Journal of Agriculture and Rural Development in the Tropics and Subtropics
Vol. 118 No. 2 (2017) 233–244

urn:nbn:de:hebis:34-2017110153630 ISSN: 2363-6033 (online); 1612-9830 (print) – website: www.jarts.info

# Assessing the impact of social grant-dependency on participation of KwaZulu-Natal rural households in farming: Application of the generalised propensity score method

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**Abstract**

Social grants are an important instrument of social protection in South Africa, reaching millions of the poor each month. Although social grants have been found to reduce poverty and promote human development, considerable uncertainty remains about some of their incentive effects. This study uses a sample of 984 rural households selected from KwaZulu-Natal, South Africa, to investigate the potential incentive/dis-incentive effects of social grant-dependency on rural households' participation in farming activities. The data are analysed using the generalised propensity score (GPS) matching method and ordinary least squares. The results showed that the effect of social-grant dependency on households' farm participation levels varies at different dependency levels. While social grants had a negative effect on the households' farming participation levels when social grants income contribute 20–60 %, they had a positive effect at lower (< 20 %) and higher (> 60 %) dependency levels. The positive effect of social grants at the lower and higher levels supports the hypothesis that social grant beneficiaries use part of the grant income to alleviate financial constraints in agricultural production. However, the negative effect at the 20–60 % dependency levels is consistent with the dis-incentive hypothesis, suggesting that social grants may generate dis-incentives to farm production. The study identified several policy variables that affect the participation of rural households in smallholder farming activities, highlighting the importance of expectations of farming success as a key motivator.

*Keywords:* continuous treatment, farm labour, incentives to farm, social grants

## 1 Introduction

Social grants are an important instrument of social protection in South Africa, benefiting over 16 million South Africans each month in 2014 (SASSA, 2014). There are seven different grants: the old age grant, child support grant, disability grant, war veterans' grant, foster care grant, care dependency grant, and grant-in-aid (ibid). Eligibility for social grants is dependent on an income and asset-based means test, which varies according to the grant, the marital status of the beneficiary and other characteristics. Despite these means tests, the majority of South Africans are eligible to receive these grants (Abel, 2013). The child support grants have the largest number of beneficiaries, reaching over 11.5 million beneficiaries in 2014. However, it pays the least amount to individual beneficiaries, R 320 per month in 2014 per beneficiary (equivalent to about US$ 30 using the 2014 exchange rate) (SASSA, 2014).

The old age grant, which benefitted over 3 million people in 2014, pays the largest amount (R 1350 per beneficiary, equivalent to about US$ 120). The remaining grant types benefit fewer beneficiaries than the above two, and they pay amounts equal to or ranging between the two grant types. Although South Africa's social

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Published online: 3 November 2017

grants have been found to address the poor's immediate basic needs, reduce poverty and promote human development (Neves et al., 2009; Samson, 2009), considerable uncertainty remains about some of their incentive effects (van der Berg et al., 2010). Conventional economic theory suggests that social grants may undermine the incentives of the poor to participate in economic activities, such as farming, by reducing the opportunity cost of failing to do so (Samson et al., 2004). Social grants may affect people's social and economic behaviour negatively and entrench a culture of dependency and entitlement (Gomersall, 2013). This is especially the case if the beneficiaries depend on social grants for many years.

Even though social grants in South Africa are targeted at specific vulnerable groups, such as the old, young, orphans and the sick, the potential for spill-over effects among household members has been noted by several researchers in the past (Klasen & Woolard, 2008; Abel, 2013; Devereux, 2013). According to Devereux (2013), the spill-over effects result in many unemployed or underpaid adults depending on these grants, i.e., becoming dependent on social grants beneficiaries. The concern, therefore, is that access to social grants by one or two household members may result in prime-aged, able-bodied household members choosing not to participate in economic activities, or reducing their work hours.

The debate in literature on the potential disincentive effects of the social grants on labour supply has been inconclusive. On one hand, some studies (e.g., Posel et al., 2006; Williams, 2007; Ardington et al., 2009, 2013) have concluded that additional income from social grants has a positive impact on employment by easing the constraints associated with job search. On the other hand, others (e.g., Bertrand et al., 2003; Abel, 2013) have concluded that social grants reduce incentives to work, as the additional income from social grants causes household members to work less and take additional leisure. In general, the previous studies have focused on the incentives of household members to engage in formal job activity, ignoring the incentives to engage in informal activities such as smallholder farming.

Given South Africa's high unemployment rates, which has been over 26 % in the past 10 years (Herrington et al., 2015), limited prospects for labour absorption in the off-farm sector (Aliber & Hall, 2012), and that the government has prioritised the expansion of the smallholder farming sector as part of its broader job creation strategy (DED, 2011), the incentives to work cannot be fully captured if the smallholder farming sector is ignored. Most of the rural people are self-employed in informal activities such as smallholder farming (Gollin, 2014), implying that studies on incentives to work should also consider this fact. Also, most of the recent social grant impact studies in South Africa, with the exception of Agüero et al. (2007), have focused on evaluating causal effects of a binary treatment, i.e., a dummy variable showing whether or not a household has access to grants. A weakness of the binary treatment approach is that it does not account for the heterogeneous effects of social grants, as it classifies all social grants recipient households in the same way, irrespective of the level of social grant support (Agüero et al., 2007; Bia & Mattei, 2012).

