and Ajzen 2010: 124f). Therefore, to gain a better understanding of the overall separate effect of attitudes on behavioural intention, the behavioural intention was regressed on the factor scores of attitudes rather than on the items that form this factor. In line with the TPB framework, findings in Table 9.5 indicate that there was a strong association between the overall attitudes and behavioural intention to adopt.
organic FFV production. Thus, attitudes had a significant role in predicting the behavioural intention with a regression coefficient of 0.70 significant at p < .001. Accordingly, about 49% of the total variance in the behavioural intention was explained by the attitudes solely. These findings are consistent with several meta-analyses of empirical literature of behavioural intentions in different fields, which found attitudes as a key predictor of behavioural intentions under consideration (e.g. Sheppard et al. 1988, Albarracin et al. 2001, Armitage and Conner 2001, Hagger et al. 2002, McDermott et al. 2015). However, the mean correlations between attitudes and behavioural intentions in those studies ranged from 0.45 to 0.60, while in the present study this correlation reaches 0.70 (see Table 9.5). This superior correlation coefficient between the attitudes and behavioural intention might be explained by the strict commitment with the principle of compatibility in terms of action, target, context, and time frame.

9.2.2.1.2 Separate effects of subjective norms on behavioural intention

With respect to the separate role of subjective norms on the prediction of behavioural intention, Table 9.6 indicates that the interviewed farmers possessed slightly positive subjective norms towards the adoption of organic FFV production within the next five years, with a mean value of +0.62 on a scale that ranged from -2 to +2. The role of family members in supporting farmer’s decision was apparently the most important subjective norm whether farmers decide to adopt organic FFV production. Regarding the relationship between the subjective norms and behavioural intention, likewise with the case of attitudes, significant correlations among the subjective norms’ indicators and the behavioural intention were found. Unlike attitudes, however, the magnitudes of the correlations between subjective norms’ indicators and the behavioural intention were comparatively small (r < 0.40). By regressing subjective norms’ indicators on behavioural intention, two out of the three used indicators demonstrated significant regression weights at p < .001. However, these results should be interpreted with caution since the first and second indicators of subjective norms were highly correlated while their correlations with the third indicator of this construct were relatively low. This suggested disregarding the third indicator from the scale of subjective norms, though this indicator showed a significant regression weight on the behavioural intention (as it is illustrated later in the third section of this chapter). Yet, this indicator was considered when examining the overall separate effect of subjective norms on behavioural intention. In this vein, the behavioural intention was regressed on the factor scores of the three subjective norms.
norms’ items. Findings showed significant correlation and regression coefficients between the overall subjective norms and behavioural intention; however, the magnitude of this relationship ($r = 0.44$) was relatively small in comparison to the magnitude of the relationship between the overall attitudes and behavioural intention. In other words, the overall subjective norms explained about 19% of the total variation in the behavioural intention when it was used as single predictor. A subjective norm mean correlation of 0.44 is slightly higher from the mean correlations between subjective norms and behavioural intentions that were found in different meta-analyses studies, in which the correlation means ranged from 0.34 to 0.42 (e.g. Sheppard et al. 1988, Albarracin et al. 2001, Armitage and Conner 2001, Hagger et al. 2002, Manning 2009, McDermott et al. 2015). Although the subjective norms demonstrated its significance as predictor of behavioural intention, this influence was, however, not significant when considering the entire TPB model as it will depicted below.

Table 9.6: Direct measures of farmers’ subjective norms towards producing organic fruit and vegetables within the next five years on their own farms

<table>
<thead>
<tr>
<th>Subjective norms</th>
<th>$SN_i$</th>
<th>Correlation of $SN_i$ with</th>
<th>Regression coefficients of $SN_i$ with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>BI</td>
</tr>
<tr>
<td>Your family favours the idea that you should produce organic fruit and vegetables on your farm within the next five years (sn_1)</td>
<td>0.98</td>
<td>0.96</td>
<td>0.399**</td>
</tr>
<tr>
<td>If you are thinking to produce organic fruit and vegetables on your farm within the next five years, would your best friends and colleague farmers favour it? (sn_2)</td>
<td>0.57</td>
<td>0.96</td>
<td>0.220**</td>
</tr>
<tr>
<td>In general, people whose opinion is important to you approve of you producing organic fruit and vegetables on your farm within the next five years (sn_3T) (N=265)</td>
<td>0.31</td>
<td>1.16</td>
<td>0.332**</td>
</tr>
<tr>
<td>SN</td>
<td>0.00</td>
<td>1.00</td>
<td>0.438**</td>
</tr>
<tr>
<td>Average of direct measures of subjective norms on scale -2 to +2: ($\sum(SN_i)/i$)</td>
<td>0.62</td>
<td>0.73</td>
<td>0.444**</td>
</tr>
</tbody>
</table>

Note: N = 266. Subjective norms towards the adoption organic FFV production are scored from -2 to +2, and SN, BI, CONV are factor scores obtained from the standardised direct measures of subjective norms towards, behavioural intention to adopt, and adoption of organic FFV production within the next five years, respectively. VIF is variance inflation factor.

** Correlation is significant at the 0.01 level (2-tailed).

Source: Own data
9.2.2.1.3 Separate effects of perceived behavioural control on behavioural intention and behaviour

Similar to the pattern of attitude results, Table 9.7 shows that farmers had a positive perceived behavioural control over the adoption of organic FFV production within the next five years, with a mean value of +0.94 on a scale that ranged from -2 to +2. The majority of farmers indicated that they have the technical ability and capability of dealing with organic farming on their farm within the next five years. They also demonstrated that they can meet the organic regulations and the amount of work needed for this purpose. Furthermore, the majority of farmers contemplated that organic FFV production will be an important topic for discussion within the next five years. However, only 39% of the farmers indicated that they are able to afford the costs of conversion to organic farming on their farms within the specified period of time, while the majority was either not certain or cannot afford such costs.

Shifting the attention to the relationship between perceived behavioural control and behavioural intention, likewise in the cases of attitudes and subjective norms, the results indicated significant correlations among all observed indicators of perceived behavioural control on the one hand and the behavioural intention on the other hand ($r > 0.18$). Statistically speaking, the magnitudes of these correlation coefficients were between the correlation coefficients of attitudes and those of subjective norms with behavioural intention, respectively. This can also be confirmed by the perceived behavioural control’s mean correlation value of 0.62 which is lower than the attitudes’ mean correlation and higher than the subjective norms’ mean correlation with the behavioural intention (see Tables 9.5 and 9.6). Four out of the six indicators of this construct showed significant regression weights at $p < .01$ when they were used as predictors of behavioural intention (see Table 9.7). However, like in the case of regression weights of the indicators of attitudes and subjective norms, the magnitudes of the regression weights of perceived behavioural control’s indicators should also be interpreted with caution since all indicators were highly correlated among each other and they were loading on one factor (i.e. PBC), therefore such regression weights may not necessarily reflect the actual contribution of each of these indicators at predicting the behavioural intention. To cope with this problem, the overall separate effect of perceived behavioural control on behavioural intention can be better demonstrated by regressing the factor scores of this construct on the behavioural intention. In this context, a strong relationship between the overall perceived behavioural control and behavioural intention was found ($r = 0.63$), indicating that about 39% of the total variance in the behavioural intention
was explained by using perceived behavioural control as a single predictor of the behavioural intention to adopt organic FFV production. These findings are in line with the TPB assumption which posits that perceived behavioural control is one of the main predictors of the behavioural intention. Interestingly, the correlation mean value of 0.63 between perceived behavioural control and behavioural intention is considerably higher than those found in many meta-analyses of behavioural intentions in different disciplines, where the mean values ranged from 0.35 to 0.46 (e.g. Sheppard et al. 1988, Albarracin et al. 2001, Armitage and Conner 2001, Hagger et al. 2002, Fishbein and Ajzen 2010, McDermott et al. 2015).

Since the perceived behavioural control is also assumed to play an important role of predicting the behaviours under consideration (Fishbein and Ajzen 2010: 21f), Table 9.7 provides the correlation coefficients and regression weights of perceived behavioural control indicators on the one hand and the behaviour (i.e. adoption of organic FFV production within the five next years) on the other hand. Though all these indicators expressed significant correlation coefficients with the adoption decision, only three of them demonstrated significant regression weights at p < .01 on this construct (see Table 9.7). Accordingly, these regression weights may not properly represent the real contribution of this construct on the adoption decision since the indicators of perceived behavioural control were highly correlated and they were loading on one factor. To determine the overall contribution of perceived behavioural control in predicting the adoption of organic FFV production, the factor scores of perceived behavioural control were regressed on the factor score of the adoption decision. Findings indicated significant correlation, and regression coefficients of 0.62 suggested a remarkable effect of perceived behavioural control towards the adoption of organic FFV production within the five next years.
Table 9.7: Direct measures of farmers’ perceived behavioural control towards producing organic fruit and vegetables within the next five years on their own farms

<table>
<thead>
<tr>
<th>Perceived control</th>
<th>Mean</th>
<th>SD</th>
<th>BI</th>
<th>CONV</th>
<th>PBC&lt;sub&gt;i&lt;/sub&gt; Correlation of PBC&lt;sub&gt;i&lt;/sub&gt; with BI CONV Regression coefficients of PBC&lt;sub&gt;i&lt;/sub&gt; with BI CONV</th>
<th>Coef.</th>
<th>Sig.</th>
<th>VIF</th>
<th>Coef.</th>
<th>Sig.</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>You think that you have the technical ability to produce organic FFV on your farm within the next five years (Pbc_1)</td>
<td>1.05</td>
<td>0.83</td>
<td>0.429**</td>
<td>0.419**</td>
<td>-0.001</td>
<td>.992</td>
<td>2.181</td>
<td>0.020</td>
<td>.769</td>
<td>2.181</td>
<td></td>
</tr>
<tr>
<td>You think that you are capable of dealing with organic farming on your farm within the next five years (Pbc_2)</td>
<td>1.25</td>
<td>0.68</td>
<td>0.532**</td>
<td>0.492**</td>
<td>0.217</td>
<td>.005</td>
<td>2.663</td>
<td>0.121</td>
<td>.119</td>
<td>2.663</td>
<td></td>
</tr>
<tr>
<td>You think that you can meet the regulations of organic farming on your farm within the next five years (Pbc_3)</td>
<td>1.03</td>
<td>0.85</td>
<td>0.490**</td>
<td>0.503**</td>
<td>0.167</td>
<td>.009</td>
<td>1.817</td>
<td>0.191</td>
<td>.003</td>
<td>1.817</td>
<td></td>
</tr>
<tr>
<td>You think that you can afford the costs of conversion to organic farming on your farm within the next five years (Pbc_4)</td>
<td>0.07</td>
<td>1.09</td>
<td>0.186**</td>
<td>0.268**</td>
<td>0.008</td>
<td>.875</td>
<td>1.120</td>
<td>0.091</td>
<td>.070</td>
<td>1.120</td>
<td></td>
</tr>
<tr>
<td>You think that you can meet the amount of work needed for organic farming on your farm within the next five years (Pbc_5)</td>
<td>1.08</td>
<td>0.93</td>
<td>0.450**</td>
<td>0.470**</td>
<td>0.156</td>
<td>.007</td>
<td>1.478</td>
<td>0.191</td>
<td>.001</td>
<td>1.478</td>
<td></td>
</tr>
<tr>
<td>For you, how important is organic FFV production as a topic of discussion within the next five years? (info_3)</td>
<td>1.17</td>
<td>0.85</td>
<td>0.516**</td>
<td>0.500**</td>
<td>0.306</td>
<td>.000</td>
<td>1.291</td>
<td>0.290</td>
<td>.000</td>
<td>1.291</td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>0.00</td>
<td>1.00</td>
<td>0.622**</td>
<td>0.623**</td>
<td>0.622</td>
<td>.000</td>
<td>1.000</td>
<td>0.623</td>
<td>.000</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

Note: N=266. Perceived behavioural control towards the adoption organic FFV production are scored from -2 to +2, and PBC, BI, CONV are factor scores obtained from the standardised direct measures of perceived behavioural control towards, behavioural intention to adopt, and adoption of organic FFV production within the next five years, respectively. VIF is variance inflation factor.

** Correlation is significant at the 0.01 level (2-tailed).

Source: Own data.
9.2.2.1.4 Separate effects of behavioural intention on behaviour

Before investigating the combined effects of both behavioural intention and perceived behavioural control on the behaviour under study, the separate effect of the behavioural intention on the adoption of organic FFV production was examined. Table 9.8 indicates that interviewed farmers possessed a greatly positive intention to adopt organic FFV production within the next five years with a mean value of +1.13 on a scale that ranged from -2 to +2. A strong correlation coefficient of 0.79 between the behavioural intention and behaviour was also found. Thus, about 63% of the total variance in the adoption of organic FFV production within the next five years was explained by the behavioural intention. This finding is consistent with the TPB assumption that considers the behavioural intention as the major predictor of the behaviour under consideration. The obtained mean correlation between the behavioural intention and behaviour is greatly higher than the mean correlations between behavioural intentions and associated behaviours that were found in various meta-analyses studies, in which the correlation means ranged from 0.45 to 0.62 (e.g. Albarracin et al. 2001, Armitage and Conner 2001, Hagger et al. 2002, Fishbein and Ajzen 2010). The strong regression coefficient of 0.79 found in the present study is also an indication of the position of behavioural intention in predicting the adoption of organic FFV production.

Table 9.8: Direct measures of farmers’ behavioural intention to produce organic fruit and vegetables within the next five years on their own farms

<table>
<thead>
<tr>
<th>Behavioural intention</th>
<th>$BI_1$</th>
<th>Correlation of $BI_1$ with</th>
<th>Regression coefficients of $BI_1$ with</th>
<th>Mean</th>
<th>SD</th>
<th>CONV</th>
<th>CONV</th>
<th>Coef.</th>
<th>Sig.</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>How likely is it that you will produce organic fruit and vegetables on your farm within the next five years? (bi_1T)</td>
<td>1.11</td>
<td>0.76</td>
<td>0.716**</td>
<td>0.403</td>
<td>.000</td>
<td>1.833</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have the intention to produce organic fruit and vegetables on your farm within the next five years? (bi_2)</td>
<td>1.15</td>
<td>0.89</td>
<td>0.736**</td>
<td>0.464</td>
<td>.000</td>
<td>1.833</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BI</td>
<td>0.00</td>
<td>1.00</td>
<td>0.793**</td>
<td>0.793</td>
<td>.000</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Average of direct measures of behavioural intention on scale -2 to +2: ($\sum(BI_i)/l$)

Note: N=266, behavioural intention towards the adoption organic FFV production are scored from -2 to +2, and BI, CONV are factor scores obtained from the standardised direct measures of behavioural intention to adopt, and adoption of organic FFV production within the next five years, respectively. VIF is variance inflation factor. 
** Correlation is significant at the 0.01 level (2-tailed).

Source: Own data.
9.2.2.2 Combined effects of direct measures on behavioural intention and behaviour

After reviewing the separate effects of attitudes, subjective norms, and perceived behavioural control on the behavioural intention to adopt organic FFV production, the attention was shifted to investigate the combined effects of these constructs on the behavioural intention. The combined effects of behavioural intention and perceived behavioural control on the behaviour were also considered.

9.2.2.2.1 Combined effects of direct measures on behavioural intention

Table 9.9 provides a comparison between the separate and the combined effects of attitudes, subjective norms, and perceived behavioural control on the behavioural intention. Thus, the table shows the contribution of each of these three proximal constructs at predicting the behavioural intention. The combined model, which included the factor scores of attitudes, subjective norms, and perceived behavioural control as predictors of behavioural intention, had a good predictive ability, as it explained more than 52% of the total variance in the behavioural intention. The attitudes and perceived behavioural control were found to be the main predictors of behavioural intention with regression coefficients of 0.50 and 0.23, respectively, and both coefficients were significant at p <.001. The subjective norms in this model, however, expressed no predictive ability as the regression coefficient was very low and not significant. In a regression model includes attitudes and subjective norms as predictors of the behavioural intention, subjective norms were also found to have an unimportant role in the prediction of behavioural intention (see Table 9.9). However, the subjective norms demonstrated some significant effect on the formation of behavioural intention, when the regression model included subjective norms and perceived behavioural control as the only predictors of the behavioural intention.

The findings suggest that attitudes were the most important factor in the formation of the behavioural intention to adopt organic FFV production within the next five years. In addition to its role in the prediction of the behaviour, perceived behavioural control was also an important predictor of the behavioural intention. The subjective norms’ role in the prediction of the behavioural intention was insignificant. However, these findings should be interpreted with caution since subjective norms were found to demonstrate significant effects on attitudes and perceived behavioural control.
### Table 9.9: Prediction of behavioural intention from attitudes, subjective norms, and perceived behavioural control: regression coefficients and R-squares

<table>
<thead>
<tr>
<th>Behavioural intention to adopt FFV production is regressed on:</th>
<th>Regression coefficients of</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attitudes (ATT)</td>
<td></td>
</tr>
<tr>
<td>ATT</td>
<td>0.702</td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td>-</td>
<td>0.438</td>
</tr>
<tr>
<td>PBC</td>
<td>-</td>
<td>0.622</td>
</tr>
<tr>
<td>ATT and SN</td>
<td>0.654</td>
<td>0.090</td>
</tr>
<tr>
<td>ATT and PBC</td>
<td>0.535</td>
<td>0.226</td>
</tr>
<tr>
<td>SN and PBC</td>
<td>-</td>
<td>0.535</td>
</tr>
<tr>
<td>ATT, SN and PBC</td>
<td>0.500</td>
<td>0.062</td>
</tr>
</tbody>
</table>

Note: Coefficients in bold are significant at p <.001

ATT, SN, PBC, and BI are factor scores obtained from the standardised direct measures of attitudes, subjective norms, perceived behavioural control, and behavioural intention to adopt organic FFV production within the next five years, respectively.

Source: Own data.

### 9.2.2.2 Combined effects of direct measures on behaviour

Consistent with the reasoned action approach, the behavioural intention and perceived behavioural control in this study were found to be the most important determinants of the behaviour (i.e. the adoption of organic FFV production among Syrian farmers within the next five years). Table 9.10 shows a comparison between the separate and the combined effects of behavioural intention, attitudes, subjective norms, and perceived behavioural control on the prediction of the behaviour under consideration. Each of these constructs demonstrated a significant effect on the behaviour when it was regressed separately on the behaviour; however, the predictive abilities of these simple regression models considerably varied. As it is demonstrated in Table 9.10, the explained variance in the adoption decision of organic FFV production was only about 15% in the case of subjective norms, while this value reached 63% if behavioural intention was used as the predictor of this behaviour.

Table 9.10 also shows that the combined model, which takes into account behavioural intention and perceived behavioural control as the proximal predictors of behaviour, indicated that about 66% of the total variance in the behaviour can be explained, whereas this value did
not increase in a great deal by including the constructs of attitudes and subjective norms, beside behavioural intention and perceived behavioural control as predictors of this behaviour.

Table 9.10: Prediction of behaviour from behavioural intention, attitudes, subjective norms, and perceived behavioural control: regression coefficients and R-squares

<table>
<thead>
<tr>
<th>Adoption of organic FFV production is regressed on:</th>
<th>Regression coefficients of</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI, ATT, SN and PBC</td>
<td>Behavioural intention: 0.615, Attitudes: 0.115, Subjective norms: 0.015, Perceived behavioural control: 0.157</td>
<td>0.663</td>
</tr>
<tr>
<td>BI and PBC</td>
<td>Behavioural intention: 0.651, Attitudes: 0.032, Subjective norms: 0.215, Perceived behavioural control: 0.206</td>
<td>0.659</td>
</tr>
<tr>
<td>BI, SN and PBC</td>
<td>Behavioural intention: 0.651, Attitudes: 0.115, Subjective norms: 0.032, Perceived behavioural control: 0.215</td>
<td>0.658</td>
</tr>
<tr>
<td>BI and ATT</td>
<td>Behavioural intention: 0.648, Attitudes: 0.073, Subjective norms: 0.385, Perceived behavioural control: 0.631</td>
<td>0.652</td>
</tr>
<tr>
<td>SN</td>
<td>Behavioural intention: 0.764, Attitudes: 0.633, Subjective norms: 0.073, Perceived behavioural control: 0.206</td>
<td>0.635</td>
</tr>
<tr>
<td>ATT</td>
<td>Behavioural intention: 0.794, Attitudes: -0.633, Subjective norms: -0.635, Perceived behavioural control: 0.398</td>
<td>0.631</td>
</tr>
</tbody>
</table>

Note: Coefficients in bold are significant at p < .001

ATT, SN, PBC, BI, and CONV are factor scores obtained from the standardised direct measures of attitudes, subjective norms, perceived behavioural control, and behavioural intention to adopt, and adoption of organic FFV production within the next five years, respectively.

Source: Own data.

These findings are in line with TPB assumptions, where the behavioural intention was found as the main proximal predictor of behaviour. That is in addition to the perceived behavioural control which demonstrated a considerable effect on performing the behaviour under consideration in all combined models that included perceived behavioural control (see Table 9.10). Attitudes and subjective norms in the combined models were found to have insignificant direct effects on the behaviour. However, it should be noted that attitudes were found as the key predictor of behavioural intention suggesting a significant indirect role of attitudes at predicting the adoption of organic FFV production within the next five years. The direct and indirect effects of the set of salient beliefs, attitudes, subjective norm, and perceived behavioural control on behavioural intention and behaviour is further discussed in the next section.
9.3 Assessing PLS-SEM results of the entire TPB model

The evaluation process of PLS-SEM output of the TPB model initially inaugurates with examining the quality of the measurement model of each construct before appraising the quality of the structural model. The evaluation criteria of the PLS measurement model depend upon the type of the measurement being employed (i.e. reflective and/or formative). A reflectively measured model should be assessed in terms of reliability and validity criteria, whereas only validity criteria are relevant in the case of formatively measured constructs (see Chapter 8 for a review). All constructs utilised in the TPB model were measured by reflective measures, though the indicators of salient beliefs covered a broader range of information than the endogenous constructs in the TPB model did. Accordingly, the evaluation process of the measurement model took into account the following set of criteria: internal consistency reliability, indicator reliability, convergent validity, and discriminant validity.