Therefore, this study aimed to contribute to the literature on social grants impacts by investigating the extent to which social grant-dependency affect rural households' incentives to participate in farming activities in the KwaZulu-Natal province. Social grant-dependency was defined as the extent to which social grants contribute to household income. The study's contribution to the literature is in three ways. Firstly, the study focuses on the smallholder farming sector, which has not been adequately investigated by the social grant impact studies. Secondly, the study uses the continuous treatment approach, instead of the limited binary treatment approaches. Lastly, the study uses the proportion of all the social grants to household income, thus capturing the importance of all the social grants to household income. Previous social grant studies (e.g., Posel et al., 2006; Agüero et al., 2007; Abel, 2013) have mostly focused on the impact of, mostly, one or a few of the social grants. This study argues that it is the relative importance of the social grant that influences household behaviour as it better captures the level of social grant-dependency compared to the absolute amount of social grants income.

## 2 Materials and methods

### *2.1 Data*

The multi-stage random sampling technique was adopted in this study to draw a sample of 984 farming households from four districts in the KwaZulu-Natal (KZN) province of South Africa. Firstly, four districts were purposively chosen out of the 11 districts in KZN. The four districts that were selected were Harry Gwala, Umzinyathi, Umkhanyakude and Uthukela. These districts have a significant number of rural communities

engaged in smallholder farming activities. Secondly, a total of 984 households were randomly selected from the four districts. The lists of farmers were obtained from the respective local offices of KZN's Department of Agriculture. The total sample comprised of 239 households from Umzinyathi, 191 from Uthukela, 143 from Umkhanyakude and 411 from Harry Gwala districts. The number of households sampled was proportional to the number of farming households in the selected districts. The data were collected using a pretested structured questionnaire. The questionnaire captured the farmers' main information used to generate variables.

### *2.2 Dependent and independent variables*

The dependent variable, capturing households participation in farming activities, was proxied by the total number of man-day equivalents the household members were involved in crop farming activities in the previous 60 days, following Abdulai et al. (2005). The 60-day period was considered short enough for the households to recall easily and give relatively accurate and reliable responses. The two months under study, October and November, represent the peak periods of labour demand for land preparation, cultivation and planting the summer crops. A man-day of work was defined as the amount of farm work that can be carried out by an adult male in an 8-hour work period (ILCA, 1990). The conversion factors (weights) applied to males and females in different age groups and carrying out different farming tasks to express labour time in terms of man-days were those presented in Panin (1986).

To capture social grant-dependency, the treatment variable, the study used the proportion of household income from social grants. The fact that social grants are given to individuals in households, and that different households differ in terms of the number of social grant beneficiaries leads to a high degree of heterogeneity in contribution levels received by households. Treating a household that receives just 10 % of its income from social grants the same as a household that receives more than 50 % of its income from grants seems likely to understate the potential effect of social grants. The proportion variable used in this study captures this variation.

The econometric models included other variables that were hypothesised to influence households' decision-making processes and incentives to participate in farming. Since the labour variable focused on the participation of family labour on crop farming activities, livestock farming was controlled for by including livestock size as one of the explanatory variables in the model. Off-farm commitments, captured as off-farm employment and off-farm business ownership, were also controlled for by entering these variables as explanatory variables.

### *2.3 Estimation methods*

The generalised propensity score (GPS) method was used to estimate the impact of social grant-dependency on household members' participation in farming activities. The use of experimental or randomised designs is not applicable when studying social grants in South Africa because the social grants were not implemented with an experimental design (Agüero et al., 2007; Patel et al., 2013). The GPS is the conditional probability of receiving a particular dosage level given a set of observable variables (Imbens, 2000; Hirano & Imbens, 2004). The GPS method was applied under the un-confoundedness assumption that adjusting for differences in a set of observed pre-treatment variables removes all biases in comparisons by different levels of social grant-dependency. Compared to estimates based on full samples, the impact estimates based on matched samples are less biased and more reliable (Rubin & Thomas, 2000).

The GPS matching method was estimated following Hirano & Imbens (2004), using a Stata ado file developed by Bia & Mattei (2008). The estimation procedure consisted of three main steps. The first step involved estimation of the propensity score. To estimate the conditional distribution of the level of dependency on social grants, it was assumed that the level of dependency on social grants follows a normal distribution, conditional on the covariates:

$$g(T_i)|X_i \sim N\left[h(\gamma, X_i), \sigma^2\right], \qquad (1)$$

where $T_i$ is the level of dependency on social grants (the treatment variable), $g(T_i)$ is a suitable transformation of the level of dependency on social grants, $h(\gamma, X_i)$ is a function of covariates ($X_i$) with linear and higher-order terms, which depends on a vector of parameters, $\gamma$, and $\sigma$ is the standard deviation. The higher-order terms were included to obtain an estimate of the GPS that satisfies the balancing property (Bia & Mattei, 2008). The tests for normality and the balancing property were done to ensure that these assumptions were met before estimating the GPS. An important assumption of the GPS method is that adjusting for differences in a set of observed variables removes all biases in comparisons by different level of dependency on social grants (unconfoundedness). To strengthen the plausibility of this strong unconfoundedness assumption, a rich num-

ber of covariates was introduced in the estimation of the propensity score.

The GPS was estimated as follows:

$$\hat{R}_i = \frac{1}{\sqrt{2\pi\hat{\sigma}^2}} \exp\left[-\frac{1}{2\hat{\sigma}^2} g(T_i) - h(\hat{\gamma}, X_i)\right], \quad (2)$$

where $\hat{R}_i$ is the estimated score, and other variables and parameters are as defined before. $\hat{\sigma}$ and $\hat{\gamma}$ are the parameters estimated in Eq. (1).

The second main step of the GPS matching technique involved estimating the conditional expectation of the outcome Yi (household's participation in farming activities in man-day equivalents), given the level of dependency on social grants ($T_i$) and the GPS ($R_i$). The conditional expectation of the outcome was estimated as a function of the two scalar variables, $T_i$ and $R_i$, as follows:

$$\varphi\left[E(Y_i|T_i, R_i)\right] = \psi(T_i, R_i, \alpha), \quad (3)$$

where $\varphi(.)$ is a link function that relates the predictor, $\psi(T_i, R_i, \alpha)$ to the conditional expectation, $\alpha$ are the parameters to be estimated using the polynomial approximations, and other variables are as defined before. As suggested by Bia & Mattei (2008), the polynomial approximations of order higher than three were not used.

The final step involved estimating the dose-response function. The estimated regression function was averaged over the score function and evaluated at the desired level of the treatment. The average potential outcome (dose-response function) for each level of dependency on social grants was estimated as follows:

$$\begin{aligned} E[\widehat{Y(t)}] &= \frac{1}{N}\sum_{i=1}^{N} \hat{\beta}\left[t, \hat{r}(t, X_i)\right] \\ &= \frac{1}{N}\sum_{i=1}^{N} \varphi^{-1}\left[\hat{\psi}\left(t, \hat{r}(t, X_i); \hat{\alpha}\right)\right], \end{aligned} \quad (4)$$

where $\hat{\alpha}$ is the vector of the estimated parameters in the second stage and other variables and parameters are as described above. The analysis here used variation in the extent of level of dependency on social grants (the treatment) to identify the causal impact.

For robustness checks as well as to investigate other factors that determine the participation levels of rural households in farming activities, ordinary least squares (OLS) was used to estimate the following equation:

$$Y_i = \beta x_i + \delta T_i + \varepsilon_i, \quad (5)$$

where $Y_i$ is the number of man-days the household members were engaged in farming activities, $T_i$ is the proportion of household income from social grants, $x_i$ is a vector of household characteristics, $\beta$'s and $\delta$ are parameters to be estimated and $\varepsilon_i$ is the residual term.

## 3 Results

### *3.1 Descriptive statistics*

Table 1 presents the demographic and socio-economic characteristics of the 984 sampled households. The table shows that the age of the rural farming households' heads was 56 years, on average, and that 47 % of households were male-headed. The sampled household heads attained low levels of education, and only 20 % were employed. On average, 0.97 prime-aged, able-bodied household members, representing just over 25 % of the total 3.67 prime-aged, able-bodied household members, were employed in the off-farm sector, highlighting the lack of economic opportunities in the rural areas. This underscores the importance of smallholder farming as a livelihood option among the rural households. The households spent an average of 36 man-days on farming activities in the previous 60 days.

The households had access to small land sizes (2 ha), and practiced both crop farming and livestock rearing. Maize was grown by most of the farmers (78 %) the season prior to the survey. Further crops cultivated included beans (56 %), spinach (53 %), onions (46 %), tomatoes (43 %), cabbages (38 %), potatoes (26 %), butternut (18 %) and beetroot (14 %). A significant proportion of the households practiced some form of irrigation. Some were members of smallholder irrigation schemes, while others watered their crops (such as spinach, tomatoes, etc.) using cans and hosepipes. The households owned moderate livestock sizes, with cattle (mean = 3), goats (mean = 5) and chickens (mean = 10) being the main animals kept. Cattle and goats are driven to communal grazing areas every morning to feed and collected at sunset, while the chickens fend for food around the yard.

The majority (84 %) of the households had access to social grants. On average, each household had about three social grants beneficiaries, showing the important role of social grants among rural households, in view of household size of seven. Social grants contributed significantly (38 %) to household income, which is bigger than the contribution of farming (13 %). The households reported poor access to markets and support services such as training, extension and credit. Few households hired people to help with their farming activities.

**Table 1:** *Household descriptive variables and their means (n = 984).*

| *Variable name* | *Variable description* | *Mean* | *SD* |
|---|---|---|---|
| Age | Household head age (Years) | 56 | 13 |
| Gender | Household head gender (1=Male) | 0.47 | – |
| Marital status | Household head marital status (1=Married) | 0.46 | – |
| Education level | Household head education level (Years of schooling) | 4.67 | 4.17 |
| Household size | Household size (Numbers) | 7.04 | 3.60 |
| Employment status of HH head | Household head off-farm employment (1=Yes) | 0.20 | – |
| Total family labour | Able-bodied, prime-aged household members | 3.61 | 2.30 |
| Number of employed HH members | Able-bodied household members employed off-farm | 0.97 | 1.32 |
| Farm labour | Household participation in farming activities in the last 60 days (Man-day equivalents) | 36.37 | 21.84 |
| Access to grants | Access to social grants (1=Yes) | 0.84 | – |
| Grants beneficiaries | Number of social grant beneficiaries per household | 3.18 | 1.81 |
| Land size | Land size household has access to (ha) | 1.90 | 4.47 |
| Livestock size | Livestock size per household (TLUs) | 3.53 | 17.40 |
| Assets | Value of assets (Rands†) | 82 105 | 38 937 |
| Total income | Total annual household income (Rands†) | 46 757 | 32 707 |
| Income from grants | Annual income from grants (Rands†) | 16 916 | 15 877 |
| Income from farming | Annual income from farm activities (Rands†) | 6553 | 12 438 |
| Social grant income proportion | Proportion of income from social grants | 0.38 | 0.26 |
| Farm income proportion | Proportion of income from farming activities | 0.13 | 0.14 |
| Farming experience | Household head farming experience (Years) | 18.70 | 13.28 |
| Hire labour | Hiring in farm labour (1=Yes) | 0.37 | – |
| Rainfall | Perceived rainfall (1=Good) | 0.67 | – |
| Soil quality | Perceived soil quality (1=Good) | 0.55 | – |
| Tenure | Secured land tenure (1=Yes) | 0.37 | – |
| Tillage access | Tillage access (1=Yes) | 0.45 | – |
| Market access | Market access (1=Yes) | 0.20 | – |
| Group membership | Farmer association member (1=Yes) | 0.42 | – |
| Credit access | Access to credit (1=Yes) | 0.36 | – |
| Extension access | Access to extension (1=Yes) | 0.46 | – |
| Training | Access to agricultural training (1=Yes) | 0.41 | – |
| Off-farm business | Small off-farm business ownership (1=Yes) | 0.08 | – |
| Irrigation access | Access to water for watering crops (1=Yes) | 0.46 | – |
| Distance to road | Distance to the nearest all-weather road (km) | 17.75 | 39.93 |
| Harry Gwala | Harry Gwala district (1=Harry Gwala) | 0.42 | – |
| Umzinyathi | Umzinyathi district (1=Umzinyathi) | 0.24 | – |
| Uthukela | Uthukela district (1=Uthukela) | 0.19 | – |
| Umkhanyakude | Umkhanyakude (1=Umkhanyakude) | 0.15 | – |