In the previous section, the separate and combined effects of attitudes, subjective norms and perceived behavioural on both the behavioural intention and the behaviour itself were examined. In this section, however, the simultaneous causal effects of those constructs and their respective salient beliefs on the prediction of behavioural intention and behaviour were further investigated. Such investigation was useful to examine how well the empirical data reinforced the TPB model and thus to determine if this theory has been empirically confirmed (Hair et al. 2014: 167f). To do that, the structural model of the TPB was first examined for collinearity and significance issues. Thereafter, the levels of predictive accuracy ($R^2$ values) and predictive relevance ($Q^2$ values) of the endogenous constructs of the TPB were assessed. This step also included an assessment of the effect size of predictive accuracy ($f^2$) and the effect size of predictive relevance ($q^2$).

9.3.1 PLS-SEM estimation

After specifying the PLS-SEM of the TPB model and validating the input data, the algorithm and bootstrapping procedures were executed. Figures 9.2 and 9.3 represent visualisations of how the measurement and structural models of PLS-SEM were specified as well as the visual outputs of PLS-SEM algorithm and bootstrapping procedures, respectively. Generally speaking, the initial examination of these two figures shows that the majorities of relationships within the TPB model were significant and they were in line with the theory.
assumptions. Further inspections of these relationships are provided in the next two sub-sections which are dedicated to examine the results of PLS-SEM measurement and structural models. Given the complexity of visualisation of the PLS-SEM of the TPB model, Figures 9.2 and 9.3 as well as Table 9.11 of this section show only abbreviations of the indicators that have been used to measure their respective constructs. Readers are referred to the questionnaire coding in Appendix 1.4 for a review of what these indicators are standing for.
Figure 9.2: Visualisation of PLS-SEM algorithm of the TPB model of Syrian farmers to adopt organic FFV production within the next five years

CONV: Conversion to organic FFV production
BI: Behavioural intention
ATT: Attitudes
SN: Subjective norms
PBC: Perceived behavioural control
bsoe: Behavioural beliefs
nbmc: Normative beliefs
cbpc: Control beliefs

Note: N = 266. All constructs of the TPB model are measured reflectively. Indicator loadings are shown in the measurement model between the indicators (yellow rectangles) and constructs (blue circles), while the path coefficients are given in the structural model of PLS-SEM (between the blue circles). The values inside the blue circles are the R-Squares. All input and output data of PLS-SEM algorithm are standardised. For the estimation of PLS-SEM algorithm, path weighting scheme was utilised. For this purpose, an abort criterion of $10^{-5}$, maximum iterations of 300, and initial weights of 1.0 were selected. Source: Own data.
Figure 9.3: Visualisation of PLS-SEM bootstrapping of the TPB model of Syrian farmers to adopt organic FFV production within the next five years: T-test of parameters’ significance levels

Note: N = 266. Bootstrapping procedure is based on 5000 sub-samples of size 266 for each. All constructs of the TPB model are measured reflectively. T-values of indicator loadings are shown in the measurement model: between the indicators (yellow rectangles) and constructs (blue circles), and the T-values of the path coefficients are given in the structural model of PLS-SEM (between the blue circles). All input and output data of PLS-SEM are standardised. Source: Own data.
9.3.2 Assessment of PLS-SEM results of the measurement model

Since all TPB constructs are reflectively measured, the evaluation process of the PLS-SEM measurement model includes examination of internal consistency reliability, indicator reliability, convergent validity, and discriminant validity. Tables 9.11 and 9.12 below exhibit the results of the PLS-SEM measurement model of the TPB model of Syrian farmers to adopt organic FFV production within the next five years. In Table 9.11, the measurements of reliability and convergent validity of the PLS-SEM measurement model are provided. Indicator loadings, the fifth column in Table 9.11, show that the majority of indicators of the TPB model were highly loading on their specified constructs, suggesting that these indicators were reliable measures of the constructs under investigation. Highly reliable indicators were also reflected in high internal reliability on the construct level as it can be seen by the high composite reliability values above 0.70 in Table 9.11.

9.3.2.1 Composite reliability and convergent validity

With respect to convergent validity of the TPB model, the endogenous latent constructs (CONV, BI, ATT, PBC, and also SN after elimination the third indicator (sn_3T) of this construct) demonstrated strong convergent validities, where the average variance extracted (AVE) values were above 0.50. The set of salient beliefs (bsoe, cbpc, and nbmc) exhibited values of AVE lower than 0.50, though they had high composite reliabilities. The low AVE values of the belief constructs can be justified as those constructs are multidimensional and comprise a wide range of information about the behaviour under consideration. Thus, the shared variance among the indicators of each belief construct is expected to be lower than the shared variance that can be explained by the indicators of each of the endogenous latent constructs within the TPB model. These low AVE values can also be confirmed by the relatively low indicator loadings in the case of belief constructs with comparison to the indicator loadings of the endogenous constructs (see Table 9.11).
Table 9.11: Reliability and convergent validity tests of the TPB model of Syrian farmers to adopt organic FFV production within the next five years

<table>
<thead>
<tr>
<th>Latent constructs</th>
<th>Mean</th>
<th>SD</th>
<th>Observed indicators</th>
<th>AVE (1)</th>
<th>Composite reliability (2)</th>
<th>Convergent validity?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Code</td>
<td>Loadings</td>
<td>Weights</td>
<td>VIF</td>
</tr>
<tr>
<td>Attitudes (ATT)</td>
<td>4.03</td>
<td>0.70</td>
<td>Att_1</td>
<td>0.786</td>
<td>0.289</td>
<td>1.713</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Att_2</td>
<td>0.851</td>
<td>0.300</td>
<td>1.967</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Att_3</td>
<td>0.776</td>
<td>0.362</td>
<td>1.554</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ATT_4T</td>
<td>0.719</td>
<td>0.320</td>
<td>1.388</td>
</tr>
<tr>
<td>Behavioural intention (BI)</td>
<td>4.13</td>
<td>0.75</td>
<td>bi_1T</td>
<td>0.913</td>
<td>0.541</td>
<td>1.833</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bi_2</td>
<td>0.917</td>
<td>0.552</td>
<td>1.833</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Att_3</td>
<td>0.776</td>
<td>0.362</td>
<td>1.554</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ATT_4T</td>
<td>0.719</td>
<td>0.320</td>
<td>1.388</td>
</tr>
<tr>
<td>Conversion (CONV)</td>
<td>4.01</td>
<td>0.75</td>
<td>conv_1</td>
<td>0.910</td>
<td>0.532</td>
<td>1.836</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>conv_2T</td>
<td>0.920</td>
<td>0.561</td>
<td>1.836</td>
</tr>
<tr>
<td>Perceived behavioural control (PBC)</td>
<td>4.05</td>
<td>0.61</td>
<td>Pbc_1</td>
<td>0.784</td>
<td>0.224</td>
<td>2.181</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pbc_2</td>
<td>0.852</td>
<td>0.277</td>
<td>2.663</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pbc_3</td>
<td>0.792</td>
<td>0.262</td>
<td>1.817</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pbc_4</td>
<td>0.387</td>
<td>0.111</td>
<td>1.120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pbc_5</td>
<td>0.710</td>
<td>0.237</td>
<td>1.478</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>info_3</td>
<td>0.659</td>
<td>0.258</td>
<td>1.291</td>
</tr>
<tr>
<td>Subjective norms (SN)</td>
<td>3.78</td>
<td>0.75</td>
<td>sn_1</td>
<td>0.840</td>
<td>0.708</td>
<td>1.095</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sn_2</td>
<td>0.726</td>
<td>0.543</td>
<td>1.159</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sn_3T</td>
<td>0.119</td>
<td>0.087</td>
<td>1.147</td>
</tr>
<tr>
<td>Behavioural beliefs (bsoe)</td>
<td>20.55</td>
<td>2.70</td>
<td>bsoe_1</td>
<td>0.574</td>
<td>0.179</td>
<td>1.277</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsoe_2</td>
<td>0.437</td>
<td>0.103</td>
<td>1.914</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsoe_3</td>
<td>0.714</td>
<td>0.280</td>
<td>1.882</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsoe_4</td>
<td>0.638</td>
<td>0.194</td>
<td>1.512</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsToe_5</td>
<td>0.250</td>
<td>0.074</td>
<td>1.071</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsToe_6</td>
<td>0.583</td>
<td>0.193</td>
<td>1.301</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsToe_7</td>
<td>0.740</td>
<td>0.263</td>
<td>1.722</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsToe_8</td>
<td>0.665</td>
<td>0.228</td>
<td>1.575</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bsToe_9</td>
<td>0.344</td>
<td>0.149</td>
<td>1.059</td>
</tr>
<tr>
<td>Control beliefs (cbpc)</td>
<td>16.99</td>
<td>4.14</td>
<td>cbpc_1</td>
<td>0.691</td>
<td>0.254</td>
<td>1.486</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cbpc_2</td>
<td>0.733</td>
<td>0.264</td>
<td>1.551</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cbpc_3</td>
<td>0.586</td>
<td>0.203</td>
<td>1.482</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cbpc_4</td>
<td>0.741</td>
<td>0.293</td>
<td>1.475</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cbpc_5</td>
<td>0.342</td>
<td>0.135</td>
<td>1.275</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cbpc_6</td>
<td>-0.002</td>
<td>-0.032</td>
<td>1.064</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cbpc_7</td>
<td>0.488</td>
<td>0.155</td>
<td>1.254</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cbpc_8</td>
<td>0.663</td>
<td>0.262</td>
<td>1.316</td>
</tr>
<tr>
<td>Normative beliefs (nbmc)</td>
<td>13.87</td>
<td>4.15</td>
<td>nbmc_1</td>
<td>0.636</td>
<td>0.382</td>
<td>1.231</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nbmc_2</td>
<td>0.732</td>
<td>0.403</td>
<td>1.320</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nbmc_3</td>
<td>0.648</td>
<td>0.292</td>
<td>1.478</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nbmc_4</td>
<td>0.410</td>
<td>0.061</td>
<td>1.370</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nbmc_5</td>
<td>0.514</td>
<td>0.230</td>
<td>1.398</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nbmc_6</td>
<td>0.508</td>
<td>0.257</td>
<td>1.328</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nbmc_7</td>
<td>0.003</td>
<td>-0.025</td>
<td>1.066</td>
</tr>
</tbody>
</table>

Note: N=266. Bold indicator loadings and/or weights are significant at p<0.001; * indicator loading and/or weights are significant at p=0.05 and ** indicator loading and/or weights are significant at p=0.01. VIF: Variance inflation factor and AVE: Average variance extracted.

(1) The values in brackets represent the AVE after disregarding sn_3T, cbpc_6, and nbmc_7 from the model.
(2) The values in brackets represent the composite reliability after disregarding sn_3T, cbpc_6, and nbmc_7 from the model.
The original data of endogenous constructs ranges from 1 to 5 and for the exogenous constructs from 1 to 25. All input and output data of PLS-SEM are standardised.

Source: Own data.
9.3.2.2 Discriminant validity

Discriminant validity refers to the degree to which a given construct in a model or theory can be truly distinctive from other constructs in the model. Though constructs may correlate, each construct should be unique and exhibit a sufficient difference from the other latent constructs in the model (Chin 2010: 670, Hair et al. 2014:105). A cross loadings test of the TPB model showed that all constructs had established discriminant and convergent validities, since the indicators of each construct were loading higher on their specified constructs than they loaded on the other constructs in the TPB model. Results of cross loadings test are given in Appendix 2.1. However, visual inspection of the cross loadings table indicated that few of these indicators had relatively high cross loadings on other constructs of the TPB model, though they were lower than their loadings on the associated constructs. Therefore, a further investigation of discriminant validity was required. Thus, the Fornell-Larcker criterion, which is considered a more rigid criterion of discriminant validity than the cross loadings test, was performed. Table 9.12 provides the discriminant validity test using the Fornell-Larcker criterion for the TPB model. In this table, the results of four PLS-SEM solutions of the TPB model are compared. The results of Models 2, 3, and 4 in Table 9.12 were calculated after eliminating few problematic variables, which either had very low loadings on their specified constructs or had high cross loadings from the original TPB model (Model 1).

The Fornell-Larcker test indicated problems with discriminant validity for three constructs (PBC, bsoe, and cbpc) in the Model 1, since the square root of AVE for each of those constructs was lower than their correlation coefficients with at least one construct in the TPB model. The construct of control beliefs (cbpc) exhibited the most problematic issues in terms of discriminant validity, followed by the constructs of behavioural beliefs (bsoe) and perceived behavioural control (PBC). This can be understood as few of the correlation coefficients of (PBC, bsoe, and cbpc) with other constructs were higher from the square root of AVE values of each of these three constructs (see Table 9.12: Model 1).

In Model 2, four indicators that had very low loadings on their specified constructs (lower than 0.30) were eliminated from the original model. Compared to Model 1, the results of Model 2 show an increase in the AVE values (and thus in the square root of it) associated with a slight decrease in the correlation coefficients. In Model 3, two indicators of Model 2 with loadings lower than 0.40 were eliminated. This model solves the problematic issues of
discriminant validity to a great extent, though the correlation coefficient between behavioural and control beliefs \( r_i = 0.668 \) is still slightly higher than the square root values of AVE obtained by these two constructs. By excluding two more indicators from Model 3 (cpbc_7 of loading = 0.491 and bsoe_2 of loading = 0.453), the discriminant validity of all constructs of the TPB model were established as it is shown in Model 4 (see Table 9.12).
Table 9.12: Discriminant validity of the TPB model: Fornell-Larcker criterion; comparisons among four PLS-SEM solutions of the TPB model

Model 1: Discriminant validity of the TPB constructs: Fornell-Larcker criterion (before disregarding any indicator from the model)

<table>
<thead>
<tr>
<th>Latent construct</th>
<th>AVE</th>
<th>Composite reliability</th>
<th>R-Square</th>
<th>ATT</th>
<th>BI</th>
<th>CONV</th>
<th>PBC</th>
<th>SN</th>
<th>bsoe</th>
<th>cbpc</th>
<th>nbmc</th>
<th>Discriminant validity?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATT</td>
<td>0.615</td>
<td>0.864</td>
<td>0.389</td>
<td>0.784</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>BI</td>
<td>0.837</td>
<td>0.911</td>
<td>0.524</td>
<td>0.704</td>
<td>0.915</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>CONV</td>
<td>0.837</td>
<td>0.911</td>
<td>0.658</td>
<td>0.664</td>
<td>0.794</td>
<td>0.915</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>PBC</td>
<td>0.509</td>
<td>0.856</td>
<td>0.381</td>
<td>0.747</td>
<td>0.632</td>
<td>0.631</td>
<td>0.713</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>SN</td>
<td>0.416</td>
<td>0.618</td>
<td>0.143</td>
<td>0.495</td>
<td>0.408</td>
<td>0.385</td>
<td>0.426</td>
<td>0.645</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>bsoe</td>
<td>0.328</td>
<td>0.802</td>
<td>0.624</td>
<td>0.516</td>
<td>0.508</td>
<td>0.559</td>
<td>0.440</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>cbpc</td>
<td>0.338</td>
<td>0.773</td>
<td>0.650</td>
<td>0.532</td>
<td>0.537</td>
<td>0.618</td>
<td>0.492</td>
<td>0.670</td>
<td>0.581</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>nbmc</td>
<td>0.293</td>
<td>0.706</td>
<td>0.302</td>
<td>0.210</td>
<td>0.203</td>
<td>0.344</td>
<td>0.378</td>
<td>0.348</td>
<td>0.372</td>
<td>0.541</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Model 2: Discriminant validity of the TPB constructs: Fornell-Larcker criterion after disregarding sn_3T, nbmc_7, bsToe_5, cbpc_6

<table>
<thead>
<tr>
<th>Latent construct</th>
<th>AVE</th>
<th>Composite reliability</th>
<th>R-Square</th>
<th>ATT</th>
<th>BI</th>
<th>CONV</th>
<th>PBC</th>
<th>SN</th>
<th>bsoe</th>
<th>cbpc</th>
<th>nbmc</th>
<th>Discriminant validity?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATT</td>
<td>0.615</td>
<td>0.864</td>
<td>0.390</td>
<td>0.784</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>BI</td>
<td>0.837</td>
<td>0.911</td>
<td>0.523</td>
<td>0.704</td>
<td>0.915</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>CONV</td>
<td>0.837</td>
<td>0.911</td>
<td>0.658</td>
<td>0.664</td>
<td>0.794</td>
<td>0.915</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>PBC</td>
<td>0.509</td>
<td>0.856</td>
<td>0.379</td>
<td>0.747</td>
<td>0.632</td>
<td>0.631</td>
<td>0.713</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>SN</td>
<td>0.620</td>
<td>0.764</td>
<td>0.144</td>
<td>0.492</td>
<td>0.405</td>
<td>0.387</td>
<td>0.431</td>
<td>0.787</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>bsoe</td>
<td>0.362</td>
<td>0.813</td>
<td>0.624</td>
<td>0.517</td>
<td>0.512</td>
<td>0.560</td>
<td>0.427</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>cbpc</td>
<td>0.386</td>
<td>0.808</td>
<td>0.647</td>
<td>0.533</td>
<td>0.539</td>
<td>0.616</td>
<td>0.493</td>
<td>0.664</td>
<td>0.621</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>nbmc</td>
<td>0.341</td>
<td>0.749</td>
<td>0.297</td>
<td>0.207</td>
<td>0.202</td>
<td>0.340</td>
<td>0.380</td>
<td>0.345</td>
<td>0.373</td>
<td>0.584</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

sn_3T, nbmc_7, bsToe_5, cbpc_6 are being excluded from the TPB model because very low loading on their specified constructs

Continued
### Model 3: Discriminant validity of the TPB constructs: Fornell-Larcker criterion after disregarding sn_3T, nbmc_7, bsToe_5, bsToe_9, cpbc_6, cpbc_5, and Pbc_4

<table>
<thead>
<tr>
<th></th>
<th>AVE</th>
<th>Composite reliability</th>
<th>R-Square</th>
<th>ATT</th>
<th>BI</th>
<th>CONV</th>
<th>PBC</th>
<th>SN</th>
<th>bsoe</th>
<th>cbpc</th>
<th>nbmc</th>
<th>Discriminant validity?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATT</td>
<td>0.615</td>
<td>0.864</td>
<td>0.371</td>
<td><strong>0.784</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>BI</td>
<td>0.837</td>
<td>0.911</td>
<td>0.524</td>
<td>0.704</td>
<td><strong>0.915</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>CONV</td>
<td>0.837</td>
<td>0.912</td>
<td>0.655</td>
<td>0.664</td>
<td>0.794</td>
<td><strong>0.915</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>PBC</td>
<td>0.588</td>
<td>0.876</td>
<td>0.378</td>
<td>0.751</td>
<td>0.635</td>
<td>0.625</td>
<td><strong>0.767</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>SN</td>
<td>0.620</td>
<td>0.764</td>
<td>0.144</td>
<td>0.492</td>
<td>0.406</td>
<td>0.387</td>
<td>0.438</td>
<td>0.788</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>bsoe</td>
<td>0.407</td>
<td>0.825</td>
<td>0.609</td>
<td>0.508</td>
<td>0.513</td>
<td>0.569</td>
<td>0.434</td>
<td>0.638</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>cbpc</td>
<td>0.439</td>
<td>0.821</td>
<td>0.640</td>
<td>0.534</td>
<td>0.535</td>
<td>0.615</td>
<td>0.493</td>
<td>0.668</td>
<td><strong>0.662</strong></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>nbmc</td>
<td>0.341</td>
<td>0.749</td>
<td>0.297</td>
<td>0.207</td>
<td>0.202</td>
<td>0.329</td>
<td>0.380</td>
<td>0.362</td>
<td>0.362</td>
<td><strong>0.584</strong></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: N=266. sn_3T, nbmc_7, bsToe_5, bsToe_9, cpbc_6, cpbc_5, and Pbc_4 are being excluded from the TPB model because very low loading on their specified constructs and/or because high cross loadings issues.

### Model 4: Discriminant validity of the TPB constructs: Fornell-Larcker criterion after disregarding sn_3T, nbmc_7, bsToe_5, bsToe_9, bsoe_2, cpbc_6, cpbc_5, cpbc_7, and Pbc_4

<table>
<thead>
<tr>
<th></th>
<th>AVE</th>
<th>Composite reliability</th>
<th>R-Square</th>
<th>ATT</th>
<th>BI</th>
<th>CONV</th>
<th>PBC</th>
<th>SN</th>
<th>bsoe</th>
<th>cbpc</th>
<th>nbmc</th>
<th>Discriminant validity?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATT</td>
<td>0.615</td>
<td>0.864</td>
<td>0.379</td>
<td><strong>0.784</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>BI</td>
<td>0.837</td>
<td>0.911</td>
<td>0.524</td>
<td>0.704</td>
<td><strong>0.915</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>CONV</td>
<td>0.837</td>
<td>0.912</td>
<td>0.655</td>
<td>0.664</td>
<td>0.794</td>
<td><strong>0.915</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>PBC</td>
<td>0.588</td>
<td>0.876</td>
<td>0.379</td>
<td>0.751</td>
<td>0.635</td>
<td>0.625</td>
<td><strong>0.767</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>SN</td>
<td>0.620</td>
<td>0.764</td>
<td>0.144</td>
<td>0.492</td>
<td>0.406</td>
<td>0.387</td>
<td>0.437</td>
<td>0.788</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>bsoe</td>
<td>0.445</td>
<td>0.827</td>
<td>0.616</td>
<td>0.515</td>
<td>0.521</td>
<td>0.568</td>
<td>0.442</td>
<td>0.667</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>cbpc</td>
<td>0.489</td>
<td>0.826</td>
<td>0.640</td>
<td>0.534</td>
<td>0.534</td>
<td>0.616</td>
<td>0.487</td>
<td>0.663</td>
<td><strong>0.699</strong></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>nbmc</td>
<td>0.341</td>
<td>0.749</td>
<td>0.297</td>
<td>0.207</td>
<td>0.202</td>
<td>0.329</td>
<td>0.380</td>
<td>0.361</td>
<td>0.355</td>
<td><strong>0.584</strong></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: N=266. sn_3T, nbmc_7, bsToe_5, bsToe_9, bsoe_2, cpbc_6, cpbc_5, cpbc_7, and Pbc_4 are excluded from the TPB model because very low loading on their specified constructs and/or because high cross loadings issues. AVE: Average variance extracted. The square root of AVE values is shown on the diagonal and printed in bold; non-diagonal are the latent constructs’ correlations. The original data of endogenous constructs ranges from 1 to 5 and for the exogenous constructs from 1 to 25. All input and output data of PLS-SEM are standardised.