Notes: † Exchange rate: R 11.28 = US$ 1; TLU: Tropical Livestock Unit, HH: household

Most of the farmers perceived their soils to be fertile and rainfall to be good.

The results also showed low levels of off-farm entrepreneurship among the interviewed households, as only a small proportion of households owned some micro-business ventures such as weaving, handicrafts and tuck shops. The roads were generally poor and inaccessible in the study areas, with many rural households found far from the nearest all-weather road. These roads to the households are generally inaccessible by car, with households having to use wheelbarrows or bicycles to get to the all-weather roads.

### 3.2 *The impact of social grant-dependency on farming participation levels: The generalised propensity score (GPS) method results*

Before presenting the GPS results, a mean comparison of households' farm participation levels at three levels of social grant-dependency was done and results are presented in Table 2. The table shows that only 155 of the total sampled households were not recipients of any type of social grant, representing 16 % of the sample. A significant proportion (36 %) of the total sampled huseholds derived more than 50 % of their income from social grants, while 48 % received less than 50 % of their income from social grants. The results indicate progressive decline in participation levels as the contribution of social grants to household income increases. While this suggest that households participate less in farming acitivities as they become more dependent on social grants, this result should not be accepted yet as the confounding factors were not controlled for.

The GPS approach was implemented following Bia & Mattei (2008) and the results are presented in Fig. 1. The tests for normality and balancing property indicated that these assumptions were satisfied. Figure 1 shows the average dose-response and treatment effect functions and the 95 % confidence bands for farm participation levels. The confidence bands were based on 100 bootstrap replications to account for the uncertainty associated with the estimation of the GPS and the parameters, as suggested by previous studies (Bia & Mattei, 2008, 2012).

**Table 2:** *Mean comparisons of household farm participation according to social grant-dependency.*

| *Variables* | *No income (0 %) from grants* ($n$ = 155) | | *Low income (< 50 %) from grants* ($n$ = 478) | | *High income (> 50 %) from grants* ($n$ = 351) | | *F test* |
|---|---|---|---|---|---|---|---|
| | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | |
| Man days over the last 60 days | 39.55 | 23.64 | 37.08 | 21.92 | 34.04 | 20.72 | 3.86** |

** means significant at 5 % significance levels.

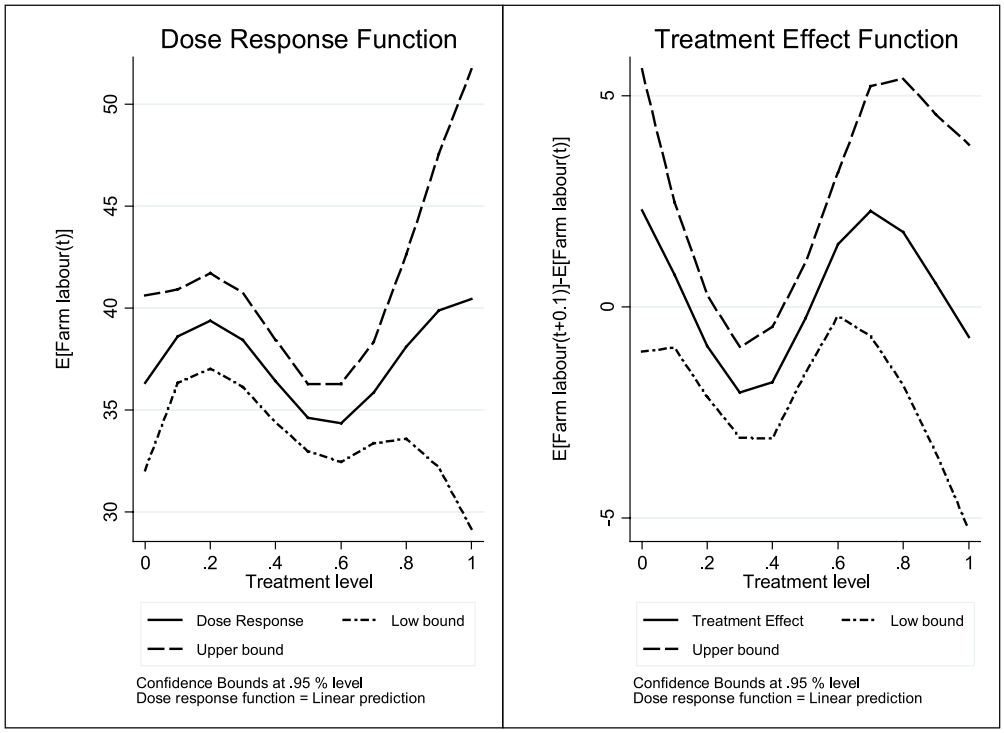


**Fig. 1:** *The average dose-response and treatment functions and 95 % confidence bands for the number of man-days the household members were engaged in farming activities during the last 60 days.*

Notes: E[Farm labour(t)] means the average number of man-days household members were engaged in farming activities at treatment level t, while treatment level means the contribution level of social grants income to total household income. The E[Farm labour(t+0.1)] – E[Farm labour(t)] shows the average effect of a social grant contribution increase of 10 % to household income on the household's farm participation level.