Source: Own data.
Within the TPB framework, it is however not surprising to observe some high correlation coefficients among few of the TPB constructs as it was found in the current study, since the presence or absence of control factors (i.e. cbpc) may influence person’s behavioural beliefs and attitudes towards the behaviour under consideration. Thus, it is not unexpected that the constructs of control beliefs and perceived behavioural control were highly correlated with other constructs in the TPB model in general and with behavioural beliefs and attitudes in particular (see also Appendix 2.1). Therefore, the trade-off among the abovementioned four models in Table 9.12 should take into account the relative importance of the eliminated indicators on the content validity of their associated constructs. The eliminated indicators in Models 3 and 4 include some items with important content validity for their specified constructs. The content validity of cbpc, bsoe, and PBC would be severely affected by excluding important indicators from their measurement model. Against this background, Model 1 was used to estimate the PLS-SEM structural model of the TPB model in the next sub-section. The key results of the PLS-SEM structural model for Models 2, 3, and 4 can be found in the Appendices 2.2, 2.3, and 2.4, respectively.

9.3.3 Assessment of PLS-SEM results of the structural model

Once the constructs in the PLS-SEM measurement model were assessed in terms of reliability and validity, the next step was to address the results of the path model among the TPB constructs. This involved examining the causal relationships among the TPB constructs and thus assessing the model’s predictive capabilities. The examination process of the path model built on the results of the PLS-SEM algorithm and bootstrapping procedures (shown in Figures 9.2 and 9.3) as well as the blindfolding routine as it is explained below. Table 9.13 exhibits the collinearity test of the latent construct scores obtained from the PLS-SEM algorithm for all TPB constructs. Findings show that all TPB constructs had acceptable levels of variance inflation factor (VIF), where all the obtained VIF values were considerably lower than the tolerance threshold of 5. Accordingly, the collinearity among the predictor constructs in the TPB model was not an important issue for estimating the paths within the structural model. Hence, the default output of algorithm and bootstrapping of the PLS-SEM structural model could be examined.
Table 9.13: Collinearity assessment of PLS-SEM structural model

<table>
<thead>
<tr>
<th>Constructs</th>
<th>VIF</th>
<th>Constructs</th>
<th>VIF</th>
<th>Constructs</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>bsoe</td>
<td>1.852</td>
<td>ATT</td>
<td>2.474</td>
<td>BI</td>
<td>1.665</td>
</tr>
<tr>
<td>cbpc</td>
<td>1.890</td>
<td>PBC</td>
<td>2.282</td>
<td>PBC</td>
<td>1.665</td>
</tr>
<tr>
<td>nbmc</td>
<td>1.185</td>
<td>SN</td>
<td>1.337</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N=266. The latent construct scores of bsoe, cbpc, nbmc, ATT, PBC, SN, BI, and CONV were obtained from the PLS-SEM algorithm output.

The dependent variables in the first, second, and third set of multiple regression models are ATT, BI, and CONV, respectively.

Source: Own data.

9.3.3.1 Path coefficients of PLS-SEM structural model

Table 9.14 summarises the main results of the total effects of predictor constructs on the endogenous latent constructs within the TPB model. Since PLS-SEM algorithm and bootstrapping procedures estimate all causal relationships within the path model simultaneously, the total effects of predictor constructs on the predicted constructs within the TPB framework can be computed by summing up their direct and indirect effects on the predicted construct under investigation. The direct effect represents the path coefficient when the predictor and predicted constructs are directly connected by a single path in the model (e.g. the direct path between attitudes and behavioural intention in Figure 9.2). The indirect effect is considered when the predictor and predicted constructs are not directly linked, but rather through a mediator construct. Consequently, an indirect effect is a sequence of at least two direct effects that are represented by multiple paths in the TPB model (e.g. the relationship between behavioural beliefs and behavioural intention, in Figure 9.2, is mediated by attitudes). By multiplying the path coefficients that represent the relationships between the mediator(s) in the one hand and both predictor and predicted constructs on the other hand, the indirect effect of the given predictor construct(s) on the predicted construct under question can be calculated.
Table 9.14: Total effect coefficients of TPB constructs on behavioural intention to adopt organic FFV production (BI) and adoption decision (CONV) within the next five years

<table>
<thead>
<tr>
<th>Effect Direction</th>
<th>Coefficients (original sample)</th>
<th>Coefficients (sample mean)</th>
<th>Standard Error</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes (ATT) -&gt; Behaviour (CONV)</td>
<td>0.331**</td>
<td>0.330</td>
<td>0.067</td>
<td>0.000</td>
</tr>
<tr>
<td>Attitudes (ATT) -&gt; Behavioural intention (BI)</td>
<td>0.503**</td>
<td>0.500</td>
<td>0.085</td>
<td>0.000</td>
</tr>
<tr>
<td>Behavioural intention (BI) -&gt; Behaviour (CONV)</td>
<td>0.658**</td>
<td>0.657</td>
<td>0.055</td>
<td>0.000</td>
</tr>
<tr>
<td>Perceived behavioural control (PBC) -&gt; Behaviour (CONV)</td>
<td>0.368**</td>
<td>0.369</td>
<td>0.068</td>
<td>0.000</td>
</tr>
<tr>
<td>Subjective norm (SN) -&gt; Behaviour (CONV)</td>
<td>0.037</td>
<td>0.039</td>
<td>0.036</td>
<td>0.305</td>
</tr>
<tr>
<td>Subjective norm (SN) -&gt; Behavioural intention (BI)</td>
<td>0.057</td>
<td>0.059</td>
<td>0.055</td>
<td>0.301</td>
</tr>
<tr>
<td>Behavioural beliefs (bsoe) -&gt; Attitudes (ATT)</td>
<td>0.624**</td>
<td>0.635</td>
<td>0.037</td>
<td>0.000</td>
</tr>
<tr>
<td>Behavioural beliefs (bsoe) -&gt; Behaviour (CONV)</td>
<td>0.206**</td>
<td>0.210</td>
<td>0.049</td>
<td>0.000</td>
</tr>
<tr>
<td>Behavioural beliefs (bsoe) -&gt; Behavioural intention (BI)</td>
<td>0.314**</td>
<td>0.318</td>
<td>0.062</td>
<td>0.000</td>
</tr>
<tr>
<td>Control beliefs (cbpc) -&gt; Behaviour (CONV)</td>
<td>0.227**</td>
<td>0.229</td>
<td>0.047</td>
<td>0.000</td>
</tr>
<tr>
<td>Control beliefs (cbpc) -&gt; Behavioural intention (BI)</td>
<td>0.143*</td>
<td>0.145</td>
<td>0.050</td>
<td>0.005</td>
</tr>
<tr>
<td>Control beliefs (cbpc) -&gt; Perceived behavioural control (PBC)</td>
<td>0.616**</td>
<td>0.621</td>
<td>0.042</td>
<td>0.000</td>
</tr>
<tr>
<td>Normative beliefs (nbmc) -&gt; Behaviour (CONV)</td>
<td>0.013</td>
<td>0.015</td>
<td>0.014</td>
<td>0.343</td>
</tr>
<tr>
<td>Normative beliefs (nbmc) -&gt; Behavioural intention (BI)</td>
<td>0.020</td>
<td>0.022</td>
<td>0.021</td>
<td>0.341</td>
</tr>
<tr>
<td>Normative beliefs (nbmc) -&gt; Subjective norm (SN)</td>
<td>0.359**</td>
<td>0.382</td>
<td>0.056</td>
<td>0.000</td>
</tr>
</tbody>
</table>

*: Total effect coefficient of original sample (N=266) is significant at P<0.01 and **: coefficient is significant at P<0.001.

(1): Sample mean represents the total effect mean obtained from PLS bootstrapping procedure (5000 samples of 266 cases for each).

Total effects = direct effects (i.e. path coefficient when there is a direct path connecting two given components of TPB model) + indirect effects (i.e. mediated effects) between two components, not necessarily, having direct path connecting them.

Source: Own data.

The results of PLS-SEM of the entire TPB model showed that farmers’ positive attitudes and perceived behavioural control towards the conversion to organic FFV production had a positive influence on the behavioural intention to convert. These findings are in line with the TPB assumptions. Subjective norms towards a conversion to organic FFV production,
however, played a small role in forming behavioural intention in this study. Furthermore, the
direct components of behavioural intention (ATT, PBC, and SN) were also well predicted by
their respective salient beliefs (bsoe, cbpc, and nbmc). Moving on in the TPB model, the
behavioural intention was found as the primary predictor of the decision to adopt organic FFV
production, followed by the perceived behavioural control towards this behaviour. PLS path
modelling results in Table 9.14 confirm that the paths linking the TPB components had
significant coefficients at $p < .05$ (with one exception for the path from SN to BI, which was
found not significant). Table 9.14 also includes the total effect coefficients that demonstrate
the chain of causal effects from the set of salient beliefs (bsoe, cbpc, nbmc) to the behaviour
(CONV) in the TPB model. Results further indicate that most of the total effect coefficients
were highly significant at $p <0.001$. Though normative beliefs had a significant effect on
subjective norms, their total effects on behavioural intention and behaviour was not
signiﬁcant.

The results presented in Figures 9.2 and 9.3 and Table 9.14 indicate that the empirical data
obtained from the TPB survey with Syrian farmers of FFV supported the following
hypotheses:

**H1:** Farmers’ intentions to convert to organic FFV production within the next five
years are the main predictor of that behaviour. - **Accepted**

**H2:** Farmers’ perceived behavioural control over producing organic FFV within the
next five years plays a significant role at determining the associated behavioural
intention and behaviour itself. - **Accepted**

**H3:** Farmers’ attitudes towards organic FFV production within the next five years
play a significant role at determining the associated behavioural intention. - Accepted

**H5:** There is a strong relationship between behavioural beliefs and attitudes towards
organic FFV production within the next five years and there are causal effects of
behavioural beliefs on farmers’ attitudes towards organic FFV production within the
next five years. - **Accepted**

**H6:** There is a strong relationship between normative beliefs and subjective norms
towards organic FFV production within the next five years and there are causal effects
of normative beliefs on farmers’ subjective norms towards organic FFV production
within the next five years. - **Accepted**

**H7:** There is a strong relationship between control beliefs and perceived behavioural
control towards organic FFV production within the next five years and there are causal
effects of control beliefs on farmers’ perceived behavioural control towards organic
FFV production within the next five years. - **Accepted**
**H8:** Farmers’ attitudes towards organic FFV production within the next five years play a significant role at determining the associated behaviour. However, their influence is indirect. – **Accepted**

**H10:** Farmers’ attitudes towards organic FFV production within the next five years play a significant role at determining the associated behaviour. However, their influence is indirect. - **Accepted**

**H11:** Behavioural beliefs towards organic FFV production within the next five years are important determinants of the associated behavioural intention. However, their influence is indirect. - **Accepted**

**H12:** Control beliefs towards organic FFV production within the next five years are important determinants of the associated behavioural intention. However, their influence is indirect. - **Accepted**

On the other hand, Table 9.14 shows that the empirical data in this study did not support the following hypotheses:

**H4:** Farmers’ subjective norms towards organic FFV production within the next five years play a significant role at determining the associated behavioural intention. - **Rejected**

**H9:** Farmers’ subjective norms towards organic FFV production within the next five years play a significant role at determining the associated behaviour. However, their influence is indirect. - **Rejected**

**H13:** Normative beliefs towards organic FFV production within the next five years are important determinants of the associated behavioural intention. However, their influence is indirect. - **Rejected**

### 9.3.3.2 Predictive accuracy and predictive relevance of PLS-SEM structural model

Since PLS-SEM is a prediction oriented technique, it is also important to examine the predicative accuracy and predictive relevance of the model. Table 9.15 exhibits the results of TPB model predictive accuracy and relevance. The predictive accuracy is commonly measured by the coefficient of determination ($R^2$) which is calculated as the squared correlation between the actual and predicted values of a given endogenous construct in a structural model, and thus, representing the amount of variance that can be explained by the predictor constructs. Accordingly, a well-developed model should convey satisfactorily high $R^2$ values (Hair et al. 2014: 174f). The PLS-SEM algorithm procedure provides $R^2$ values for the endogenous latent constructs. In the current study, $R^2$ values of the TPB endogenous constructs vary from a small value of 0.14 in the case of subjective norms to a substantial
value of 0.66 in the case of the decision to adopt organic FFV production. However, all these values were found to be much greater than the minimum $R^2$ values required in a quantitative research (Cohen 1988, 1992, Hair et al. 2014: 21), and thus, indicating that the TPB model had a good predictive accuracy.

The effect size of a given predictor construct ($f^2$) on the predictive accuracy of a predicted construct within the TPB model can be calculated from the changes in $R^2$ values whether a given predictor construct is included in or excluded from the OLS path model of the predicted construct. The effect sizes of ATT, PBC, and SN on the predictive accuracy of BI and CONV are provided in Table 9.15. Attitudes had apparently the most important effect on behavioural intention, followed by perceived behavioural control, and subjective norms. With respect to the effect sizes of predictor constructs on the behaviour under consideration, behavioural intention had the largest effect on behaviour, followed by perceived behavioural control. Attitudes and subjective norms, however, possessed only very small effects on the behaviour.

<table>
<thead>
<tr>
<th></th>
<th>Model predictive accuracy</th>
<th>Model predictive relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$R^2$</td>
<td>Effect size on behavioural intention ($f^2$)</td>
</tr>
<tr>
<td>CONV</td>
<td>0.658</td>
<td>-</td>
</tr>
<tr>
<td>BI</td>
<td>0.524</td>
<td>-</td>
</tr>
<tr>
<td>ATT</td>
<td>0.389</td>
<td>0.212</td>
</tr>
<tr>
<td>PBC</td>
<td>0.381</td>
<td>0.050</td>
</tr>
<tr>
<td>SN</td>
<td>0.142</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Note. $N=266$. The predictive accuracy of the TPB endogenous constructs is calculated by means of PLS-SEM algorithm, while the predictive relevance of those constructs is obtained by blindfolding procedure of PLS-SEM. All input and output data of PLS-SEM are standardised.

$Q^2 > 0$: Endogenous construct has predictive relevance. $f^2$ and $q^2$ values of 0.02, 0.15, and 0.35, respectively, represent small, medium, and large effects on the prediction of BI and CONV.

Source: own data.
For assessing the predictive relevance ($Q^2$ values) of the PLS-SEM structural model, the blindfolding procedure was utilised. The blindfolding procedure is a resampling technique that omits and predicts every data point of the indicators in a reflectively endogenous construct (Hair et al. 2014: 198f). By specifying an omission distance of 5 and choosing one of the endogenous constructs to run the blindfolding procedure on it, the model predictive relevance of the specified construct could be estimated. The omission distance of 5 denotes that every fifth data point in a given reflective indicator of the chosen endogenous construct would be deleted and predicted in each blindfolding round. Hence, five rounds of blindfolding procedure were required until all data points are omitted and then predicted. $Q^2$ values indicate the extent to which the observed values of reflective endogenous indicators (which are omitted in blindfolding procedure) can be reproduced by the structural model of PLS-SEM (Henseler et al. 2009: 303, Chin 2010: 679f, Hair et al. 2011: 145). A detailed overview of the PLS-SEM blindfolding procedure is given in Chapter 7.

After obtaining the $Q^2$ value of the specified construct, the blindfolding procedure was repeated in the same manner with the other reflective endogenous constructs in the model, each a time. The results in Table 9.15 show that the PLS-SEM structural model had predictive relevance for all TPB endogenous constructs, where all $Q^2$ values were found to be greater than 0. In terms of $Q^2$ values, subjective norms had the lowest predictive relevance within the TPB model, while the behavioural intention and behaviour were the constructs with the highest predictive relevance.

With analogy to the way how effect size ($f^2$) was obtained from the changes in $R^2$ values, the relative effect of the predictive relevance ($q^2$) were calculated from the changes in $Q^2$ values whether a given predictor construct is included in or excluded from the OLS path model of the predicted construct. Table 9.15 indicates that the result patterns of the effect sizes of construct’s predictive relevance on the behavioural intention and behaviour were similar to the effect sizes of predictive accuracy. Though PBC’s effect size of predictive relevance on the behaviour was large, its effect size on predictive accuracy was rather small to medium. This suggests the relative importance of PBC in predicting the behaviour under investigation as it is assumed by the TPB model. In the next chapter, a general discussion of the thesis’ findings is given and then conclusions and recommendations are drawn.
10 Discussion and conclusions

In this chapter, the findings of the dissertation are briefly discussed and conclusions drawn from the results are presented. The first section of this chapter provides a concise review of the thesis statements, emphasises the key findings, and synthesises the main issues arising from the investigation of research questions and study objectives (see Chapter 1). In this section the findings from the farmer survey are contrasted with previous studies. Merits and limitations of the current study are then highlighted and discussed. The second section of this chapter is dedicated to the conclusions and recommendations to promote the Syrian organic sector. Directions and areas of future research regarding the adoption of organic farming among Syrian farmers are suggested at the end of this dissertation.

10.1 Discussion

10.1.1 Composition of the thesis findings

Overall, this thesis aimed at exploring the market potential of Syrian organic FFV in Germany. For this purpose, three research questions reflecting the study objectives have been sequentially investigated (see Chapter 1). A twofold methodological approach combining expert interviews and a farmer survey were used in this research. While expert interviews were conducted with German and Syrian wholesalers of (organic) FFV in 2011 (9 interviews each), the farmer survey was administrated with 266 Syrian farmers of FFV in the main region for the production of FFV from November 2012 until May 2013.

10.1.1.1 Perspectives of German importers regarding the import potential of organic FFV from Syria

Findings from the interviewed German companies show that Germany mainly imported fresh (organic) vegetables and large amounts of fresh (organic) fruit from the EU neighbouring countries: Spain and the Netherlands were by far most important, followed by Italy and Belgium. The Netherlands and Belgium are important transport hubs for the import of (organic) FFV from all over the world by sea freight (via Rotterdam) or air freight (via Maastricht). Some of the organic FFV were imported from the Mediterranean Non-EU countries, particularly in the off-season of the EU Member States. Round, bush and cherry tomatoes, capsicum, citrus fruit, seedless grapes, and pomegranates were the most important
organic FFV being exported to Germany from the Mediterranean Non-EU countries. Among those countries, Israel, Egypt, Turkey, and Morocco were the main suppliers for organic FFV in 2010. None of the interviewed companies reported any import activity of organic FFV from Syria between 2008 and 2011.

The findings also show that the interviewed companies were generally satisfied with quality requirements, logistics and transport issues regarding the imports of organic FFV from the Mediterranean Non-EU countries in 2010. However, a main concern of most of the interviewed importers was to enhance and boost the cooperation and transparency alongside the value chain of organic FFV originating from these countries. Regarding the imports of organic FFV from Syria, the interviewed importers mentioned specific requirements concerning the import potential for some fruit and vegetables. Besides the EU compulsory minimum standards for organic produce, they were also concerned about quality and logistics issues. According to those interviewees, fresh produce in the off-season (mainly winter time in Germany) has the best chances for market access. During periods when there is a shortage in German supply, lower import duties and higher import quotas are set for different fruit and vegetable species. This is particularly true for some organic vegetables that always have a market potential like tomatoes, sweet peppers, cucumbers and spring vegetables, and additionally some organic fruit like citrus fruit, white and seedless grapes.

10.1.1.2 Perspectives of Syrian exporters regarding the export potential of organic FFV

Regarding the second objective, results based on the interviews with Syrian exporters of (organic) FFV show that considerable amounts of different varieties of FFV have been exported. Before the political rumours and war situation in Syria, FFV were mainly exported to the neighbouring countries, the Gulf States and Northern Africa as well as Eastern Europe. Yet, Syrian exports of FFV to high value markets in countries like Germany have been small.

By the time of interview conductions, Syrian exports of certified organic FFV were still novel and the destination markets of those products were mainly the emerging niche outlets in the Gulf States. No concrete data exist about the exported volume of organic FFV. However, it can be assumed that their volume was relatively small compared to the scale of Syrian exports of FFV. Two of the interviewed Syrian exporters perceived that the Gulf markets have potential for further demand of Syrian organic FFV in the future (after 2011). This can be
explained as the number of specialised outlets for organic products was growing in big cities in the Gulf States over the past few years. For instances, outlets of *Organic Watania, Fleet Organic Center, Abazeer, Bio-Best*, and supermarkets with organic products section such as *Carrefour, Tamimi, and Danube* are currently booming in Riyadh and Jeddah in Saudi Arabia (SOFA 2014). Likewise, several stores of *Organic Foods & Café, Greenheart Organic, Sophie’s, Spinneys and SuperMart* in Dubai and Abu Dhabi in the United Arab Emirates are mainly marketing organic products (Muhammad et al. 2015, Interviewee S1).

The interviewed exporters argued that most of the Syrian exporters were sourcing their FFV from the wholesale markets rather than from the farmers themselves, which is a disadvantage with regard to freshness and the fulfilment of specific needs of the export markets. Together with the lack of national associations or companies which are able to export fresh produce according to the standards of high value markets with a long term strategy, this is not a favourable situation for exports. The SAPEA was the only exception. By the time of interview conduction, SAPEA was still working to develop their methods and quality requirements for better access to the high value markets, including the EU markets. Sub-section 4.3.2.2.4 in Chapter 4 provided a detailed overview about SAPEA experience in exporting FFV to the EU markets.

Regarding the logistics concerning the export of fresh produce, Syria had a relatively large fleet of refrigerated trucks that transport Syrian FFV into the Arabic region (before 2011). However, most of Syrian trucks were unable to access European countries. That is particularly due to the scarcity of bilateral agreements with the EU and Eastern European countries in the field of transport and custom fees. As sea ports in Syria are not equipped with proper and modern cooling facilities sea transport is still not a common way for exporting FFV in Syria. Few interviewed Syrian exporters indicated that sea freight can still be perceived as a vital alternative for transport when considering future exports of (organic) FFV to the EU markets or even when expanding the export volume of FFV to the East European markets (Interviewees S1, 3, 7). That is feasible since sea freight is many times cheaper and more sustainable in terms of fossil fuel consumption (per km) than both road and air freight to destinations like the EU and Eastern Europe. That is particularly relevant in the case of some Western European countries as public concerns about the issues of food miles and energy use for transport are becoming more and more important in European countries (e.g. Foster et al. 2006, Stancu and Smith 2006, NRDC 2007, Reisch et al. 2013, Albisu 2014) and especially
among organic food consumers (e.g. Rigby and Bown 2003, ITC 2007, Sirieix et al. 2011, Hermansen et al. 2013). Against this background, it can be argued that importing (organic) FFV by sea freight from Syria to the high value EU markets (like Germany) would have a lower energy consumption than producing organic FFV in Europe in winter and early spring when the cultivation of FFV takes place in greenhouses.

10.1.1.3 Perspectives of Syrian farmers towards organic FFV production

Regarding the third objective, results of the farmer survey reveal that many of the interviewed farmers had heard about the term ‘organic farming’ through different sources. The vast majority of farmers indicated that they use ‘low chemical inputs’ on their farms, and that their current practices for maintaining soil fertility and for pest control includes at least one of the practices that are part of certified organic production. For instance, many farmers indicated the application of livestock manure for maintaining the soil fertility together with the use of biological enemies and physical and pheromone traps for the purpose of pest control. These practices can be considered as good pre-conditions for the adoption of certified organic FFV production among Syrian farmers.

The majority of interviewed farmers demonstrated favourable attitudes towards organic farming aspects. In this vein, farmers rated many statements regarding the environmental, health and economic aspects of organic agriculture positively. Interestingly, attitudes about protecting the environment and providing healthy food for family members were rated higher than attitudes towards economic and profitability aspects of organic farming. The results of PLS-SEM estimation of the adopted TPB model provided further confirmation that farmers’ positive attitudes and perceived behavioural control towards a conversion to organic FFV production had a positive influence on the behavioural intention to convert. Interviewed farmers perceived social pressure towards a conversion to organic FFV production to play only a minor role in forming their behavioural intention in this study. These findings are in line with the TPB assumptions, as the path coefficients linking the TPB components are highly significant and the total effect coefficients that demonstrate the chain of causal effects from the set of salient beliefs to behaviour (adoption of organic FFV production) in the TPB are highly significant. These results give evidence that the TPB was an appropriate and satisfactory theoretical framework for modelling the conversion to certified organic farming among Syrian farmers of FFV. Finally, to the extent that farmers have sufficient actual control
over the conversion process within the next five years (after 2013), farmers with positive behavioural intentions are anticipated to convert their farms to organic FFV production within the specified period.

In accordance with the findings of the present research, a study from Iran by Asadollahpour et al. (2014b) found the TPB model as a largely relevant and constituent model for predicting the conversion to organic farming among rice farmers in Iran. This study also indicated that attitudes and subjective norms towards the conversion decision were the main drivers of behavioural intention, while perceived behavioural control was found to be insignificant. Interestingly, unlike the present study, Asadollahpour and his colleagues found perceived behavioural control to have a stronger effect on the conversion decision than the behavioural intention had (Asadollahpour et al. 2014b: 1665f). This can be explained as Iranian farmers were found to be risk-averse, and the challenges and costs of the conversion to organic farming were more relevant in their decisions than their motivations towards the conversion (Asadollahpour et al. 2013, Soltani et al. 2014). In a study from Malaysia, Terano et al. (2015) investigated the factors influencing the intention to adopt sustainable agricultural practices. By applying a multiple linear regression model, Terano and his colleagues found that perceived behavioural control and attitudes were the main drivers of the behavioural intention among Malaysian farmers, while subjective norms were found not significant. The level of farmers’ awareness and knowledge about sustainable farming practices were also found to have direct effects on the behavioural intention in this study (Terano et al. 2015: 268f). That is in line with findings obtained from the TPB model in the present research. Finding from Herath and Wijekoon (2013) also showed the importance of the farmers’ attitudes and the level of perceived behavioural control, together with the availability of technical and marketing assistance, in the decision to adopt organic coconut production in Sri Lanka (Herath and Wijekoon 2013: 5f).

In contrast to the findings of the present research, Hattam (2006a) found that Mexican farmers had generally positive attitudes towards organic avocado production; however, their intentions to adopt organic farming were rather weak, suggesting that favourable attitudes alone are not sufficient to explain the behavioural intention. Moreover, the influence of perceived social pressure and perceived ease of conversion were found to be influential on farmer’s intention to adopt organic avocado production (Hattam 2006a). A study from Jharkhand in India indicated that vegetable farmers were found to have a strong intention to use pesticides within
the next year in order to obtain a better harvest. Farmers’ intentions were mainly driven by their positive attitudes towards the application of pesticides on their farms and to a lower extent by their favourable subjective norms and perceived behavioural control (Bond et al. 2009: 53f). Similarly, in another study from Jordan, Al-Oun and his colleagues (2008) indicated that organic farming was negatively perceived by Jordan farmers in Al-Badia (i.e. steppe), since the conversion to organic farming is perceived as complex and incompatible with their existing experiences and knowledge alongside with risk propensity and low profitability under the semi-arid climate in Jordan steppe (Al-Oun et al. 2008: 1f).

With respect to farm and farmer characteristics, the results of the present study show that a strong intention to convert to organic agriculture can be seen particularly among farmers who were already using many organic practices and low chemical inputs. Furthermore, the intention to adopt FFV production was particularly strong with Syrian farmers who had a better educational level and a better income obtained from FFV cultivation. Interestingly, the majority of interviewed farmers of FFV in the present research obtained at least a high school degree. In contrast to this finding, many studies from developing countries demonstrated farmers to have a lower educational level such as Hattam (2006a, 2006b) in Mexico, Sarker et al. (2010) in Bangladesh, Pornpratansombat et al. (2011) in Thailand, and Karki et al. (2011) in Nepal. Furthermore, farmers’ age and experience in cultivation of FFV had only played a small role on the decision to adopt organic FFV production within the next five years. Interestingly, Sarker and Itohara (2008) and Karki et al. (2011) found that older and more experienced farmers can better cope with organic farming practices than younger farmers who usually have less experience in farming. These two studies further indicated that farmers with larger land holdings (i.e. sign of farmers’ richness in Nepal and Bangladesh) have a greater ability to convert their farms to organic (Sarker and Itohara 2008, Karki et al. 2011). The land holding in Syria is also an important indicator of farmer’s wealth. However, in the present research, the farm size did not show a direct influence on farmers’ intention to convert to organic FFV production within the next five years. Nevertheless, the farm size and other farm and farmer characteristics (such as the educational levels of farmers and their income from FFV cultivation, farmers’ current practices on their farms and their general attitudes about organic farming) were found to have indirect effects on the behavioural intention to adopt organic FFV production. In accordance with the TPB assumptions, these variables served as background factors that had direct influences on the set of accessible beliefs from which the attitudes, perceived behavioural control, subjective norms, and behavioural intentions were
Syrian farmers of FFV perceived that organic farming can be more profitable than conventional farming, though they indicated that it is difficult to find business buyers who are willing to pay higher prices for organic products. Farmers also stated that conversion to organic farming may require higher investment costs; however, they were not certain about the costs of certification and inspection issues. Additionally, they perceived that some of the required external organic inputs (seeds and pesticides) are expensive or not available in the local market. Interestingly, farmers indicated that an organic farming system is not too labour intensive and they can fulfill the volume of work needed. Remarkably, farmers perceived organic yields to be not significantly different from the yield of its conventional counterpart. In contrary to these findings, Herath and Wijekoon (2013) found that conventional farmers of coconuts in Sri Lanka perceived the organic yield as too low compared to the conventional ones. A recently published meta-analysis study by Ponisio and her colleagues shows that the yields of organic farming are on average 19.2% (±3.7%) lower than the yields obtained from conventional counterparts, and that by using proper crop rotation systems and agricultural diversification practices this yield gap can decrease to less 10% (Ponisio et al. 2015). Similarly, in another meta-analysis research, Seufert et al. (2012) stated that under given circumstances that include good management practices, particular crop types and growing conditions, yields in organic system can approximately match yields in the conventional counterpart. However, under other conditions the organic yield can be significantly lower than conventional yields (Seufert et al. 2012). Barmaki and his colleagues also found no significant difference of the yield of potatoes under organic farming compared to its level under conventional ones (Barmaki et al. 2008: 106f). Likewise, Ramos et al. (2014) found in a study from Brazil that vegetable cultivation under organic system on the high slopes with shallow soil in the Campestre catchment (Colombo, Brazil) was superior to its conventional agricultural counterpart for preserving the soil and water on the fragile lands. The organic system of vegetable cultivation also performed better than the conventional one due to minimising the nutrient loss from the soils in the long term. Nevertheless, this study found that in the short term, the losses of soluble nitrogen and bioavailable phosphors were higher in organic farming systems than those under conventional systems in the area under study (Ramos et al. 2014: 31f).

Due to the current war conditions in Syria and its consequences on the economic situation in
general and the industrial and trade sectors in particular, it can be assumed that farmers may further relinquish the use of chemical fertilisers and pesticides on their farms, since such inputs are not supported anymore by the state, and are becoming more expensive to afford. This condition may push farmers to search for cheaper alternatives and to rely more upon agricultural inputs from the local environment. Nevertheless, few interrogative issues remain crucial, especially the availability of some required external organic inputs, certification and inspection service, together with the accessibility to business buyers of organic products who are willing to pay a price premium. Likewise, no prior scientific evidence exists in Syria about the yield’s differences under conventional and organic agricultural systems. Future research should therefore consider investigating and examining the yield gap between these two agricultural systems under the situation in Syria and look for means to minimise such gap.

10.1.1.4 The role of different stakeholders in improving the Syrian export value chain of organic FFV

Export of organic FFV to the German market could deliver lucrative trade opportunities for Syria. Importing organic FFV into this market, however, presents a major challenge in terms of quality and prices. The strong competition among the actors in the German market of organic produce has significant effects on the import of organic food. German traders of organic FFV have become extremely demanding in terms of quality/price ratios, quantity and continuity of supply, services and communication. More than 60% of organic products being marketed in Germany are sold in supermarkets and discounter chains. Therefore, prior of seeking German market entry, Syrian exporters and farmers of FFV have to be sure that they can fulfil the demands of German importers. Thus, Syrian organic farmers and exporters of FFV have to adapt to the procuring strategies and criteria of buyer-driven international chains, including requirements for continual supplies, punctual delivery, quality, price, food safety and related issues.

On the supply side, the present research has shown that Syrian farmers of FFV had favourable attitudes towards organic farming alongside with a big interest of Syrian traders in exporting organic FFV to the German market. Thus, improving the cooperation, coherence and transparency throughout the value chain, from farmers up to the import point and vice versa, are crucial in order to overcome any barriers which can lead to delays in the value chain, and subsequently to avoid any quality problems. Additionally, continuous work to modernise the Syrian traditional value chain of FFV and to improve the transport and logistics infrastructure
will help in increasing the competitiveness of Syrian exports of (organic) FFV in the EU markets.

Though Syrian farmers had positive intentions to convert to organic farming within the next five years, initiatives of governmental institutions, NGOs and international development agencies about organic farming are important to spread further information about conversion, certification and quality requirements for their organic produce. Such initiatives should also give particular attention to inform more about the continuously increasing demand for fresh organic produce in the regional and international markets, alongside with boosting farmers’ perceptions and awareness of the economic, health and environmental benefits of producing fruit and vegetables organically. These initiatives should not overlook or underestimate the important role that can be played by successful producers of organic FFV in the coastal region at helping and motivating farmers to convert their farms to certified organic FFV production. Farmers are inclined to have high faith in experience-based information provided by successful organic farmers. The role of wholesalers and exporters with interest in organic FFV can also be decisive at motivating farmers to start the conversion process through offering long term contracts.

Finally, in the pre-war time, Syria had been a major producer and exporter of various agricultural products in the Middle East and the agricultural sector was a significant source of income for many Syrian families. Thus, once Syria is stabilised and the economic relationships with the EU are resumed, exporting organic FFV to the high value EU markets (including Germany) under the EU Mediterranean Association Agreement will indispensably offer great chances for Syria at gaining foreign currency needed to help in rebuilding the country in the post-war.

10.1.2 Merits and limitations of the study

Foremost, this research is the first empirical study at exploring the export potential of Syrian organic FFV to the German market. Opinions and perceptions of German importers and Syrian exporters of (organic) FFV were explored, together with an in-depth investigation of Syrian farmers’ attitudes, opinions, and perceptions towards producing organic fruit and vegetables. According to the author’s knowledge, no previous research has been done regarding Syrian farmers’ attitudes towards organic farming. The current study represents a
contribution for understanding of the intentions and attitudes of Syrian farmers of FFV towards organic farming and the likelihood of converting their farms to certified organic production within the next five years. The findings of the present research can be particularly helpful for governmental institutions, NGOs, peasant unions and private stakeholders who are interested in certified organic FFV at drawing and implementing an appropriate action plan for further advancement of the organic sector as a tool for development in Syria. Based on the study and a literature review, a proposal of an action plan for the development of organic agriculture in Syria is presented in the next section of this chapter.

With respect to the theoretical and methodological approach of the present study, only few studies so far investigated the conversion to organic farming upon either partially or fully implementation of the TPB as theoretical framework (e.g. Wehinger et al. 2002, Hattam 2006a, McCarthy et al. 2007, Läpple 2010, Asadollahpour et al. 2014b). Unlike the current study, none of these studies, however, used the approach of PLS-SEM as the main tool to analyse and examine the causal relationships among the theoretical model. In the present study, the adopted TPB model showed its aptitude and importance as an appropriate theoretical framework for modelling and understanding the decision-making process of Syrian farmers with regard to the adoption of organic FFV. By boosting and augmenting the economic model of organic farming with a social psychology model of behaviour and ideas from rural sociology, as it was presented in the adopted TPB model, this research makes a substantial contribution to the literature regarding a new technology adoption in developing countries. Thus, the different constructs of the TPB were able to capture and combine a wide range of information needed for decision-making in one single model. Accordingly, the adopted model included farmers’ beliefs, perceptions, subjective norms, and attitudes about different aspects of organic farming (i.e. economic, environmental, health, and animal welfare) to predict farmers’ intentions and the likelihood to convert their farms to organic FFV within the next five years. Obtained results of PLS-SEM confirm the stipulated relationships within the theory and provide further evidence about the profound role of the TPB model used in this study.

The present investigation also exhibits three major limitations. Firstly, this study has not sufficiently been addressing the opinions and attitudes of German importers and Syrian exporters towards supporting farmers in their conversion process to organic FFV production. Due to the political situation in Syria, some investigations on the organisation of value chains,
which have been planned before, could not be conducted. In addition to that the number of interviewed German and Syrian companies of (organic) FFV was relatively small. Thus, further investigation is needed to examine the role of importers and exporters of organic FFV on farmers’ decisions to adopt certified organic production through contract farming dedicated for export to the EU markets as well as a further investigation on value chain management issues.

Secondly, though the methodological approach to model decision-making of farmers was reasonable, few variables were problematic, particularly those of subjective norms, whose reliability indices were only medium and thus affect the contribution of this construct at explaining the variance in the behavioural intention. Additionally, the role of pioneer farmers, heads of rural communities, governmental institutions, and wholesalers were not explicitly identified by separate variables. Instead, they were implicitly mentioned in the more general term as ‘important others for farmers’ though farmers believed that those groups are important in influencing their decisions with respect to farm management. In spite of other constructs in the TPB model, namely behavioural intention to convert and conversion to organic FFV production showed very high reliability indices, they were however measured only by two variables each. This issue needs to be explored further by constructing two to three additional variables for each of those constructs. That will be appropriate to detect whether any substantial change may occur in the strong relationships that have been found empirically among the constructs within the TPB framework. This procedure also provides the possibility to detect if any significant changes may take place in the robustness and predictive ability of the TPB model.

Thirdly, the area of study and the sample size should be critically discussed. The coastal area of Syria was chosen for this research because it is the leading area in producing FFV in Syria, however, other areas (Darra, Damascus Rural and Homs Rural) in which considerable amounts of FFV are produced, were not investigated due to current war situations in those areas. Therefore, multi-group analysis among different areas to compare differences was not possible. Thus, further investigations should consider those areas in order to be able to generalise the findings for Syria. Furthermore, the relatively small sample size of the farmer survey may also play a role in hiding sources of heterogeneity in data. Therefore, further investigation with a larger sample size than the one used in the current study is desirable.
10.2 Conclusions

The findings of this dissertation yield implications for the different stakeholders who are interested in prompting the Syrian export of organic products. In this final section, conclusions are drawn for farmers, processors, and traders of FFV in public and private sector to achieve their goals for organic farming, together with recommendations for policy makers and NGOs to smooth the organic movement in Syria. This dissertation closes then with suggestions for future scientific research.

10.2.1 Recommendations for stakeholders to develop organic agriculture in Syria

Like in many developing countries in the Mediterranean region, development of organic farming in Syria is export-geared and the local market for organic products is just dawning. So far, policy makers in Syria considered organic agriculture as a small move into a niche export market (Pugliese 2007: 93, Malorgio 2008: 2, Santucci 2010: 50). The development of the organic sector however requires a holistic and integrated approach, which takes into consideration the cooperation and coordination among the different actors who are involved in the organic sector (Dabbert et al. 2004, Al-Bitar and Pugliese 2008, Malorgio 2008, Bteich et al. 2010, Santucci 2010). Based on the analysis of data obtained from the farmer survey and expert interviews with Syrian exporters and German importers of (organic) FFV, this section is dedicated to provide some recommendations and suggestions for policy makers in their endeavour for setting up a national organic action plan. The development of such a plan would be a useful tool to pave the way for the further development of the Syrian organic sector after the current war in the country comes to an end, and it may thus facilitate Syrian exports of organic FFV to the EU markets. The suggestions are also based on previous published recommendations of scientists and stakeholders for organic action plans in other countries (Dabbert et al. 2004, Al-Oun 2007, Al-Bitar and Pugliese 2008, Rundgren 2008, Vairo et al. 2009, Padel et al. 2010, Santucci 2010, Twarog 2013, Adebiyi 2014, Moeskops et al. 2014).

10.2.1.1 General recommendations for an intervention policy for organic agriculture

Any intervention policy wishing to switch the attention from supporting conventional farming to the development of the organic sector should cover the following points: analysis of the current situation of organic farming, identification of barriers and potentials, instruments and
addressees, priorities, and monitoring and control (Dabbert et al. 2004, Rundgren 2008, Santucci 2010, Twarog 2013). With regard to the Syrian organic sector, these general points of intervention can briefly be described as follows:

a) Analysis of the current situation of organic farming as well as identification of barriers and potentials: A comprehensive review and examination of the present situation of organic farming in Syria should be considered by the policy makers as a vital component for the success of any action plan. Accordingly, this analysis should specify the areas (prime-sites) and products where organic agri-business might be more easily established, human resources requirements, organic production needs, research requirements, perspectives of the organic market (domestic and export), certification bodies (local and foreign) and accredited laboratories, legislation and regulation for organic produce originated from Syria and its compliance with the international regulations, as well as an internationally recognised accreditation body.

b) Objectives and strategic decisions: Combined with a clear analysis of the Syrian organic sector at present, a number of strategic decisions should be taken by policy makers as an attempt to establish an effective action plan for supporting this sector. Thus, important questions should be addressed by both governmental officials and private stakeholders in the agricultural sector in order to obtain a clear vision for organic farming: In which way should the organic sector develop within the next 5 to 10 years of time? How can the according objectives be reached? The Syrian organic sector represented only about 0.14% of the total arable area in 2011 (Willer et al. 2013: 47). Therefore, a plausible vision of the development in the next 10 years could be to reach a level of 5% of the arable area to be certified as organic. To achieve such a goal, policy makers should undoubtedly discuss objectives and strategic decisions with other stakeholders as the basis for a successful implantation of the action plan (Rundgren 2008: 13, Vairo et al. 2009: 215, Santucci 2010: 51). Accordingly, a number of meaningful indicators should be considered: the support that should be given to the organic farming in Syria within the next 10 years as an alternative to conventional farming systems, the areas and number of farms to be converted, the output volume to be reached and the market opportunities (including export potential) to be investigated, extension agents and farmers to be trained, research projects to be initiated, labs to be established, etc.
c) Instruments and addressees: The action plan should pay attention to national regulations and financial support (subsidies, loans, grants, etc.) for all stakeholders along the value chain that consequently facilitate the conversion to organic farming within the pre-specified areas. This should also consider improving the functioning of the organic supply chain with particular emphasis on further cooperation among the different actors (farmers, traders, processors, etc.). This cooperation can be established through improving transparency, information flow, technology development, research, education and extension support (Dabbert et al. 2004: 128, Santucci 2010: 50f).

d) Priorities: The action plan should be balanced and feasible and it should take into account different instruments that are applicable by the various stakeholders. Thus, it is important to identify the priorities in order to have a logic development and not a hectic misuse of available resources (Dabbert et al. 2004: 136, Santucci 2010: 51).

e) Monitoring and control: It is necessary to have continuous monitoring and control in order to guarantee a smooth implementation of the action plan. Such control also helps to identify potential difficulties and to provide interactive solutions to deal with it (Dabbert et al. 2004: 136, Rundgren 2008: 13f). Therefore, a continuous check of the implementation and achievements of an action plan is a viable tool for improving this plan and ultimately reaching the desired objectives (Santucci 2010: 51, Twarog 2013: 180f).