The confidence bands are narrow in the 0–80 % range, implying that the results are reliable up to 80 %. The wide 95 % confidence bands imply a high level of uncertainty. As such, the shape of the graph after dosages greater than 80 % should be considered with caution, and was not interpreted in this study.

The results showed that the effect of social grant-dependency is not uniform at different treatment levels. Figure 1 shows that increasing treatment (i.e., increasing dependency on social grants) is associated with increasing participation at lower (0–20 %) and higher (60–80 %) treatment levels. The implication is that the additional income from social grants, at lower and higher levels of social grant-dependency, plays a positive role in motivating households to participate more in farming. At lower levels, the social grant income is not significant enough to create a dependency syndrome. On the other hand, at higher levels, the households are poorer and have fewer other income sources, such that households must look for economic activities to augment their inadequate income. However, Fig. 1 indicate that additional income from social grants results in decreased incentives to supply more family labour to farming at dosages between 20 and 60 %.

### 3.3 *The impact of social grant-dependency on farming participation levels: Ordinary least squares (OLS) results*

Table 3 presents the OLS results estimated for robustness checks on the GPS matching results as well as to investigate the determinants of households' farm participation levels. The highly significant F statistic indicates that, collectively, the variables are significant determinants of farm participation, suggesting good model fit. The tests for collinearity were done using variance inflation factors (VIFs), and they indicated that there was little evidence of severe multi-collinearity among other variables. Heteroscedasticity was remedied by reporting robust standard errors. The Hausman test indicated that the level of dependency on social grants was not endogenous in the model. The results indicate a negative relationship between dependency on social grants and household participation in farming activities. Even though the GPS results indicated that this negative relationship applies only when households receive between 20 and 60 % of their income from social grants, the OLS results indicated that this relationship dominates on average.

The results showed that the relationship between the age of the household head and farming participation levels is non-linearly. This means that households are less likely to decrease their farm participation up to a certain age of the household head. However, after the household head reaches a particular age, more household members become involved in farming activities. This can be explained in terms of the earning opportunities of the household head. At younger ages, additional years mean more experience and connections, such that the household head accumulates opportunities. Such opportunities result in the household becoming less reliant on smallholder farming, hence less commitment to farming. However, at older years, the household head

**Table 3:** *The impact of social grant-dependency on household farm participation, OLS results (n = 984).*

| *Variables* | *Coef.* | *Std. Err.* |
|---|---|---|
| Social grant income proportion | −3.985 ** | 1.914 |
| Age | −1.090 *** | 0.346 |
| Age$^2$ | 0.009 *** | 0.003 |
| Gender | 1.484 | 1.495 |
| Education level | −0.094 | 0.189 |
| Marital status | 2.351 | 1.493 |
| Total family labour | 2.167 *** | 0.203 |
| Hired labour | −1.112 *** | 0.246 |
| Employment status of HH head | −3.035 * | 1.768 |
| Number of employed HH members | −1.627 *** | 0.542 |
| Off-farm business | 5.647 ** | 2.860 |
| Farming experience | 0.044 | 0.053 |
| Land size | 0.900 | 0.626 |
| Livestock size | −0.034 ** | 0.019 |
| Assets | 0.298 | 0.857 |
| Rainfall | −1.044 | 1.696 |
| Soil quality | 1.112 *** | 0.364 |
| Tillage access | −3.109 *** | 1.320 |
| Market access | 2.206 * | 1.339 |
| Group membership | 5.145 *** | 1.687 |
| Credit access | 1.125 *** | 0.372 |
| Extension access | 3.909 *** | 1.365 |
| Training | 0.958 | 1.564 |
| Distance to road | 0.033 | 0.019 |
| Irrigation access | 3.699 *** | 1.345 |
| Umzinyathi | 0.010 | 1.961 |
| Uthukela | −6.901 *** | 1.831 |
| Umkhanyakude | 2.879 | 2.600 |
| _Constant | 2.638 | 2.914 |
| *N* | 984 | |
| *F* | 9.46 *** | |
| $R^2$ | 0.43 | |
| Mean VIF | 4.50 | |
| Hausman test: $F = 1.43$, $p = 0.23$ | | |

Notes: *** means significant at 1 %; ** means significant at 5 %; * means significant at 10 % significance levels

is retiring or about to retire. The likely loss of income due to the head retiring forces households to be more involved in farming activities.

The results showed a positive relationship between total family labour and farm participation. This is expected, since higher number of able-bodied, prime-aged household members imply increased labour availability, which results in an increase in the number of mandays supplied to farming. The results also demonstrate that those households who hired in labour supplied less household labour to farming activities. This is because hired labour substitute for family labour, such that increasing hired labour leads to decreased farm participation by household members.

The employment status of the household head as well as the number of employed family members had negative estimated coefficients. This indicates that family members engage less in farming when the household head or a greater number of household members are employed off-farm. The explanation here is that households where members are employed in the off-farm sector have less remaining labour time to supply to farming activities. Moreover, these households are less dependent on farming, and therefore less committed to farming. Ownership of a off-farm small business had a positive estimated coefficient, suggesting a positive relationship between off-farm businesses and farming.

The results showed a negative relationship between livestock size and household farm participation levels. A bigger livestock size implies a wealthier household, and increasing wealth is associated with decreasing dependency on crop farming only. As such, household members become less committed to crop farming as the household becomes wealthier. As expected, access to tillage services reduces the participation of household members involved in farming. Access to tractors or animals for draught power reduces the work burden and/or drudgery. Households with access to tillage services such as tractors require fewer people to perform farming activities such as land preparation compared to households that rely on manual labour for the same tasks.

The households who felt that their soils were of good quality supplied more labour to farming activities than those who felt otherwise. The reason is that better soils increase the prospects of better yields, such that the households with good land quality, expecting better yields, would participate more in farming than those with poor soils. The results also indicate that access to the market motivates rural households to participate more in farming activities. Members of farmer groups supplied more family labour to farming than those who are not members. This is because association membership may help the individual farmers through pooling of resources and sharing of knowledge and experiences. The significant credit access estimate highlights the importance of credit support to the success of smallholder producers.

Access to extension is a motivator for households to become more involved in farming, hence the positive estimated coefficient. The same explanation applies to the positive estimated coefficient of irrigation access. Access to irrigation implies reduced chances of crop failure, higher productivity as well as higher expected revenues, hence more family members are likely to be involved in farming. Compared to Harry Gwala, the results indicate that households in the Uthukela district supplied less family labour to farming. The result may be indicative of the differences in economic opportunities between the two districts, suggesting that households in Uthukela district are less dependent on farming than those in Harry Gwala district.

## 4 Discussion

This paper examines the extent to which social grant-dependency has incentive / dis-incentive impacts on rural households' incentives to participate in farming activities. The paper addresses this issue by focusing on the causal effect of receiving different amounts of social grants to households and the subsequent relative importance of social grants income to the households. The GPS results indicate that the effect of social-grant dependency on households' farm participation levels differs at different dependency levels. This indicates the importance of moving beyond the dummy variable showing whether or not a household had access to social grants, as this would have failed to show these heterogeneities at different social grant-dependency levels.

The GPS matching approach indicates that while social grants have a negative effect on farming participation when social grants income contribute 20–60 %, they had a positive effect at lower and higher dependency levels. This suggests that increasing income from social grants motivates households to participate more in farming at lower and higher levels of social grant-dependency. Whereas households may be forced to participate at higher levels of dependency, as this implies poorer households, the study findings suggest that social grants may play a positive role if their contribution levels are kept below 20 % of household income. The positive effect of social grants at the lower and higher treatment levels is consistent with the presence of credit

constraints that limit poor rural households' ability to engage in economic activities, supporting the hypothesis that social grant beneficiary households use some of the grant income to alleviate financial constraints in agricultural production.

This result is consistent with several studies (e.g., Devereux, 2002; Lund, 2002; Woolard, 2003; Diao et al., 2012; Mabugu et al., 2014; Proctor, 2014), that have reported that social grants can promote livelihoods and enhance economic activities by easing the financial constraints facing the poor - the so-called 'irrigation function' of social security. This suggests that social grants have the potential to complement livelihood activities such as farming as options for rural livelihoods in Africa. This is supported by Sinyolo et al. (2016a) who found that the households with access to social grants adopt more modern technologies such as inorganic fertilisers compared to households without access to social grants. However, findings from Sinyolo et al. (2016b) suggest that the increase in technology use due to access to social grants is not associated with increase in land under cultivation, as the study found no significant impact of social grants on the proportion of land cultivated. Similarly, the results of this current study suggests that the increase in household members participating in farming activities does not necessarily result in increasing proportion of land cultivated by households.

The GPS results also suggest that social grants have a dis-incentive effect when they contribute between 20 and 60 % to household income. This result supports other studies (e.g., Bertrand et al., 2003; Abel, 2013), which reported that an increase in social grants income increases the reservation wage and lowers labour force participation. This implies that, at least some of the social grant income that is, in theory, targeted towards the elderly, young or sick, ends up being redistributed (as cash or food, etc.) towards the working-age members of the household. The result of this intra-family redistribution is a significant reduction of the number of mandays that the household members engage in smallholder farming activities when social grants contribute between 20 and 60 % to household income.

The study identified key variables that affect the participation levels of rural households in smallholder farming. In general, the study highlighted the importance of expectations of success in motivating households to commit more family labour on farming activities. For example, households with access to irrigation had more members participating because of reduced risk of crop failure under irrigation. Moreover, access to institutional and/or organisational support such as extension, markets, credit or farmer groups were positively related to farming participation as these also increase chances of farming success. Agricultural extension officers remain the main sources of information with regards to new technologies or markets among the rural households. In South Africa, access to agricultural extension officers also means higher chances of accessing government support. Since farming is more likely to succeed where households have access to government support, household members are more likely to engage in farming where success is expected. Further analysis of the data indicated that households with access to extension had significantly higher farm income than those without extension access.

The result that households with better access to markets supplied more labour to farming than those with less access to the market is consistent with other studies in South Africa (e.g., Kirsten & Sartorius, 2002; van der Heijden & Vink, 2013). This highlights the important role played by access to markets in the success of smallholder farming. Market access speaks of opportunities of making good profits out of farming activities and it is these prospects that encourage households to supply more labour to farming. This study also demonstrates the positive role of farmer organisation in smallholder farming success, in line with what has been reported by earlier studies (e.g., Hellin et al., 2009; Markelova et al., 2009; HLPE, 2013; Sinyolo et al., 2014).