10.2.1.2 Suggestions for a national organic action plan

The agricultural policy makers should consider all feasible options which can promote the organic farming sector in Syria while taking into account the abovementioned reasons and pillars of organic farming development. The most important areas and actions of an intervention policy for the development organic sector in Syria can be resumed as follows:

10.2.1.2.1 Strengthening the position of organic farming in general agricultural policy

The findings of this dissertation show that Syrian farmers had generally positive intentions and favourable attitudes towards the adoption of organic FFV within the next five years. That
is alongside with a growing interest of Syrian exporters of FFV in organic produce. These are good pre-conditions for the further development of organic farming in Syria. Governmental officials at MAAR could use the findings of this dissertation to discuss and clarify realistic objectives for the development of the organic sector within the next five years. In order to have a clear vision for the agricultural sector in general and the organic sector in particular, the government should involve all stakeholders and incorporate civil society organisations at drawing the policies and related programmes as well as the respective action plans needed to realise and implement such policies. This procedure requires commitment, dedication and a period of time to be specified. The action plan should therefore state feasible aims and measurable goals for the organic sector to support all stakeholders and concentrate their efforts to achieve desired objectives.

10.2.1.2.2 Implementing the national legislation on organic agriculture to strengthen the credibility of the sector

National organic law in Syria and its operational instructions had been issued in 2012. This legislative framework was adopted after long time of preparation, taking into account the international standards of organic produce as benchmarks (see Chapter 1 for an overview). This is undoubtedly a very valuable step for the development of organic sector in Syria. Yet, further work is still needed to translate such legislations into force, since the route from passing the organic regulations until all pieces are put in practice needs time and resources.

In the present study, findings show that Syrian farmers and exporters of FFV were not yet well informed about the legislation and the regulations of organic produce as well as about the costs of respective certification issues. Therefore, it is recommended that the government and its affiliated institutions, together with an active engagement of NGOs and farmers cooperatives, work to communicate the legislative framework of organic farming to the likely stakeholders, providing regular consultations and periodically workshops and debates about these legislations and its operational implementations. Hence, the target is to make market actors contribute significantly to the development of the organic value chain, including the fields of production, processing, trade and even in providing certification and services to the organic sector.

Moreover, since Syrian organic products are export-driven and mainly targeted to the European markets, continuous updating of Syrian legislations of organic produce should take
into account the development of legislations and requirements of import countries. In post-
war, it is therefore recommended to apply for the recognition and compliance of the national
organic standards with the well-established international standards such as the EU regulations
of organic agriculture. In the long term, such a step can smooth the flow of Syrian organic
products to the EU markets to a great extent.

10.2.1.2.3 Facilitating the process of certification and accreditation

Products marketed as organic require mandatory certifications. Such certifications give proof
of quality guarantee and also provide protection for both producers and consumers of organic
produce from fraud and false proclamations. This implies that certified organic products
should be subject to a process of control and inspection, which is done by recognised
certification bodies. This is essential to ensure that marketed organic products fulfil the
requirements of organic standards and regulations under which those certification bodies are
operating. Accordingly, certified organic products may offer producers the opportunity to
obtain a price premium, to access high value international markets, and to meet the national
demand of organic produce. However, in many developing countries including Syria, the
process of achieving certification is still difficult and costly. Many farmers of FFV in the
present study perceived the costs of certification and inspection services to be relatively high.
Hence, it represents a major hurdle for the conversion to organic FFV production. In Syria,
the process of control and inspection of organic products has mainly been provided by foreign
certification bodies (particularly European ones), which is a rather expensive solution. To deal
with such problem, the government and NGOs should work to facilitate the access of
stakeholders to required certification services. That is by stimulating foreign certification
bodies to inaugurate local offices in the short term. Moreover, in medium and long term,
supporting the development of national service providers should be considered as priority.
Therefore, domestically based certification bodies need to be established. This procedure can
decrease the reliance on foreign certification bodies and consequently lowering the costs of
certification and inspection.

With respect to accreditation services, MAAR should actively be engaged to reinforce and
boost the role of the Syrian Bureau of Organic Agriculture (SBOA) in promoting the organic
sector nationwide. Therefore, continuous work is needed to strengthen the cooperation of
SBOA with other national institutions: the Syrian Centre for Services Accreditation and also
with the Syrian National Programmes of Supporting Quality Infrastructure. Such cooperation is important and should be continued in order to get the expertise available at these institutions in building qualified and competent staff of the SBOA as well as providing supervision and accreditation services over the SBOA’s activities.

Importantly, MAAR should resume the cooperation with the international organisations and foreign donors (such as IFOAM, FAO and GIZ) because such cooperation is still needed for the endogenous development of the organic sector and capacity building. The collaboration with international organisations can even pave the way to a better access to international markets of organic products. In the short term, it is also recommended for SBOA to work with the International Organic Accreditation Service (IOAS), a renowned branch of IFOAM. In the short and medium term, IOAS could be an option to provide SBOA with the support needed for the technical and procedural assessment parts of the accreditation process or even it can provide SBOA with the entire accreditation service. This in turn would facilitate the future application\textsuperscript{44} for the inclusion of Syria into the EU list of recognised third countries with regard to the Regulation No. 1235/2008 (EC 2008b) as well as helping at establishing national certification bodies recognised by the EU organic regulations. This may also help to overcome other challenges such as establishing accredited laboratories (public or private) with the proper equipment for analysing samples of organic produce, soil and plants. Additionally, technicians should be trained and qualified to perform the required physical, chemical, microbiological tests for the organic produce and to ensure the compliance of these products with the quality standards of international safety systems and globally renowned organic regulations.

\textbf{10.2.1.2.4 Initiating programmes for research, extension training and dissemination of knowledge}

Though farmers in this study showed positive attitudes towards various aspects of organic agriculture, further research and training programmes about organic agriculture should be continued in order to educate farmers and boost their favourable attitudes about organic practices. In this respect, some areas of intervention should be considered. It is a matter of fact that almost all of Syrian scientists are affiliated to conventional schools of agriculture and

\textsuperscript{44} It should be however considered that such an application can be achieved on the long term strategy, since the application procedure requires a lot of time and work. Nevertheless, for a medium-term, certification services can be done by authorised foreign certifiers who are operating in the Middle East.
their knowledge on certified organic farming may be poor. The starting point for such intervention should be to provide Syrian agronomists and farmer advisors with a solid knowledge of certified organic agriculture, so that they are able to provide interested farmers with appropriate extension and consulting services about organic agriculture. Accordingly, extension and advisory services should cover all important aspects to implement an organic farming system, including practical and technical aspects of production together with the necessary knowledge on the specific economic and marketing issues in organic farming.

The educational and training programmes should be incorporated in educational curricula through providing courses about organic farming at Syrian faculties and schools of agricultural sciences, together with offering the opportunities for interested scientists and agronomists to get in touch with foreign renowned universities and institutions regarding organic agricultural research and its recent trends. The MAAR and GCSAR with cooperation of national and international NGOs should also be actively involved in research and development of organic agriculture in Syria. This can be facilitated by establishing units or even independent research centres with a principal focus on applied research devoted to organic agriculture. Such applied research programmes should cover the different levels of the value chain of organic products from the farm up to final consumers. Likewise, stakeholders (i.e. farmers, certifiers, traders, providers of extension and consultancy services, etc.) should be involved in a holistic and participatory approach to the research design, application and outcome evaluation of governmental programmes to introduce organic agriculture. This would enable stakeholders to combine their traditional expertise with a modern knowledge acquired from the applied research. Consequently, such research centres may also facilitate the implementation of effective extension and advisory programmes that favour knowledge exchange among farmers and advisors as well as stimulating the principle of knowledge sharing among farmers themselves. This can be facilitated by means of demonstration plots devoted for organic practices in the areas under consideration. This may also help at promoting and boosting the concepts of farmer field schools of organic agriculture, participatory learning among farmers, and establishing organic farmers’ cooperatives in these areas.
10.2.1.2.5 Expanding the domestic demand by governmental and NGOs initiatives

Many farmers in this study perceived that it is hard to find business buyers who are willing to pay higher prices for the organic products. Interestingly, the majority of farmers were convinced that local consumers, particularly in large metropolitan cities, would be willing to pay a price premium for organic produce. Accordingly, governmental and non-governmental initiatives should not only engage in setting the general regulatory framework of organic produce, but are also important to promote the domestic consumption of organic products. This can be achieved by national promotional campaigns for raising consumers’ awareness about the benefits of organic agriculture. Moreover, a particular emphasis should be given to communicate and promote the recent established national logo of Syrian organic products in order to be easily recognisable by consumers.

Joint initiatives of civil society organisations and local governorates’ halls (especially in the big cities) can further promote the consumption of organic food among urban public. Another possibility is to reserve spaces in the home-grown trade fairs\(^{45}\) for the locally produced organic food. In such niche markets, local governorates and civil society organisations can also play a role by bringing together the different stakeholders of the value chain with consumers. Furthermore, cooperatives of organic farmers should also be encouraged to play a role in direct marketing activities of organic products. That is by supporting these cooperatives to organise a joint supply, storage facilities, packaging and an effective distribution. Product presentation at national fairs would also help to build ties and mutual trust between organic farmers’ cooperatives and business buyers. Local governorates can also promote the consumption and demand of organic food through integrating such products into the public procurements.

10.2.1.2.6 Improving the access to foreign markets

Parallel to establishing and expanding the local market for Syrian organic products, promotional activities abroad should be supported and organised in the prospective

\(^{45}\) Home-grown trade fairs are frequently held in trade and public facilities belonging to the local governorates halls. These fairs are usually organised by Syrian chambers of commerce and dedicated for promoting and supporting the products of local small and medium enterprises. Such products may include hand-made products and locally produced goods including agricultural and dairy products. These fairs also pay a particular attention to present goods produced by women under national projects for women’ empowerment in the society (Ministry of Labour and Social Affairs 2015).
destination markets (particularly in the Gulf and European markets). In this vein, the active participation of Syrian companies at specialised trade fairs abroad should be considered as a priority. For instance, the participation of Syrian agri-business companies and organic farmers’ cooperatives in the internationally renowned trade fair of organic products in Germany (i.e. Biofach) will be a good option to start with. A regular attendance at Biofach and similar fairs can provide tremendous opportunities to introduce a wide assortment of Syrian organic products into the high value markets. Consequently, such fairs may also facilitate business-to-business trade with the EU leading import companies of organic products. The government together with Syrian chambers of agriculture, industry and commerce can play a significant role at helping interested export companies and farmers’ cooperatives of organic products to actively participate in the international fairs through providing support for export activities (such as exemption from export tax) in the short and medium term, bearing a part of the fair costs, or even by their direct participation in such fairs to provide an umbrella for an active participation for the private companies.

Many developed countries (including the EU Member states) apply control systems for the organic imports from third countries. Thus, it can be assumed that Syria should consider the adoption and implementation of similar mandatory governmental regulations of organic produce as the easiest way to get an access to these markets. Adoption of the EU regulation of organic produce for instance will be an indispensable tool for assisting Syrian organic producers and traders to gain access to the EU markets through equivalence promises. As this ambitious goal is however costly and time consuming, the only short term path to expand the access of Syrian organic products to the EU markets is getting the required certificates through recognised certification bodies that have the authorisation to certify according to the EU regulation of organic produce (see sub-section 10.2.1.2.3).

### 10.2.1.2.7 Expanding the conversion to organic farming

During the 1990s and 2000s, with support from international organisations, the Syrian government has been successful at promoting some sustainable types of agricultural systems among Syrian farmers (such as IPM system for citrus fruit, cotton, and olives and no-tillage farming system for grain and legumes production in fragile areas) (FAO 2011a, MAAR 2015c). Similarly, the government may unveil programmes to encourage farmers to convert their farms to organic farming. Bearing in mind the favourable perceptions of organic farming
among interviewed Syrian farmers of FFV and their faith in MAAR initiatives, it is recommended for MAAR and its affiliated institutions to launch a comprehensive programme to promote the conversion to FFV production in the coastal region. This programme should give particular attention to the following points:

First, such a programme should consider guiding and assisting farmers by the available means to comply with the organic regulation and certification requirements as well as facilitating their access to the extension and consulting services needed for this purpose. Accordingly, government and/or NGOs should develop a simple consulting guideline booklet, in which farmers are provided with the required instructions about organic farming, since in many cases, farmers’ tendency to violate organic regulation comes from the misunderstanding or even lack of information. Thus, providing farmers with such instructions’ guidance could offer them a first access to information for an appropriate understanding of what is meant by certified organic farming. This can also serve as an important reference for backing farmers with a proper assistance needed at the implementation process.

Second, the government and NGOs can also encourage the conversion to organic farming by adopting a scheme that abandons the support of chemical fertilisers and other chemical inputs in agriculture. This scheme should rather set priority to direct the grants, tax reductions, and preferential conditions to credits and subsidies to support interested farmers to introduce organic farming practices on their farms. Area based subsidies devoted to organic farming should also be considered to help farmers in the early stages of conversion and particularly for the conversion period where the produce cannot be sold as organic. In this research, it has been found that many of the interviewed Syrian farmers traditionally used animal manure to keep soil fertility together with traps and biological enemies for pest control. These practices should be maintained and farmers should be supported to abandon the applications of any chemical inputs. Site-specific and on-farms resources should be appropriately used to minimise the need of external inputs. Thus, further integration of livestock and plant production is required (particularly in the case of horticultural sector). Agricultural systems that include crop rotation, intercropping, green manure, together with using traditional plant extracts should also be disseminated among farmers. The government should further consider supporting and subsidising farmers’ communities to establish small composting facilities for handling the organic waste originating from farmers’ households and their farms. This would be a good alternative to provide farmers with good quality compost. Moreover, the government and NGOs should actively work in order to make required external organic inputs
(such as seeds, seedlings, pesticides, and other fertilisers) available and affordable for farmers. That can be facilitated by establishing domestic stations for organic seed breeding, plants for organic fertilisers and pesticides, together with boosting GCSAR centres of proliferation and deployment of pests’ biological enemies.

Third, group certification\textsuperscript{46} systems should also be considered as an option. Group certification can substantially minimise the costs of certification paid by farmers, since the certificates are awarded to a farmer group rather than to each individual farmer (Lyons et al. 2013: 138). This option can be particularly useful for prompting organic agriculture among small-scale farmers in a given area. Within group certification systems, farmers should be organised in groups with an internal control system supervising the group’s activity over the implementation process. Thus, the role of external certification bodies is exclusive to inspect the internal control system rather than verifying each individual farmer within the group. Yet, farmers interested in group certification (especially the smallholders) might have a lack of information about this option. Therefore, it is recommended that MAAR and/or NGOs should work together with potential business buyers to launch group certification programmes among small-scale farmers in a given geographic area. These groups should then be provided by training programmes dedicated to help farmers to set up internal control systems. Such internal control systems should be responsible for the issues of farmer group management. These issues are mainly related to supervising farmers’ practices (both on-farm and post-harvest practices), record keeping and other activities required by other stakeholders in the value chain.

Fourth, an active communication between stakeholders within the value chain should be encouraged, together with continuous effort to improve the work conditions for farmers in the organic agricultural sector. Transparency and information exchange among the actors along the value chain of organic products can play an important role to overcome the challenges that this sector may face. Accordingly, the adoption of organic agriculture would be strengthened when the different stakeholders work together to encounter financial, technical, and administrative difficulties with their endeavour to sell the organic produce in the targeted markets (both domestic and export). In the medium and long term, other important policy options should also consider linking the local organic produce with geographical indications to refer to specific areas and locations within Syria. This may increase the trust and faith of

\textsuperscript{46}The concept of group certification of organic produce is still not officially acknowledged in most regulations, however through a counseling process by IFOAM, it has relatively reached an overall de facto approval, at least for farmers in developing countries (Rundgren 2008: 25, Lyons et al. 2013: 138f).
local consumers in national organic products and may also provide foreign customers with a transparent and traceable system needed to promote Syrian exports of organic products.

Finally, establishing an appropriate market information system can be beneficial for all stakeholders, and foremost for organic farmers. Such a system should consider to set up a business directory that includes the names and information about the operators in the organic sector, data about organic farms, locations, production, and marketing (domestic and export), regular and periodic reports of prices and available quantities of organic products, together with building an information base for organic products on the global markets. This system should also provide an outlook on trends regarding future production and consumption. Market data should be communicated to all concerned parties via available media channels.

10.2.2 Suggestions for future research

The current research was explorative in nature. Future studies should examine whether the findings of the present research can be generalised to all stakeholders in the Syrian value chain of (organic) FFV. Based on the finding of this research new research areas should be taken into consideration. The following three research areas have been identified and they deserve to be further investigated:

I. The present study reveals that the majority of farmers of FFV in the coastal region have been using ‘low chemical inputs’ on their farms. The low use of chemical pesticides among farmers, particularly those who mainly cultivate citrus fruit, can be viewed as a result of Integrated Pest Management (IPM) projects which have been launched at the beginning of 1990s in this region by governmental institutions with support from FAO. Many of the interviewed farmers in the present study participated in the IPM programmes, mainly through IPM field schools. Thus, it would be interesting to investigate the role of ‘organic farmer schools’ at helping farmers to establish and increase their knowledge about agricultural practices under certified organic farming. This investigation should also consider the important role of ‘organic farmer schools’ at helping to bring farmers interested in organic farming in touch with other stakeholders such as successful organic farmers, wholesalers and exporters, even importers. Ultimately, these schools might facilitate a further development of the organic sector in Syria.
II. Post-harvest operations represent a major challenge for (organic) FFV marketing, which can reflect positively or negatively on the product quality. Poor post-harvest technology and lack of cold chain infrastructure from the field via the wholesale market until the export hub consequently lead to quality degradation of FFV. Therefore, it is important to investigate how to bridge this gap and how to improve the cool value chain from the farm-gate into the marketplace, since FFV are perishable products and any delay in transit to the final destinations (particularly when FFV are dedicated for export) can critically reduce the shelf life of these goods.

III. Another issue concerning problems faced by intensive conventional agriculture in many developing countries should also be investigated in Syria: intensive conventional agriculture in those countries has been neither profitable nor able to maintain food security. Intensive conventional agricultural systems are still faced by three major challenges. Firstly, the high use of external chemical inputs in intensive conventional agricultural systems has frequently led to negative repercussions on the environment, health of humans and animals, biodiversity, soil fertility, and other natural resources (e.g. Brandt et al. 2013, UNCTAD 2013, Barański et al. 2014, Bilsborrow et al. 2014, Carrubba 2014). The careless use of chemicals also led to an increase of pest resistance towards those chemicals. Secondly, intensive conventional agriculture also needs the support of the state, for instance through subsidised prices for agricultural inputs including chemical fertilisers or reduced taxes along with subsidised prices for some of agricultural products (e.g. cereals, cotton, and sugar beets have been heavily subsidised by the Syrian government over the last three decades). Thirdly, the scarce natural resources are often used without counting the huge environmental costs of intensive conventional agricultural systems. This embodies the lack of attention to the environmental implications, such as deterioration of arable land, natural pastures and forests along with the pollution of air and water (e.g. FAO 2011b, Kremen and Miles 2012, Seufert et al. 2012, Ponisio et al. 2015).

In this respect, future research should examine and critically analyse the environmental costs of intensive conventional farming compared to an organic farming system in Syria. On the one hand, future investigation should consider the negative impacts of intensive conventional agriculture on the quality of life conditions
for humans and other beings in the rural areas where intensive conventional agricultural systems are still common. On the other hand, this investigation should also consider the role of a more sustainable alternative such as organic agriculture with regard to maintain food security and offer healthier food for ever-growing population in Syria. Such an investigation should also pay particular attention to the role of the organic farming system at mitigating the ecological challenges and degrading environmental conditions in Syria. Particularly the drought has been enduring to plague Syria over the last decade, together with the aggregate pressure of growing population over decreasing natural resources (water, arable land, grazing land, and forests). Ultimately, the adoption of a more sustainable approach in the agricultural sector should be integrated as a unique and essential part of any governmental policies and NGOs initiatives with respect to any future environmental discourse and agricultural policy in Syria.
References


References


References


Citrus Fruit Board (2011): Database of citrus fruit board, MAAR, Tartous, Syria.


References


References


Freshfel (2015): Fresh fruit and vegetable production, trade, supply and consumption monitor in the EU28. 12th, European Fresh Produce Association (Freshfel), Brussel, Belgium. Available at: http://www.freshfel.org/asp/what_we_do/consumption_monitor.asp (accessed 10.08.2015).


References


References


Hübschen, K. (2011): Integrated water resources management as a governance challenge for countries of the Middle East, with special focus on Yemen, Jordan and Syria. Logos Verlag Berlin GmbH.


References


Khazma, M. (2007): The marketing opportunities of apples produced under the integrated pest management (IPM) programmes in the Syrian Arab Republic. The Regional Project for Integrated Pest Management in the Near East GTFSP/REM/070/ITA.