The positive and significant credit access estimate highlights the importance of credit support to the success of smallholder producers, as has been reported by others (Louw, 2013; Rahman & Smolak, 2014). Access to credit reduces the liquidity problem that usually affects the farmers during the planting season and this enhances the use of agricultural inputs in production, by ensuring that farmers secure the inputs in time. This leads to improved agricultural productivity, resulting in increased farm revenues and incentives for the farmers to participate more in farming.

Interestingly, whereas one would have expected that households who own off-farm businesses would be less committed to farming, the results of this study imply the opposite (Table 3). This indicates that rural households diversify their livelihoods and engage on a number of income generating activities, as has been reported by several studies (Shackleton et al., 2007; Jacobs & Makaudze, 2012; Aliber & Mdoda, 2015). According to these studies, households diversify into off-farm small businesses to supplement farming, not to substitute it. This suggests that starting off-farm businesses may be motivated by the need to find ways and means to

relax credit constraints in farming, or raise supplementary income to augment to what they get from farming, especially during lean seasons.

To conclude, the study indicates that the effect of social grants on incentives of households to participate in smallholder farming activities is dependent upon the contribution levels of the grants. Given the importance of social grants in poverty reduction, the study recommends that social grants should continue but policy makers should be particularly cognisant of their possible adverse consequences on smallholder farming at moderate dependency levels. To address the disincentive effects of social grants and ensure successful smallholder production activities in the rural areas, this study recommends a holistic approach that addresses both the social grants side as well as the smallholder farming side. Policy-makers should aim to find strategies of reducing social grant-dependency and dis-incentive effects, while simultaneously creating a conductive environment to improve the attractiveness, viability and success of smallholder farming. The study suggests that introducing and/or supporting existing irrigation schemes as well as increasing institutional and/or organisational support could encourage the rural people to participate more in smallholder farming. This is especially important in South Africa where the government's employment strategy puts agriculture at the core of its drive.

## References

Abdulai, A., Barrett, C. B. & Hoddinot, J. (2005). Does food aid really have disincentive effects? New evidence from sub-Saharan Africa. *World Development*, 33 (10), 1689–1704.

Abel, M. (2013). Unintended labour supply effects of cash transfer programmes: Evidence from South Africa's old age pension. SALDRU Working Paper 114. University of Cape Town, Cape Town, South Africa.

Agüero, J., Michael, C. & Ingrid, W. (2007). The impact of unconditional cash transfers on nutrition: The South African Child Support Grant. Working Paper number 39. International Poverty Centre, Brasilia, Brazil.

Aliber, M. & Hall, R. (2012). Support for smallholder farmers in South Africa: Challenges of scale and strategy. *Development Southern Africa*, 29 (4), 548–562.

Aliber, M. & Mdoda, L. (2015). The direct and indirect economic contribution of small-scale black agriculture in South Africa. *Agrekon*, 54 (2), 18–37.

Ardington, C., Bärnighausen, T., Case, A. & Menendez, A. (2013). Social protection and labour market outcomes of youth in South Africa. SALDRU Working Paper 96. University of Cape Town, Cape Town, South Africa.

Ardington, C., Case, A. & Hosegood, V. (2009). Labour supply responses to large social transfers: Longitudinal evidence from South Africa. *American Economic Journal: Applied Economics*, 1 (1), 22–24.

van der Berg, S., Siebrits, K. & Lekezwa, B. (2010). Efficiency and equity effects of social grants in South Africa. Stellenbosch Economic Working Papers 15/10. University of Stellenbosch, Cape Town.

Bertrand, M., Mullainathan, S. & Miller, D. (2003). Public policy and extended families: Evidence from pensions in South Africa. *World Bank Economic Review*, 17 (1), 27–50.

Bia, M. & Mattei, A. (2008). A Stata package for the estimation of the dose–response function through adjustment for the generalized propensity score. *The Stata Journal*, 8 (3), 354–373.

Bia, M. & Mattei, A. (2012). Assessing the effect of the amount of financial aids to Piedmont firms using the generalized propensity score. *Statistical Methods and Applications*, 21, 485–516.

DED (2011). The New Growth Path: Framework. DED (Department of Economic Development), Pretoria. Available at: http://www.economic.gov.za/communications/publications/new-growth-path-series (accessed on: 25 August 2015).

Devereux, S. (2002). Can social safety nets reduce chronic poverty? *Development Policy Review*, 20 (5), 657–675.

Devereux, S. (2013). Trajectories of social protection in Africa. *Development Southern Africa*, 30 (1), 13–23.

Diao, X., Thurlow, J., Benin, S. & Fan, S. (2012). Strategies and priorities for African agriculture: economy wide perspectives from country studies. International Food Policy Research Institute, Washington DC.

Gollin, D. (2014). Smallholder agriculture in Africa: An overview and implications for policy. IIED Working Paper. IIED, London. Available at: http://pubs.iied.org/14640IIED (accessed on: 5 March 2015).

Gomersall, J. (2013). The performance of the Child Support Grant: Review and research priorities. *Development Southern Africa*, 30 (4-05), 525–544.

van der Heijden, T. & Vink, N. (2013). Good for whom? Supermarkets and small farmers in South Africa: A critical review of current approaches to increasing access to modern markets. *Agrekon*, 52 (1), 68–86.

Hellin, J., Lundy, M. & Meijer, M. (2009). Farmer organization, collective action and market access in Meso-America. *Food Policy*, 34, 16–22.