MAAR (2014c): The website of the Ministry of Agriculture and Agrarian Reform (MAAR): Information on farmers field schools. Damascus, Syria (website in Arabic language). Available at: http://moaar.gov.sy/main/archives/category/%d8%a7%d9%84%d8%a5%d8%b1%d8%b4%d8%a7%d8%af%d8%a7%d9%84%d8%b2%d8%b1%d8%a7%d8%b9%d9%8a (accessed 14.10.2015).


References


References

Muller, A. (2014): Key factors influencing conversion to organic agriculture. Seminar at Organic Farming, Today and Tomorrow, December 3-5, INRA, Biovallée, FiBL.


References


References


Thomas, W.I., Znaniecki, F. (1918): The Polish peasant in Europe and America vol.1, Boston: Badger.


Appendices

Appendix 1

Appendix 1.1: Expert interview manual used to interview German importers of organic fruit and vegetables

Introducing myself to the interview partner and also introducing the objects of my research:

My name is Irwa Issa, a doctoral student at the faculty of organic agriculture in the University of Kassel. I am doing a research that might be interesting for you. The research is on (new) suppliers of organic fruit and vegetables for the EU markets. My focus is on the supply of the Mediterranean Non-EU countries. If you do not mind and of course if you have a little bit time (around 10 -15 min), I would like to ask you few questions with this regard.

1 Do you import organic fruit or vegetables from the Non-EU countries?
   Yes □ No □

2 Do you import fruit or vegetables from the Non-EU Mediterranean countries (e.g. Turkey, Egypt, Tunisia, Israel, etc.)?
   Yes □ No (If the answer is ‘No’ thank respondent and close interview)

3 Which of the Non-EU Mediterranean countries does your company import organic fruit or vegetables from?
   Could you please specify these countries?
   1 ______________________  2 ______________________
   3 ______________________  4 ______________________

The European-Mediterranean Association Agreement (AA):
Since 1995, the EU ensures imports from Non-EU Mediterranean countries. The EU set up country specific import quotas for agricultural products (including fruit and vegetables in specific periods) without taxes. That means that (organic) fruit and vegetables can be imported into the EU without any toll (off-season). By now, these import quotas are not used in full, so that there is room for higher imports.

4 Can you tell me, what are the most important fruit or vegetables do you import from those Non-EU Mediterranean countries? Could you please specify these products by the countries of origin?

<table>
<thead>
<tr>
<th>Product</th>
<th>Country of origin (Non-EU Mediterranean)</th>
<th>Quantities(if it is possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 Could you please tell me, in which months of the year does your company usually import these aforementioned fruit and vegetables from those countries?
<table>
<thead>
<tr>
<th>Product</th>
<th>Months of import</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Have any of the aforementioned products been short in supply in the last two years?
(That means that you wanted to import higher quantities than could be delivered.)

Yes ☐  No ☐

If ‘No’ go to question (7)
If ‘Yes’ continue (6.1)

6.1 Which of these products have been short in supply? And in which months did this shortage happen?

<table>
<thead>
<tr>
<th>Product</th>
<th>Shortage period of supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Have you ever faced any problems regarding required quality parameters of imported fruit and vegetables from your suppliers in the Mediterranean Non-EU countries?

Yes ☐  No ☐

If ‘No’ go to question (8)
If ‘Yes’ continue (7.1)

7.1 Could you please specify that (size, ripeness, colour, shape, etc.)?

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Have you ever faced any problem regarding the logistics of fruit and vegetables imports from those countries?

Yes ☐  No ☐

If ‘No’ go to question (9)
If ‘Yes’ continue

8.1 Could you please specify that?
9 As Syria is a partner country with the EU under (AA):
9.1 From your point of view, which conditions should be fulfilled so that your company would import organic fruit and vegetables from Syria?

Note: if the answer of question 9.1 includes that his/her company would import (organic) fruit and vegetables from Syria in future, the question 9.2 must only be asked to his/her company. However, in case of no interest for his/her company the question 9.2 must only be limited to (Germany)

9.2 Regarding organic imports, what are the issues that Syrian exporters should bear in mind when exporting organic products to your company or (Germany)?

9.3 In case there are some Syrian exporters of organic fruit and vegetables who would like to get an access to the German market, what would you recommend for them?

9.4 What is the best way for Syrian exporters of fruit and vegetables to have contact with the importers in Germany?

9.5 Under which conditions your company would be interested to support the production of organic fruit and vegetables in Syria (certification, price premium, etc.) in order to import from there?

Thank you for your precious time!
Appendices

Appendix 1.2: Expert interview manual used to interview Syrian exporters of (organic) fruit and vegetables

Introducing myself to the interview partner and also introducing the objects of my research:

My name is Irwa Issa, a doctoral student at the faculty of organic agriculture at the University of Kassel. I am doing a research that might be interesting for you. The research is on the potential export of Syrian organic fruit and vegetables for the EU markets. My focus is particularly on the opportunities for Syrian organic fruit and vegetables to have an access to the German market. The German market is by far the largest market of organic products in the EU and the second largest in the world after the USA. If you do not mind and of course if you have a little bit time (around 10-15 min), I would like to ask you few questions with this regard.

1. Do you export (organic) fruit or vegetables into other countries?
   Yes ☐ No ☐

2. Could you please specify these countries and products?

<table>
<thead>
<tr>
<th>Product</th>
<th>Export destination</th>
<th>Quantities(if it is possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Do you export (organic) fruit or vegetables into EU countries?
   Yes ☐ No ☐

3. Which of the EU countries does your company export (organic) fruit or vegetables to?

……………………………………………………………………………………………

4. What are the most important fruit or vegetables you do export to the EU countries? Could you please specify these products by the export destination?

<table>
<thead>
<tr>
<th>Product</th>
<th>Export destination</th>
<th>Quantities(if it is possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5 Could you please tell me, in which months of the year does your company usually export these aforementioned fruit and vegetables to those countries?

<table>
<thead>
<tr>
<th>Product</th>
<th>Export destination</th>
<th>Months of import</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 Which of these products have been short in supply? And in which months did this shortage happen?

<table>
<thead>
<tr>
<th>Product</th>
<th>Shortage period of supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 Have your customers ever faced any problems with your products because of demanding (better) quality standards?

Yes ☐ No ☐

If ‘No’ go to question (8)
If ‘yes’ continue

7.1 Could you please specify these problems (size, ripeness, colour, shape, etc.)?

1 ______________________________________________________________

2 ______________________________________________________________

3 ______________________________________________________________

7.2 What criteria do you use to assess the quality of your exported fruit and vegetables?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

8 Have you ever faced any problems regarding the logistics of fruit and vegetables exports?

Yes ☐ No ☐

If ‘No’ go to question (10)
If ‘Yes’ continue

9 Could you please specify that?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
10 From which regions do you source your exported fruit and vegetables?

<table>
<thead>
<tr>
<th>Product</th>
<th>Region in Syria</th>
<th>Quantities (if it is possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11 Which companies do you usually source your fruit and vegetables from?

1 direct from the farmers of fresh fruit and vegetables
2 Intermediates
3 Wholesale markets
4 others: ________________________________________________

If the answer number 1, go to question (12)

12 Have ever faced any problems with the farmers of fruit and vegetables regarding fulfilling the quality and quantity criteria?

Yes ☐ No ☐

If ‘No’ go to question (14)
If ‘Yes’ continue

13 Could you please specify that?

_____________________________________________________________________

_____________________________________________________________________

14 Do you usually have contracts with the farmers of fresh fruit and vegetables?

1 Oral contract
2 Written contract
3 Others: ________________________________________________

15 Have you ever participated in any trade fairs of fruit and vegetables In the EU? Where and when?

_____________________________________________________________________

_____________________________________________________________________

16 As I have mentioned before, that I am interested in the market access for Syrian organic fruit and vegetables into Germany. Can you tell me please, under which conditions in the future do you think that your company would be interested to support Syrian farmers (e.g. by sharing certification, price premium, etc.) to produce organic fruit and vegetables.

_____________________________________________________________________

_____________________________________________________________________

Thank you for your precious time!

294
Appendices

Appendix 1.3: Questionnaire of farmer survey with conventional Syrian farmers of fresh fruit and vegetables

Two advices for the interviewer to consider

1. The interviewer has to inform the farmers before starting the survey that their answers will be anonymised. They may, at any time, withdraw their participation, including the withdrawal of any information they have provided. If they complete the interview, however, it will be understood that they have consented to participate in this research and agree to the publication of the overall results of this research with the understanding that anonymity of the interviewees will be taken into account.

2. Furthermore, the interviewer has to be aware that some questions in this questionnaire have extra information which are italicised in brackets. Thus, the interviewer should read this extra information only in case of the question is not clear for the interviewees.

Part I: Fertilisers and pest control methods

1. How do you preserve soil fertility?
   - ☐ Fertilisation (*Chemicals, animal manure, green manure etc*)
   - ☐ Crop rotation (*Cultivation of a series of dissimilar types of crops in the same area in sequential seasons*)
   - ☐ Intercropping (*Cultivation of two or more dissimilar types of crops in the same area in the same season*)
   - ☐ Tillage
   - ☐ Other (specify): .................................................................

   ➢ In case fertilisers are applied, which kinds do you use?
     - ☐ Chemical fertilisers
     - ☐ Organic fertilisers (*non-chemicals like animal manure, green manure, compost, etc.*)

   ✗ In case organic fertilisers are used, can you specify the type?
     - ☐ Livestock manure
     - ☐ Poultry manure
     - ☐ Green manure (*Type of crops cultivated primarily to enrich the soil with nutrients and organic matter through ploughing it into the soil when flowering begins*)
     - ☐ Other (specify): .................................................................

   ➢ In case that crop rotation, and/or intercropping and/or green manure are practiced, do you integrate legumes?
     - ☐ Yes
     - ☐ No
2. How do you control pests and diseases?
   - Biological & organic control methods (*non-chemical control methods*)
   - Integrated pest management (IPM) methods
   - Chemical pesticides (treatment), specify what do you use?
   - Other methods (specify)

   ➢ In case of non-chemical methods for plant protection are used. Can you specify that?
     - Mechanical ways
     - Physical and pheromone traps
     - Biological enemies of pests
     - Other (specify):

3. How do you control weeds?
   - By burning plant residues after harvesting.
   - By grazing through animals.
   - By mechanical weeding (*tillage, mowing and/or manual*).
   - By crop rotation and/or intercropping
   - By chemical herbicides, specify what do you use?

4. Have you ever heard about ‘organic farming’?
   - Yes
   - No

   ➢ If yes, could you briefly specify what does ‘organic farming’ mean for you?
Appendices

Part II: Attitudinal interview towards organic farming

Before asking the interviewee further questions, the interviewer(s) should clarify for them what is meant by organic farming as follows:

Organic production is an overall system of farm management and food production that combines environmental practices, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and a production method in line with the preference of certain consumers for products produced using natural substances and processes. It is a way of farming that relies on techniques such as crop rotation, green manure, compost, crop residues, animal manure, legumes, off-farm organic wastes, mechanical cultivation, mineral bearing rocks, and aspects of biological pest control to maintain soil productivity and fertility, to supply plant nutrients, and to control insects, weeds, and other pests. Thus, organic farming uses natural fertilizers and pesticides but excludes or strictly limits the use of manufactured (synthetic) fertilizers, pesticides (which include herbicides, insecticides and fungicides), plant growth regulators such as hormones, livestock antibiotics, food additives, genetically modified organisms, etc.

1. General attitudes towards organic farming adoption

<table>
<thead>
<tr>
<th>Attitude statements</th>
<th>Strongly disagree</th>
<th>Disagree nor agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic farming gives a positive image to a farm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic farming is a step back to farming of the past</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local markets for organic products are available</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic farming is more profitable than conventional farming</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic certification bodies are available</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of chemical inputs is negative for health of people and animals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtaining information regarding organic farming is difficult</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic farming is too labour intensive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without using chemical pesticides, high pest infestation can happen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Attitude statements (Cont.)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governmental support to organic farming is important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic yields are too low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local consumers would be willing to pay higher prices for organic products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtaining consulting and advices regarding organic farming is difficult</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of chemical inputs improves product appearance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic fertilisers and pesticides are available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic products can be sold for higher prices compared to conventional products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic farmers live more in harmony with nature</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAAR programs for organic farming are not sufficient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversion into organic farming requires high investment costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of chemical fertilisers improves product taste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic farming requires high certification and inspection costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic farming reduces chemical output to the environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is a lack of subsidies for organic farming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic products are healthier for the family</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic fertilisers and pesticides are expensive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is hard to find business buyers (e.g. wholesalers) who pay higher prices for organic products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtaining information about export markets of organic products is difficult</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Components of the Theory of Planned Behaviour

A. Behavioural beliefs:

Please consider the following pairs of statements carefully. Indicate for the first statement whether you agree or disagree to it. For the second statement please indicate how important or unimportant it is for you.

As an advice for the interviewer(s) to consider that each of the following questions has two statements should be measured on two different scales. We take Question (1) as an example:

- The first statement: If you produce organic fruit and vegetables you will save on production costs: should be measured on five-point scale Agree/Disagree
- And the second statement: Saving on production costs is: (should be measured on five-point scale Important/Unimportant)

<table>
<thead>
<tr>
<th>Behavioural beliefs</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If you produce organic fruit and vegetables you will save on production costs (mainly fertilizer and pesticide costs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saving on production costs is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. If you produce organic fruit and vegetables you will receive higher prices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiving higher prices is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. If you produce organic fruit and vegetables you will increase farm income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increasing farm income is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. If you produce organic fruit and vegetables you will get opportunities to reach other markets (e.g. markets with higher prices; markets with better prospects compared to the current market)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting opportunities to reach better markets is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Producing organic fruit and vegetables on your farm is not a modern way of farming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being modern in farming is:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Behavioural beliefs (Cont.)

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very unimportant</strong></td>
<td><strong>Unimportant</strong></td>
<td><strong>Neither important nor unimportant</strong></td>
<td><strong>Important</strong></td>
<td><strong>Very important</strong></td>
</tr>
</tbody>
</table>

6. Producing organic fruit and vegetables on your farm can improve soil fertility and soil structure

**Improving soil fertility and soil structure is:**

7. Producing organic fruit and vegetables on your farm will protect the environment

**Protecting the environment is:**

8. Producing organic fruit and vegetables on your farm will provide healthy food for your family

**Providing healthy food for your family is:**

9. For you, it would be risky to convert to organic fruit and vegetable production

**In general, playing it safe is:**

### B. Control beliefs:

Please consider the following statements carefully and then express your opinion whether you agree or disagree with the statement by ticking one box in each line

<table>
<thead>
<tr>
<th>Control beliefs</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
</table>

1. You have the possibility to get access to information sources about organic farming

**Having access to information resources about organic farming would make it easier for you to produce fruit and vegetables organically on your farm within the next five years**

2. Soil fertility on your farm is suitable for fruit and vegetable cultivation

**Having good soil fertility would make it easier for you to produce fruit and vegetables organically on your farm within the next five years**

### Control beliefs (Cont.)

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
</table>
3. The size of your farm is big enough for making the cultivation of fruit and vegetables economically viable

**Having a sufficient farm size for an economic cultivation of fruit and vegetables would make it easier for you to produce fruit and vegetables organically on your farm within the next five years.**

4. You have the possibility to cultivate fruit and vegetables with organic instead of chemical fertilizers.

**Being able to farm with organic instead of chemical fertilizers would make it easier for you to produce organic fruit and vegetables on your farm within the next five years.**

5. You have the means to afford the certification and inspection costs of organic farming.

**Being able to afford the certification and inspection costs of organic farming would make it easier for you to produce organic fruit and vegetables on your farm within the next five years.**

6. You have access to credits for fruit and vegetable cultivation.

**Being able to have access to credits would make it easier for you to produce organic fruit and vegetables on your farm within the next five years.**

7. You have access to governmental subsidies for fruit and vegetable cultivation.

**Being able to have access to governmental subsidies would make it easier for you to produce organic fruit and vegetables on your farm within the next five years.**

8. You work collectively with other farmers to solve farming problems (production and marketing problems).

**Being able to work collectively with other farmers would make it easier for you to produce organic fruit and vegetables on your farm within the next five years.**
C. Normative beliefs:

C1. How motivated would you be to follow the advice of those listed below regarding the production of organic fruit and vegetables on your farm within the next five years? (Motivation to comply with significant referents)

<table>
<thead>
<tr>
<th>Motivation to comply with significant referents</th>
<th>Not at All</th>
<th>Little</th>
<th>Moderately</th>
<th>Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Your family</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Other farmers (fellow farmers and friends)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. MAAR and GCSAR agronomists</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Information events/ field days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Agricultural press and news</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Governmental support programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Farm advisors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C2. How likely is it that the following referents think you should produce organic fruit and vegetables on your farm within the next five years?

<table>
<thead>
<tr>
<th>Normative beliefs of significant referents</th>
<th>Very Likely</th>
<th>Unlikely</th>
<th>Neutral</th>
<th>Likely</th>
<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Strength of normative beliefs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Your family</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Other farmers (fellow farmers and friends)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. MAAR and GCSAR agronomists</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Information events/ field days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Agricultural press and news</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Governmental support programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Farm advisors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
D. Attitudes, Subjective norm and Perceived behaviour control

Please consider the following statements/questions carefully and then express your opinion by ticking one box in each line.

<table>
<thead>
<tr>
<th>Attitudes towards producing organic fruit and vegetables on your farm within the next five years</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Producing organic fruit and vegetables on your farm within the next five years would be a good idea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Producing organic fruit and vegetables on your farm within the next five years would be possible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Producing organic fruit and vegetables on your farm within the next five years would be more profitable than the conventional farming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Producing organic fruit and vegetables on your farm within the next five years would be foolish (not wise) compared to conventional farming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subjective norm towards producing organic fruit and vegetables on your farm within the next five years</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Your family favours the idea that you should produce organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. If you are thinking to produce organic fruit and vegetables on your farm within the next five years, would your best friends and colleague farmers favour it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. In general, people whose opinion is important to you disapprove of you producing organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived behavioural control towards producing organic fruit and vegetables on your farm within the next five years</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. You think that you have the technical ability to produce organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. You think that you are capable of dealing with organic farming on your farm within the next five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. You think that you can meet the regulations of organic farming on your farm within the next five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. You think that you can afford the costs of conversion to organic farming on your farm within the next five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. You think that you can meet the amount of work needed for organic farming on your farm within the next five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
E. Information seeking and communication about organic farming

1. How informed do you feel about organic farming (regulation, certification, inspection, cost, profits, etc)
   - Not at all informed
   - Only little
   - Moderately
   - Well informed
   - Very well informed

2. How often do you discuss about organic farming or conversion to organic farming?
   - Never
   - Seldom
   - Sometimes
   - Often
   - Very often

3. How important is organic farming as a topic of discussion?
   - Very unimportant
   - Unimportant
   - Neither important nor unimportant
   - Important
   - Very important

F. Intention and conversion

1. How likely is it that you will (think seriously to) produce organic fruit and vegetables on your farm within the next five years?
   - Very likely
   - Likely
   - Undecided
   - Unlikely
   - Very unlikely

2. Do you have the intention to produce organic fruit and vegetables on your farm within the next five years?
   - Definitely no
   - Probably no
   - Undecided
   - Probably yes
   - Definitely yes

3. For you, is the conversion to organic farming within the next five years possible?
   - Definitely impossible
   - Impossible
   - Undecided
   - Possible
   - Definitely possible

4. For you, how probable is that you will start the conversion to organic farming within the next five years?
   - Highly probable
   - Probable
   - Maybe
   - Not probable
   - Not probable at all
Part III: Farm and household attributes

1. Age of the farmer: ............ years old

2. Gender: ............................

3. Current size of farmer’s household (Current number of people living in your house): ........ persons

4. Educational level of the farmer:
   - Less than elementary level (Illiterate)
   - Elementary to less than high school
   - High school
   - Two years college
   - University or above

5. Farmer’s experience in agriculture (years):
   a. Farmer’s experience in farming in general: ....................................... years
   b. Farmer’s experience in fruit and vegetable cultivation: ...................... years

6. Total land property of the farmer: ....................................................... Donum
   a. Land area of fruit and vegetables owned by farmer: ............. Donum
   b. Land area of fruit and vegetables rented by farmer: ............. Donum

7. What is the share of the income from fruit and vegetables in your household income?
   - Up to 25 %
   - 26 – 50 %
   - 51 – 75 %
   - 76 – 100 %

8. To whom do sell your products?
   - Directly to consumers
   - Retailers
   - Wholesalers
   - Exporters
   - Processors
   - Governmental corporation for storage and marketing of agricultural products
   - Selling through Damman
   - Other (specify): ........................................................................................................

---

47 Donum is a unit for measuring the land area, it is equal to 1000 m² (or 0.1 ha). Since this unit is better known than hectare among Syrian farmers, Donum will be used in the questionnaire as area unit.
9. Can you please specify the most important three varieties of citrus fruit or tomatoes you do produce on your farm?

....................................................................................................................................................................
....................................................................................................................................................................
....................................................................................................................................................................

**Further expectation of farm future**

How do you imagine the future of your farm in the next 10 years? (*please tick one box only*)

- [ ] You will continue business as usual
- [ ] You will continue and expand farming business
- [ ] You will allow family member(s) to manage the farm
- [ ] You will sell/rent it for agricultural purpose
- [ ] Other (please specify)..............................................................................................

*Thank you very much for participating in this interview!*
### Appendix 1.4: Farmer survey: Questionnaire coding (Tables I – XIII)

#### Table (I): Fertilisers and pest control methods

<table>
<thead>
<tr>
<th>Qust.</th>
<th>No.</th>
<th>Code</th>
<th>Definition</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.1</td>
<td>1</td>
<td>Fer</td>
<td>Use of fertilisation</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>CR</td>
<td>Use of crop rotation</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>IC</td>
<td>Use of intercropping</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Til</td>
<td>Use of tillage</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>O1</td>
<td>Use of other methods</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>Q.1a</td>
<td>6</td>
<td>CFer</td>
<td>Use of chemical fertilisers</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>OFer</td>
<td>Use of organic fertilisers</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>Q.1aa</td>
<td>8</td>
<td>LM</td>
<td>Use of livestock manure</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>PM</td>
<td>Use of poultry manure</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>GM</td>
<td>Use of green manure</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>O2</td>
<td>Use of other methods</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>Q.1b</td>
<td>12</td>
<td>Leg</td>
<td>Cultivation of legumes within crop rotation, intercropping and/or green manure crops</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>Q.2</td>
<td>13</td>
<td>OCont</td>
<td>Use of Biological and organic control methods</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>IPM</td>
<td>Use of integrated pest management methods</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>CCont</td>
<td>Use of chemical pesticides for pest treatment</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>O3</td>
<td>Use of other methods</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>Q.2a</td>
<td>17</td>
<td>MW</td>
<td>Use of mechanical ways for plant protection from pests</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>PPT</td>
<td>Use of physical and pheromone traps of pests</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>BE</td>
<td>Use of biological enemies of pests</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>O4</td>
<td>Use of other methods</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>Q.3</td>
<td>21</td>
<td>Burn</td>
<td>Burning of plant residues after harvesting</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>GA</td>
<td>Grazing weeds through animals</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>MWeed</td>
<td>Use mechanical weeding (tillage, mowing and/or manual weeding)</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>CR_IC</td>
<td>Use of crop rotation and/or intercropping for weed control</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>CH</td>
<td>Use of chemical herbicides for weed treatment</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>Q.4</td>
<td>27</td>
<td>HOF</td>
<td>Have you ever heard about organic farming?</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
</tbody>
</table>
### Table (II): General Attitude statements toward organic farming

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GATT_1</td>
<td>Organic farming gives a positive image to a farm</td>
<td>1-5 score</td>
<td>1 = Strongly disagree;</td>
</tr>
<tr>
<td>2</td>
<td>GATT_2</td>
<td>Organic farming is a step back to farming of the past</td>
<td></td>
<td>2 = Disagree;</td>
</tr>
<tr>
<td>3</td>
<td>GATT_3</td>
<td>Local markets for organic products are available</td>
<td></td>
<td>3 = Neither agree nor disagree;</td>
</tr>
<tr>
<td>4</td>
<td>GATT_4</td>
<td>Organic farming is more profitable than conventional farming</td>
<td></td>
<td>4 = Agree;</td>
</tr>
<tr>
<td>5</td>
<td>GATT_5</td>
<td>Organic certification bodies are available</td>
<td></td>
<td>5 = Strongly agree</td>
</tr>
<tr>
<td>6</td>
<td>GATT_6</td>
<td>Use of chemical inputs is negative for health of people and animals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>GATT_7</td>
<td>Obtaining information regarding organic farming is difficult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>GATT_8</td>
<td>Organic farming is too labour intensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>GATT_9</td>
<td>Without using chemical pesticides, high pest infestation can happen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>GATT_10</td>
<td>Governmental support to organic farming is important</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>GATT_11</td>
<td>Organic yields are too low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>GATT_12</td>
<td>Local consumers would be willing to pay higher prices for organic products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>GATT_13</td>
<td>Obtaining consulting and advices regarding organic farming is difficult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>GATT_14</td>
<td>Use of chemical inputs improves product appearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>GATT_15</td>
<td>Organic fertilisers and pesticides are available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>GATT_16</td>
<td>Organic products can be sold for higher prices compared to conventional products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>GATT_17</td>
<td>Organic farmers live more in harmony with nature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>GATT_18</td>
<td>MAAR programs for organic farming are not sufficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>GATT_19</td>
<td>Conversion into organic farming requires high investment costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>GATT_20</td>
<td>Use of chemical fertilisers improves product taste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>GATT_21</td>
<td>Organic farming requires high certification and inspection costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>GATT_22</td>
<td>Organic farming reduces chemical output to the environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>GATT_23</td>
<td>There is a lack of subsidies for organic farming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>GATT_24</td>
<td>Organic products are healthier for the family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>GATT_25</td>
<td>Organic fertilisers and pesticides are expensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>GATT_26</td>
<td>It is hard to find business buyers (e.g. wholesalers) who pay higher prices for organic products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>GATT_27</td>
<td>Obtaining information about export markets of organic products is difficult</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table (III): Perceived beliefs on the likely benefits from adoption of organic fruit and vegetable production (strength of behavioural beliefs (bs_i))

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>bs_1</td>
<td>If you produce organic fruit and vegetables you will save on production costs</td>
<td>1-5 score</td>
<td>1 = Strongly disagree;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 = Disagree;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Neither agree nor disagree;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 = Agree;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 = Strongly agree</td>
</tr>
<tr>
<td>2</td>
<td>bs_2</td>
<td>If you produce organic fruit and vegetables you will receive higher prices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>bs_3</td>
<td>If you produce organic fruit and vegetables you will increase farm income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>bs_4</td>
<td>If you produce organic fruit and vegetables you will get opportunities to reach other markets (e.g. markets with higher prices; markets with better prospects compared to the current market)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>bs_5</td>
<td>Producing organic fruit and vegetables on your farm is not a modern way of farming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>bs_6</td>
<td>Producing organic fruit and vegetables on your farm can improve soil fertility and soil structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>bs_7</td>
<td>Producing organic fruit and vegetables on your farm will protect the environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>bs_8</td>
<td>Producing organic fruit and vegetables on your farm will provide healthy food for your family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>bs_9</td>
<td>For you, it would be risky to convert to organic farming</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table (IV): Perceived beliefs on the outcomes from adoption of organic fruit and vegetable production (Outcome evaluation of behavioural belief statements (oe_i))

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>oe_1</td>
<td>Saving on production costs is:</td>
<td>-2 to 2</td>
<td>-2 = Very unimportant;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>score</td>
<td>-1 = Unimportant;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 = Neither important nor unimportant;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+1 = Important;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+2 = Very important</td>
</tr>
<tr>
<td>2</td>
<td>oe_2</td>
<td>Receiving higher prices is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>oe_3</td>
<td>Increasing farm income is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>oe_4</td>
<td>Getting opportunities to reach better markets is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>oe_5</td>
<td>Being modern in farming is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>oe_6</td>
<td>Improving soil fertility and soil structure is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>oe_7</td>
<td>Protecting the environment is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>oe_8</td>
<td>Providing healthy food for your family is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>oe_9</td>
<td>In general, playing it safe is:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table (V): Perceived beliefs of factors that may support or impede adoption of organic fruit and vegetable production (control beliefs ($cb_i$))

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cb_1</td>
<td>You have the possibility to get access to information resources about organic farming</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree;</td>
</tr>
<tr>
<td>2</td>
<td>cb_2</td>
<td>Soil fertility on your farm is suitable for fruit and vegetable cultivation</td>
<td></td>
<td>-1 = Disagree;</td>
</tr>
<tr>
<td>3</td>
<td>cb_3</td>
<td>The size of your farm is big enough for making the cultivation of fruit and vegetables economically viable</td>
<td></td>
<td>0 = Neither agree nor disagree;</td>
</tr>
<tr>
<td>4</td>
<td>cb_4</td>
<td>You have the possibility to cultivate fruit and vegetables with organic instead of chemical fertilizers</td>
<td></td>
<td>+1 = Agree;</td>
</tr>
<tr>
<td>5</td>
<td>cb_5</td>
<td>You have the means to afford the certification and inspection costs of organic farming</td>
<td></td>
<td>+2 = Strongly Agree</td>
</tr>
<tr>
<td>6</td>
<td>cb_6</td>
<td>You have access to credits for fruit and vegetable cultivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>cb_7</td>
<td>You have access to governmental subsidies for fruit and vegetable cultivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>cb_8</td>
<td>You work collectively with other farmers to solve farming problems (production and marketing problems)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table (VI): Power of control over factors that may support or impede adoption of organic fruit and vegetable production (power of control over control belief statements ($pc_i$))

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pc_1</td>
<td>Having access to information resources about organic farming would make it easier for you to produce fruit and vegetables organically</td>
<td>1-5 score</td>
<td>1 = Strongly disagree;</td>
</tr>
<tr>
<td>2</td>
<td>pc_2</td>
<td>Having good soil fertility would make it easier for you to produce fruit and vegetables organically on your farm within the next five years</td>
<td></td>
<td>2 = Disagree;</td>
</tr>
<tr>
<td>3</td>
<td>pc_3</td>
<td>Having a sufficient farm size for an economic cultivation of fruit and vegetables would make it easier for you to produce fruit and vegetables organically on your farm within the next five years</td>
<td></td>
<td>3 = Neither agree nor disagree;</td>
</tr>
<tr>
<td>4</td>
<td>pc_4</td>
<td>Being able to farm with organic instead of chemical fertilizers would make it easier for you to produce organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td>4 = Agree;</td>
</tr>
<tr>
<td>5</td>
<td>pc_5</td>
<td>Being able to afford the certification and inspection costs of organic farming would make it easier for you to produce organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td>5 = Strongly Agree</td>
</tr>
<tr>
<td>6</td>
<td>pc_6</td>
<td>Being able to have access to credits would make it easier for you to produce organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>pc_7</td>
<td>Being able to have access to governmental subsides would make it easier for you to produce organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>pc_8</td>
<td>Being able to work collectively with other farmers would make it easier for you to produce organic fruit and vegetables on your farm within the next five years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table (VII): Perceived beliefs on social expectations from adoption of organic fruit and vegetable production (normative beliefs \((nb_i)\))

*Q: How likely is it that the following referents think you should produce organic fruit and vegetables on your farm within the next five years?*

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>nb_1</td>
<td>Your family</td>
<td>-2 - +2 score</td>
<td>-2 = Very unlikely;</td>
</tr>
<tr>
<td>2</td>
<td>nb_2</td>
<td>Other farmers (fellow farmers and friends)</td>
<td></td>
<td>-1 = Unlikely;</td>
</tr>
<tr>
<td>3</td>
<td>nb_3</td>
<td>MAAR and GCSAR agronomists</td>
<td></td>
<td>0 = Neutral;</td>
</tr>
<tr>
<td>4</td>
<td>nb_4</td>
<td>Information events/ field days</td>
<td></td>
<td>+1 = Likely;</td>
</tr>
<tr>
<td>5</td>
<td>nb_5</td>
<td>Agricultural press and news</td>
<td></td>
<td>+2 = Very likely</td>
</tr>
<tr>
<td>6</td>
<td>nb_6</td>
<td>Governmental support programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>nb_7</td>
<td>Farm advisors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table (VIII): Motivation to comply with social expectations regarding adoption of organic fruit and vegetable production (motivation to comply with normative referents \((mc_i)\))

*Q: How motivated would you be to follow the advice of those listed below regarding the production of organic fruit and vegetables on your farm within the next five years?*

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>mc_1</td>
<td>Your family</td>
<td>1-5 score</td>
<td>1 = Very much;</td>
</tr>
<tr>
<td>2</td>
<td>mc_2</td>
<td>Other farmers (fellow farmers and friends)</td>
<td></td>
<td>2 = Much;</td>
</tr>
<tr>
<td>3</td>
<td>mc_3</td>
<td>MAAR and GCSAR agronomists</td>
<td></td>
<td>3 = Moderately;</td>
</tr>
<tr>
<td>4</td>
<td>mc_4</td>
<td>Information events/ field days</td>
<td></td>
<td>4 = Little;</td>
</tr>
<tr>
<td>5</td>
<td>mc_5</td>
<td>Agricultural press and news</td>
<td></td>
<td>5 = Not at all</td>
</tr>
<tr>
<td>6</td>
<td>mc_6</td>
<td>Governmental support programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>mc_7</td>
<td>Farm advisors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table (VIII): Attitudes toward adoption of organic fruit and vegetable production within the next five years

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Att_1</td>
<td>Producing organic fruit and vegetables on your farm within the next five years would be a good idea</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>2</td>
<td>Att_2</td>
<td>Producing organic fruit and vegetables on your farm within the next five years would be possible</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>3</td>
<td>Att_3</td>
<td>Producing organic fruit and vegetables on your farm within the next five years would be more profitable than the conventional farming</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>4</td>
<td>ATT_4</td>
<td>Producing organic fruit and vegetables on your farm within the next five years would be foolish (not wise) compared to conventional farming</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
</tbody>
</table>

### Table (IX): Perceived behavioural control to adopt organic fruit and vegetable production within the next five years

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pbc_1</td>
<td>You think that you have the technical ability to produce organic fruit and vegetables on your farm within the next five years</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>2</td>
<td>Pbc_2</td>
<td>You think that you are capable of dealing with organic farming on your farm within the next five years</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>3</td>
<td>Pbc_3</td>
<td>You think that you can meet the regulations of organic farming on your farm within the next five years</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>4</td>
<td>Pbc_4</td>
<td>You think that you can afford the costs of conversion into organic farming on your farm within the next five years</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>5</td>
<td>Pbc_5</td>
<td>You think that you can meet the amount of work needed for organic farming on your farm within the next five years</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
</tbody>
</table>

### Table (X): Subjective norm towards adoption of organic fruit and vegetable production within the next five years

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>sn_1</td>
<td>Your family thinks you should produce organic fruit and vegetables on your farm within the next five years</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>2</td>
<td>sn_2</td>
<td>If you are thinking to produce organic fruit and vegetables on your farm within the next five years, would your best friends and colleague farmers favour it?</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
<tr>
<td>3</td>
<td>sn_3</td>
<td>In general, people whose opinion is important to you disapprove of you producing organic fruit and vegetables on your farm within the next five years</td>
<td>-2 - +2 score</td>
<td>-2 = Strongly disagree; -1 = Disagree; 0 = Neither agree nor disagree; +1 = Agree; +2 = Strongly agree</td>
</tr>
</tbody>
</table>
### Appendices

**Table (XI): Information seeking and communication about organic farming**

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>info_1</td>
<td>How informed do you feel about organic farming (regulation, certification, inspection, cost, profits, etc)?</td>
<td>1-5 score</td>
<td>1 = Not at all informed; 2 = Only little; 3 = Moderately; 4 = Well informed; 5 = Very well informed</td>
</tr>
<tr>
<td>2</td>
<td>info_2</td>
<td>How often do you discuss about organic farming or conversion to organic farming?</td>
<td>1-5 score</td>
<td>1 = Very often; 2 = Often; 3 = Sometimes; 4 = Seldom; 5 = Never</td>
</tr>
<tr>
<td>3</td>
<td>Info_3</td>
<td>How important is organic farming as a topic of discussion?</td>
<td></td>
<td>1 = Very unimportant; 2 = Unimportant; 3 = Neither important nor unimportant; 4 = Important; 5 = Very important</td>
</tr>
</tbody>
</table>

**Table (XII): Intention to adopt organic fruit and vegetable production within the next five years**

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>bi_1T</td>
<td>How likely is it that you will produce organic fruit and vegetables on your farm within the next five years?</td>
<td>-2- +2 score</td>
<td>-2 = Very unlikely; -1 = Unlikely; 0 = Undecided; +1 = Likely; +2 = Very likely</td>
</tr>
<tr>
<td>2</td>
<td>bi_2</td>
<td>Do you have the intention to produce organic fruit and vegetables on your farm within the next five years?</td>
<td>-2- +2 score</td>
<td>-2 = Definitely no; -1 = Probably no; 0 = Uncertain; +1 = Probably yes; +2 = Definitely yes</td>
</tr>
</tbody>
</table>

**Table (XIII): Adoption of organic fruit and vegetable production within the next five years**

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Statement</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>conv_1</td>
<td>For you, is the conversion to organic farming within the next five years possible?</td>
<td>-2- +2 score</td>
<td>-2 = Definitely impossible; -1 = Impossible; 0 = Undecided; +1 = Possible; +2 = Definitely possible</td>
</tr>
<tr>
<td>2</td>
<td>conv_2T</td>
<td>For you, how probable is the conversion to organic farming within the next five years?</td>
<td>-2- +2 score</td>
<td>-2 = Not probable at all; -1 = Not probable; 0 = Maybe; +1 = Probable; +2 = Highly probable</td>
</tr>
</tbody>
</table>
## Table (XIII): Farm and Household Attributes

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Definition</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>Age of farmers</td>
<td>years</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gender</td>
<td>Gender of farmers</td>
<td>0-1 score</td>
<td>0 = female; 1 = male</td>
</tr>
<tr>
<td>3</td>
<td>HH</td>
<td>Current size of farmer’s household</td>
<td>Persons</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Edu</td>
<td>Educational level of farmers</td>
<td>1-5 score</td>
<td>1 = Less than elementary level (Illiterate); 2 = Elementary to less than high school; 3 = High school; 4 = Two years college; 5 = University or above</td>
</tr>
<tr>
<td>5</td>
<td>Exp_1</td>
<td>Farmer’s experience in farming in general</td>
<td>years</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Exp_2</td>
<td>Farmer’s experience in fruit and vegetable cultivation</td>
<td>years</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Land</td>
<td>Total land property of the farmer</td>
<td>Donum</td>
<td>Donum is a unit for measuring the land area, it is equal to 1000 m² (or 0.1 ha).</td>
</tr>
<tr>
<td>8</td>
<td>Land_1</td>
<td>Land area of fruit and vegetables owned by farmer</td>
<td>Donum</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Land_2</td>
<td>Land area of fruit and vegetables rented by farmer</td>
<td>Donum</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Income</td>
<td>The share of the income from fruit and vegetables in farmer’s household income</td>
<td>1-4 score</td>
<td>1 = Up to 25%; 2 = 26% to 50%; 3 = 51% to 75%; 4 = 76% to 100%</td>
</tr>
<tr>
<td>11</td>
<td>Sell_1</td>
<td>Farmers sell their products direct to final consumers</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>12</td>
<td>Sell_2</td>
<td>Farmers sell their products to retailers</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>13</td>
<td>Sell_3</td>
<td>Farmers sell their products to wholesalers</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>14</td>
<td>Sell_4</td>
<td>Farmers sell their products to exporters</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>15</td>
<td>Sell_5</td>
<td>Farmers sell their products to processors</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>16</td>
<td>Sell_6</td>
<td>Farmers sell their products to Governmental corporation for storage and marketing of agricultural products</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>17</td>
<td>Sell_7</td>
<td>Farmers sell their products through so-called Damman</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>18</td>
<td>Sell_8</td>
<td>Farmers sell their products through other ways (not mentioned before)</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>19</td>
<td>Citrus</td>
<td>The most important three varieties of citrus fruit</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>20</td>
<td>Tomato</td>
<td>The most important three varieties of tomatoes</td>
<td>0-1 score</td>
<td>0= no; 1= yes</td>
</tr>
<tr>
<td>21</td>
<td>Future</td>
<td>Farmer’s imagination about future of the farm in the next 10 years</td>
<td>1-5</td>
<td>1 = you will continue business as usual; 2 = you will continue and expand farming business; 3 = you will allow family member(s) to manage the farm; 4 = you will sell/rent it for agricultural purpose; 5 = others</td>
</tr>
</tbody>
</table>
### Appendix 1.5: Production development of most important fresh vegetables in Syria since 2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomatoes</td>
<td>753</td>
<td>772</td>
<td>900</td>
<td>923</td>
<td>965</td>
<td>957</td>
<td>1036</td>
<td>1232</td>
<td>1163</td>
<td>1166</td>
<td>1156</td>
<td>1155</td>
<td>784</td>
<td>500</td>
</tr>
<tr>
<td>Potatoes</td>
<td>485</td>
<td>453</td>
<td>513</td>
<td>487</td>
<td>542</td>
<td>608</td>
<td>603</td>
<td>570</td>
<td>720</td>
<td>706</td>
<td>673</td>
<td>713</td>
<td>698</td>
<td>442</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>91</td>
<td>102</td>
<td>141</td>
<td>152</td>
<td>149</td>
<td>147</td>
<td>130</td>
<td>147</td>
<td>140</td>
<td>133</td>
<td>155</td>
<td>154</td>
<td>85</td>
<td>115</td>
</tr>
<tr>
<td>Eggplants</td>
<td>124</td>
<td>111</td>
<td>133</td>
<td>138</td>
<td>158</td>
<td>154</td>
<td>159</td>
<td>153</td>
<td>165</td>
<td>147</td>
<td>149</td>
<td>142</td>
<td>106</td>
<td>115</td>
</tr>
<tr>
<td>Dry onions</td>
<td>72</td>
<td>84</td>
<td>97</td>
<td>95</td>
<td>117</td>
<td>125</td>
<td>103</td>
<td>98</td>
<td>94</td>
<td>82</td>
<td>110</td>
<td>85</td>
<td>64</td>
<td>88</td>
</tr>
<tr>
<td>Squashes</td>
<td>65</td>
<td>61</td>
<td>94</td>
<td>73</td>
<td>88</td>
<td>119</td>
<td>80</td>
<td>93</td>
<td>97</td>
<td>111</td>
<td>108</td>
<td>109</td>
<td>63</td>
<td>81</td>
</tr>
<tr>
<td>Green onions</td>
<td>51</td>
<td>51</td>
<td>76</td>
<td>44</td>
<td>46</td>
<td>48</td>
<td>53</td>
<td>46</td>
<td>48</td>
<td>74</td>
<td>50</td>
<td>67</td>
<td>42</td>
<td>51</td>
</tr>
<tr>
<td>Lettuces</td>
<td>46</td>
<td>43</td>
<td>54</td>
<td>57</td>
<td>57</td>
<td>52</td>
<td>56</td>
<td>62</td>
<td>52</td>
<td>52</td>
<td>62</td>
<td>62</td>
<td>48</td>
<td>45</td>
</tr>
<tr>
<td>Green peppers</td>
<td>43</td>
<td>45</td>
<td>40</td>
<td>49</td>
<td>50</td>
<td>61</td>
<td>60</td>
<td>79</td>
<td>67</td>
<td>48</td>
<td>77</td>
<td>59</td>
<td>38</td>
<td>35</td>
</tr>
<tr>
<td>Cabbages</td>
<td>43</td>
<td>43</td>
<td>51</td>
<td>39</td>
<td>37</td>
<td>40</td>
<td>39</td>
<td>34</td>
<td>39</td>
<td>44</td>
<td>45</td>
<td>42</td>
<td>39</td>
<td>34</td>
</tr>
<tr>
<td>Haricot beans</td>
<td>23</td>
<td>27</td>
<td>36</td>
<td>20</td>
<td>28</td>
<td>40</td>
<td>32</td>
<td>30</td>
<td>30</td>
<td>32</td>
<td>30</td>
<td>38</td>
<td>20</td>
<td>33</td>
</tr>
<tr>
<td>Broad beans (Green)</td>
<td>31</td>
<td>45</td>
<td>53</td>
<td>45</td>
<td>39</td>
<td>44</td>
<td>51</td>
<td>43</td>
<td>50</td>
<td>42</td>
<td>45</td>
<td>44</td>
<td>46</td>
<td>32</td>
</tr>
<tr>
<td>Cauliflowers</td>
<td>30</td>
<td>34</td>
<td>35</td>
<td>31</td>
<td>35</td>
<td>46</td>
<td>35</td>
<td>37</td>
<td>30</td>
<td>36</td>
<td>37</td>
<td>37</td>
<td>25</td>
<td>27</td>
</tr>
<tr>
<td>Dry garlics</td>
<td>20</td>
<td>29</td>
<td>27</td>
<td>42</td>
<td>37</td>
<td>47</td>
<td>40</td>
<td>30</td>
<td>32</td>
<td>28</td>
<td>36</td>
<td>31</td>
<td>29</td>
<td>24</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>16</td>
<td>17</td>
<td>16</td>
<td>19</td>
<td>37</td>
<td>21</td>
<td>27</td>
<td>28</td>
<td>39</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Leaf beets</td>
<td>12</td>
<td>14</td>
<td>20</td>
<td>15</td>
<td>14</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>13</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Green peas</td>
<td>15</td>
<td>17</td>
<td>24</td>
<td>18</td>
<td>24</td>
<td>23</td>
<td>17</td>
<td>24</td>
<td>20</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Okras</td>
<td>11</td>
<td>13</td>
<td>12</td>
<td>20</td>
<td>20</td>
<td>22</td>
<td>16</td>
<td>22</td>
<td>15</td>
<td>20</td>
<td>14</td>
<td>15</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>Kidney beans (Green)</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Other vegetables</td>
<td>62</td>
<td>98</td>
<td>145</td>
<td>156</td>
<td>160</td>
<td>218</td>
<td>184</td>
<td>202</td>
<td>206</td>
<td>232</td>
<td>233</td>
<td>178</td>
<td>208</td>
<td>147</td>
</tr>
<tr>
<td>Fresh vegetables</td>
<td>1994.8</td>
<td>2065.0</td>
<td>2472.1</td>
<td>2427.4</td>
<td>2610.7</td>
<td>2784.1</td>
<td>2743.7</td>
<td>2943.9</td>
<td>3032.7</td>
<td>2988.3</td>
<td>3023.6</td>
<td>2974.3</td>
<td>2343.1</td>
<td>1816.8</td>
</tr>
</tbody>
</table>

Source: Own calculation based on official statistics of the Syrian Ministry of Agriculture and Agrarian Reform (MAAR). For this purpose, annual statistical abstracts of MAAR for years from 2000 to 2013 have been used.
### Appendix 1.6: Production development of most important fresh fruit in Syria since 2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Citrus fruit (Total):</td>
<td>800</td>
<td>833</td>
<td>746</td>
<td>653</td>
<td>844</td>
<td>778</td>
<td>907</td>
<td>967</td>
<td>1046</td>
<td>1093</td>
<td>1071</td>
<td>1164</td>
<td>927</td>
<td>1251</td>
</tr>
<tr>
<td>Oranges</td>
<td>407</td>
<td>465</td>
<td>427</td>
<td>399</td>
<td>496</td>
<td>453</td>
<td>554</td>
<td>603</td>
<td>658</td>
<td>690</td>
<td>669</td>
<td>734</td>
<td>542</td>
<td>792</td>
</tr>
<tr>
<td>Other citrus fruit than oranges and lemons</td>
<td>309</td>
<td>289</td>
<td>234</td>
<td>182</td>
<td>237</td>
<td>214</td>
<td>234</td>
<td>233</td>
<td>251</td>
<td>262</td>
<td>260</td>
<td>268</td>
<td>238</td>
<td>297</td>
</tr>
<tr>
<td>Lemons</td>
<td>83</td>
<td>79</td>
<td>85</td>
<td>71</td>
<td>112</td>
<td>111</td>
<td>119</td>
<td>131</td>
<td>137</td>
<td>141</td>
<td>142</td>
<td>162</td>
<td>148</td>
<td>161</td>
</tr>
<tr>
<td>Apples</td>
<td>287</td>
<td>263</td>
<td>216</td>
<td>307</td>
<td>358</td>
<td>296</td>
<td>374</td>
<td>280</td>
<td>361</td>
<td>361</td>
<td>393</td>
<td>308</td>
<td>349</td>
<td>257</td>
</tr>
<tr>
<td>Watermelons</td>
<td>202</td>
<td>228</td>
<td>480</td>
<td>674</td>
<td>812</td>
<td>588</td>
<td>627</td>
<td>367</td>
<td>750</td>
<td>539</td>
<td>671</td>
<td>478</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td>Pomegranates</td>
<td>69</td>
<td>75</td>
<td>56</td>
<td>62</td>
<td>52</td>
<td>54</td>
<td>51</td>
<td>61</td>
<td>56</td>
<td>60</td>
<td>56</td>
<td>70</td>
<td>69</td>
<td>66</td>
</tr>
<tr>
<td>Apricots</td>
<td>79</td>
<td>66</td>
<td>101</td>
<td>105</td>
<td>76</td>
<td>66</td>
<td>99</td>
<td>113</td>
<td>101</td>
<td>99</td>
<td>62</td>
<td>76</td>
<td>72</td>
<td>65</td>
</tr>
<tr>
<td>Cherries</td>
<td>56</td>
<td>51</td>
<td>40</td>
<td>55</td>
<td>35</td>
<td>53</td>
<td>63</td>
<td>75</td>
<td>48</td>
<td>57</td>
<td>58</td>
<td>62</td>
<td>82</td>
<td>62</td>
</tr>
<tr>
<td>Peaches</td>
<td>42</td>
<td>38</td>
<td>35</td>
<td>35</td>
<td>27</td>
<td>52</td>
<td>56</td>
<td>57</td>
<td>56</td>
<td>63</td>
<td>49</td>
<td>54</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td>Figs</td>
<td>44</td>
<td>40</td>
<td>43</td>
<td>41</td>
<td>37</td>
<td>50</td>
<td>51</td>
<td>41</td>
<td>40</td>
<td>54</td>
<td>41</td>
<td>43</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>Yellow melons</td>
<td>48</td>
<td>74</td>
<td>100</td>
<td>116</td>
<td>102</td>
<td>95</td>
<td>98</td>
<td>159</td>
<td>61</td>
<td>107</td>
<td>76</td>
<td>99</td>
<td>57</td>
<td>45</td>
</tr>
<tr>
<td>Plums</td>
<td>26</td>
<td>23</td>
<td>23</td>
<td>21</td>
<td>20</td>
<td>23</td>
<td>26</td>
<td>31</td>
<td>32</td>
<td>27</td>
<td>26</td>
<td>29</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td>Pears</td>
<td>31</td>
<td>28</td>
<td>20</td>
<td>20</td>
<td>21</td>
<td>20</td>
<td>22</td>
<td>25</td>
<td>25</td>
<td>26</td>
<td>22</td>
<td>20</td>
<td>23</td>
<td>21</td>
</tr>
<tr>
<td>Green plums</td>
<td>13</td>
<td>13</td>
<td>14</td>
<td>10</td>
<td>12</td>
<td>12</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>17</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Palm dates</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Quinces</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Loquats</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh fruit</td>
<td>2118</td>
<td>2131</td>
<td>2225</td>
<td>2416</td>
<td>2649</td>
<td>2404</td>
<td>2672</td>
<td>2714</td>
<td>2500</td>
<td>3081</td>
<td>2741</td>
<td>2959</td>
<td>2573</td>
<td>2444</td>
</tr>
</tbody>
</table>

Source: Own calculation based on official statistics of the Syrian Ministry of Agriculture and Agrarian Reform (MAAR). For this purpose, annual statistical abstracts of MAAR for years from 2000 to 2013 have been used.
Appendix 2

Appendix 2.1: Cross loadings test of Model 1: PLS-SEM results of the TPB model of Syrian farmers of FFV

<table>
<thead>
<tr>
<th>Construct</th>
<th>ATT</th>
<th>BI</th>
<th>CONV</th>
<th>PBC</th>
<th>SN</th>
<th>bsoe</th>
<th>cbpc</th>
<th>nbmc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Att_1</td>
<td>0.79</td>
<td>0.54</td>
<td>0.49</td>
<td>0.58</td>
<td>0.34</td>
<td>0.44</td>
<td>0.51</td>
<td>0.23</td>
</tr>
<tr>
<td>Att_2</td>
<td>0.85</td>
<td>0.67</td>
<td>0.63</td>
<td>0.69</td>
<td>0.40</td>
<td>0.50</td>
<td>0.55</td>
<td>0.21</td>
</tr>
<tr>
<td>Att_3</td>
<td>0.78</td>
<td>0.50</td>
<td>0.51</td>
<td>0.53</td>
<td>0.44</td>
<td>0.55</td>
<td>0.56</td>
<td>0.27</td>
</tr>
<tr>
<td>ATT_4T</td>
<td>0.72</td>
<td>0.48</td>
<td>0.43</td>
<td>0.53</td>
<td>0.37</td>
<td>0.47</td>
<td>0.41</td>
<td>0.24</td>
</tr>
<tr>
<td>Pbc_1</td>
<td>0.55</td>
<td>0.43</td>
<td>0.42</td>
<td>0.78</td>
<td>0.34</td>
<td>0.43</td>
<td>0.43</td>
<td>0.17</td>
</tr>
<tr>
<td>Pbc_2</td>
<td>0.66</td>
<td>0.53</td>
<td>0.49</td>
<td>0.85</td>
<td>0.39</td>
<td>0.49</td>
<td>0.55</td>
<td>0.25</td>
</tr>
<tr>
<td>Pbc_3</td>
<td>0.56</td>
<td>0.49</td>
<td>0.50</td>
<td>0.79</td>
<td>0.34</td>
<td>0.43</td>
<td>0.50</td>
<td>0.30</td>
</tr>
<tr>
<td>Pbc_4</td>
<td>0.21</td>
<td>0.19</td>
<td>0.27</td>
<td>0.39</td>
<td>0.08</td>
<td>0.08</td>
<td>0.18</td>
<td>0.21</td>
</tr>
<tr>
<td>Pbc_5</td>
<td>0.58</td>
<td>0.45</td>
<td>0.47</td>
<td>0.71</td>
<td>0.26</td>
<td>0.39</td>
<td>0.43</td>
<td>0.26</td>
</tr>
<tr>
<td>info_3</td>
<td>0.53</td>
<td>0.52</td>
<td>0.50</td>
<td>0.66</td>
<td>0.33</td>
<td>0.44</td>
<td>0.45</td>
<td>0.29</td>
</tr>
<tr>
<td>bi_1T</td>
<td>0.64</td>
<td>0.91</td>
<td>0.72</td>
<td>0.58</td>
<td>0.37</td>
<td>0.46</td>
<td>0.49</td>
<td>0.20</td>
</tr>
<tr>
<td>bi_2</td>
<td>0.65</td>
<td>0.92</td>
<td>0.74</td>
<td>0.58</td>
<td>0.38</td>
<td>0.48</td>
<td>0.48</td>
<td>0.18</td>
</tr>
<tr>
<td>bsoe_1</td>
<td>0.32</td>
<td>0.21</td>
<td>0.27</td>
<td>0.23</td>
<td>0.31</td>
<td>0.57</td>
<td>0.43</td>
<td>0.19</td>
</tr>
<tr>
<td>bsoe_2</td>
<td>0.19</td>
<td>0.14</td>
<td>0.14</td>
<td>0.24</td>
<td>0.12</td>
<td>0.44</td>
<td>0.28</td>
<td>0.16</td>
</tr>
<tr>
<td>bsoe_3</td>
<td>0.51</td>
<td>0.34</td>
<td>0.36</td>
<td>0.40</td>
<td>0.38</td>
<td>0.71</td>
<td>0.41</td>
<td>0.29</td>
</tr>
<tr>
<td>bsoe_4</td>
<td>0.35</td>
<td>0.31</td>
<td>0.29</td>
<td>0.30</td>
<td>0.27</td>
<td>0.64</td>
<td>0.40</td>
<td>0.25</td>
</tr>
<tr>
<td>bsToe_5</td>
<td>0.13</td>
<td>0.10</td>
<td>0.06</td>
<td>0.11</td>
<td>0.15</td>
<td>0.25</td>
<td>0.20</td>
<td>0.06</td>
</tr>
<tr>
<td>bsToe_6</td>
<td>0.35</td>
<td>0.27</td>
<td>0.26</td>
<td>0.41</td>
<td>0.23</td>
<td>0.58</td>
<td>0.40</td>
<td>0.12</td>
</tr>
<tr>
<td>bsToe_7</td>
<td>0.48</td>
<td>0.47</td>
<td>0.45</td>
<td>0.43</td>
<td>0.36</td>
<td>0.74</td>
<td>0.56</td>
<td>0.33</td>
</tr>
<tr>
<td>bsoe_8</td>
<td>0.41</td>
<td>0.42</td>
<td>0.41</td>
<td>0.43</td>
<td>0.24</td>
<td>0.67</td>
<td>0.47</td>
<td>0.24</td>
</tr>
<tr>
<td>bsToe_9</td>
<td>0.27</td>
<td>0.20</td>
<td>0.13</td>
<td>0.17</td>
<td>0.08</td>
<td>0.34</td>
<td>0.18</td>
<td>-0.01</td>
</tr>
<tr>
<td>cbpc_1</td>
<td>0.40</td>
<td>0.32</td>
<td>0.31</td>
<td>0.42</td>
<td>0.34</td>
<td>0.53</td>
<td>0.69</td>
<td>0.25</td>
</tr>
<tr>
<td>cbpc_2</td>
<td>0.51</td>
<td>0.37</td>
<td>0.37</td>
<td>0.44</td>
<td>0.38</td>
<td>0.45</td>
<td>0.73</td>
<td>0.18</td>
</tr>
<tr>
<td>cbpc_3</td>
<td>0.36</td>
<td>0.26</td>
<td>0.26</td>
<td>0.34</td>
<td>0.27</td>
<td>0.32</td>
<td>0.59</td>
<td>0.21</td>
</tr>
<tr>
<td>cbpc_4</td>
<td>0.53</td>
<td>0.47</td>
<td>0.46</td>
<td>0.49</td>
<td>0.34</td>
<td>0.54</td>
<td>0.74</td>
<td>0.28</td>
</tr>
<tr>
<td>cbpc_5</td>
<td>0.23</td>
<td>0.14</td>
<td>0.18</td>
<td>0.22</td>
<td>0.13</td>
<td>0.15</td>
<td>0.34</td>
<td>0.18</td>
</tr>
<tr>
<td>cbpc_6</td>
<td>-0.08</td>
<td>0.02</td>
<td>0.08</td>
<td>-0.05</td>
<td>0.01</td>
<td>-0.03</td>
<td>0.00</td>
<td>0.06</td>
</tr>
<tr>
<td>cbpc_7</td>
<td>0.28</td>
<td>0.23</td>
<td>0.23</td>
<td>0.26</td>
<td>0.25</td>
<td>0.29</td>
<td>0.69</td>
<td>0.19</td>
</tr>
<tr>
<td>cbpc_8</td>
<td>0.43</td>
<td>0.42</td>
<td>0.44</td>
<td>0.43</td>
<td>0.36</td>
<td>0.50</td>
<td>0.66</td>
<td>0.33</td>
</tr>
<tr>
<td>conv_1</td>
<td>0.60</td>
<td>0.70</td>
<td>0.91</td>
<td>0.60</td>
<td>0.35</td>
<td>0.48</td>
<td>0.54</td>
<td>0.20</td>
</tr>
<tr>
<td>conv_2T</td>
<td>0.62</td>
<td>0.76</td>
<td>0.92</td>
<td>0.56</td>
<td>0.35</td>
<td>0.45</td>
<td>0.45</td>
<td>0.17</td>
</tr>
<tr>
<td>nbmc_1</td>
<td>0.08</td>
<td>0.06</td>
<td>0.09</td>
<td>0.13</td>
<td>0.28</td>
<td>0.17</td>
<td>0.19</td>
<td>0.64</td>
</tr>
<tr>
<td>nbmc_2</td>
<td>0.12</td>
<td>0.04</td>
<td>0.02</td>
<td>0.14</td>
<td>0.29</td>
<td>0.16</td>
<td>0.18</td>
<td>0.73</td>
</tr>
<tr>
<td>nbmc_3</td>
<td>0.24</td>
<td>0.20</td>
<td>0.16</td>
<td>0.31</td>
<td>0.21</td>
<td>0.21</td>
<td>0.23</td>
<td>0.65</td>
</tr>
<tr>
<td>nbmc_4</td>
<td>0.17</td>
<td>0.15</td>
<td>0.15</td>
<td>0.22</td>
<td>0.04</td>
<td>0.09</td>
<td>0.06</td>
<td>0.41</td>
</tr>
<tr>
<td>nbmc_5</td>
<td>0.30</td>
<td>0.23</td>
<td>0.27</td>
<td>0.28</td>
<td>0.17</td>
<td>0.30</td>
<td>0.30</td>
<td>0.51</td>
</tr>
<tr>
<td>nbmc_6</td>
<td>0.29</td>
<td>0.19</td>
<td>0.16</td>
<td>0.27</td>
<td>0.19</td>
<td>0.31</td>
<td>0.33</td>
<td>0.51</td>
</tr>
<tr>
<td>nbmc_7</td>
<td>-0.09</td>
<td>-0.08</td>
<td>-0.04</td>
<td>-0.08</td>
<td>-0.02</td>
<td>-0.10</td>
<td>-0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>sn_1</td>
<td>0.44</td>
<td>0.40</td>
<td>0.37</td>
<td>0.39</td>
<td>0.84</td>
<td>0.39</td>
<td>0.45</td>
<td>0.29</td>
</tr>
<tr>
<td>sn_2</td>
<td>0.32</td>
<td>0.22</td>
<td>0.23</td>
<td>0.28</td>
<td>0.73</td>
<td>0.28</td>
<td>0.31</td>
<td>0.32</td>
</tr>
<tr>
<td>sn_3T</td>
<td>0.07</td>
<td>0.07</td>
<td>0.01</td>
<td>-0.02</td>
<td>0.12</td>
<td>0.14</td>
<td>0.03</td>
<td>0.01</td>
</tr>
</tbody>
</table>

N=266. Symbols in the first row refer to the TPB constructs and in first column to the associated indicators. Primary loadings are in bold. Own data.
Appendix 2.2: Visualisation of PLS-SEM algorithm of the TPB model of Syrian farmers to adopt organic FFV production within the next five years (Model 2)

Note: N = 266. All constructs of the TPB model are measured reflectively. Indicator loadings are shown in the measurement model between the indicators (yellow rectangles) and constructs (blue circles), while the path coefficients are given in the structural model of PLS-SEM (between the blue circles). The values inside the blue circles are the R-Squares. All input and output data of PLS-SEM algorithm are standardised. For the estimation of PLS-SEM algorithm, path weighting scheme was utilised. For this purpose, an abort criterion of $10^{-5}$, maximum iterations of 300, and initial weights of 1.0 were selected. Source: Own data.
Note: N = 266. All constructs of the TPB model are measured reflectively. Indicator loadings are shown in the measurement model between the indicators (yellow rectangles) and constructs (blue circles), while the path coefficients are given in the structural model of PLS-SEM (between the blue circles). The values inside the blue circles are the R-Squares. All input and output data of PLS-SEM algorithm are standardised. For the estimation of PLS-SEM algorithm, path weighting scheme was utilised. For this purpose, an abort criterion of $10^{-5}$, maximum iterations of 300, and initial weights of 1.0 were selected. Source: Own data.
Appendices

Appendix 2.4: Visualisation of PLS-SEM algorithm of the TPB model of Syrian farmers to adopt organic FFV production within the next five years (Model 4)

Note: N = 266. All constructs of the TPB model are measured reflectively. Indicator loadings are shown in the measurement model between the indicators (yellow rectangles) and constructs (blue circles), while the path coefficients are given in the structural model of PLS-SEM (between the blue circles). The values inside the blue circles are the R-Squares. All input and output data of PLS-SEM algorithm are standardised. For the estimation of PLS-SEM algorithm, path weighting scheme was utilised. For this purpose, an abort criterion of $10^{-5}$, maximum iterations of 300, and initial weights of 1.0 were selected. Source: Own data.
Affidavit

I herewith give assurance that I completed this dissertation independently without prohibited assistance of third parties or aids other than those identified in this dissertation. All passages that were drawn from published or unpublished writings, either word-for-word or in paraphrase have been clearly identified as such. Third parties were not involved in the drafting of the materials contents of this dissertation; most specifically I did not employ the assistance of a dissertation advisor. No part of this thesis has been used in another doctoral or tenure process”.


Witzenhausen, July 2016

Irwa Issa