Herrington, M., Kew, J. & Kew, P. (2015). 2014 GEM South Africa Report. South Africa: The crossroads – a goldmine or a time bomb? Global Entrepreneurship Monitor (GEM). Available at: http://www.gemconsortium.org/country-profile/108 (accessed on: 1 December 2015).

Hirano, K. & Imbens, G. W. (2004). The propensity score with continuous treatments. *In:* Gelman, A. & Meng, X.-L. (eds.), *Applied Bayesian modeling and causal inference from incomplete-data perspectives*. Ch. 7, Wiley, New York.

HLPE (2013). Investing in smallholder agriculture for food security. HLPE Report 6. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Food and Agricultural Organisation (FAO), Rome.

ILCA (1990). Livestock systems research manual. Working Paper 1, Vol. 1. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia.

Imbens, G. (2000). The role of the propensity score in estimating dose-response functions. *Biometrika*, 87 (3), 706–710.

Jacobs, P. & Makaudze, E. (2012). Understanding rural livelihoods in the West Coast District, South Africa. *Development Southern Africa*, 29 (4), 574–587.

Kirsten, J. & Sartorius, K. (2002). Linking agribusiness and small-scale farmers in developing countries: Is there a new role for contract farming. *Development Southern Africa*, 19 (4), 503–529.

Klasen, S. & Woolard, I. (2008). Surviving unemployment without state support: Unemployment and household formation in South Africa. *Journal of African Economies*, 18 (1), 1–51.

Louw, A. (2013). Sustainable policy support for smallholder agriculture in South Africa: Key issues and options for consideration. *In:* Greenberg, S. (ed.), *Smallholder and agro-food value chains in South Africa: Emerging practices, emerging challenges*. Institute of Poverty, Land and Agrarian Studies (PLAAS), Cape Town.

Lund, F. (2002). 'Crowding in' care, security, and micro-enterprise formation: Revisiting the role of the state in poverty reduction and development. *Journal of International Development*, 14, 681–694.

Mabugu, R., Chitiga, M., Fofana, I., Abidoye, B. & Mbanda, V. (2014). Assessing the general equilibrium effects of social grants in South Africa. Paper presented at the 17th Annual Conference on Global Economic Analysis "New Challenges in Food Policy, Trade and Economic Vulnerability", Dakar, Senegal.

Markelova, H., Meinzen-Dick, R., Hellin, J. & Dohrn, S. (2009). Collective action for smallholder market access. *Food Policy*, 34, 1–7.

Neves, D., Samson, M., van Niekerk, I., Hlatshwayo, S. & du Toit, A. (2009). The use and effectiveness of social grants in South Africa. Institute for Poverty, Land and Agrarian Studies (PLAAS) and Economic Policy Research Institute (EPRI), Cape Town.

Panin, A. (1986). *A comparative socio-economic analysis of hoe and bullock farming systems in northern Ghana*. Ph.D. thesis, University of Goettingen, Goettingen, Germany.

Patel, L., Hochfeld, T. & Moodley, J. (2013). Gender and child sensitive social protection in South Africa. *Development Southern Africa*, 30 (1), 69–83.

Posel, D., Fairburn, J. A. & Lund, F. (2006). Labour migration and households: A reconsideration of the effects of the social pension on labour supply in South Africa. *Economic Modelling*, 23 (5), 836–853.

Proctor, F. J. (2014). Rural economic diversification in sub-Saharan Africa. IIED Working Paper. IIED, London.

Rahman, A. & Smolak, J. (2014). Financing smallholder farmers in developing countries. *In:* Hazell, P. & Rahman, A. (eds.), *New directions of smallholder agriculture*. Oxford University Press, Oxford.

Rubin, D. & Thomas, D. (2000). Combining propensity score matching with additional adjustments for prognostic covariates. *Journal of American Statistical Association*, 95, 573–585.

Samson, M. (2009). Social cash transfers and employment: A note on empirical linkages in developing countries. The Organisation for Economic Co-operation and Development (OECD), Paris.

Samson, M., Lee, U., Ndlebe, A., Quene, K. M., van Niekerk, I., Gandhi, V., Harigaya, T. & Abrahams, C. (2004). The Social and Economic Impact of South Africa's Social Security System. Summary Report. Department of Social Development, Economic Policy Research Institute, Cape Town, South Africa.

SASSA (2014). Fact sheet: Issue no 12 of 2014. A statistical summary of social grants in South Africa. South Africa Social Security Agency (SASSA), Pretoria. Available at: http://www.sassa.gov.za/index.php/statistical-reports (accessed on: 28 June 2015).

Shackleton, C. M., Shackleton, S. E., Buiten, E. & Bird, N. (2007). The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. *Forest Policy and Economics*, 9, 558–577.

Sinyolo, S., Mudhara, M. & Wale, E. (2014). Water security and rural household food security: Empirical evidence from the Mzinyathi district in South Africa. *Food Security*, 6 (3), 483–499.

Sinyolo, S., Mudhara, M. & Wale, E. (2016a). The impact of social grants on the propensity and level of use of inorganic fertiliser among smallholders in KwaZulu-Natal, South Africa. *Agrekon*, 55 (4), 436–457.

Sinyolo, S., Mudhara, M. & Wale, E. (2016b). To what extent does dependence on social grants affect smallholder farmers' incentives to farm? Evidence from KwaZulu-Natal, South Africa. *African Journal of Agricultural and Resource Economics*, 11 (2), 154–165.

Williams, M. J. (2007). The social and economic impacts of South Africa's Child Support Grant. Working Paper #40. Economic Policy Research Institute, Cape Town.

Woolard, I. (2003). Social assistance grants, poverty and economic growth in South Africa. Paper presented at the TIPS/DPRU Forum 2003: The Challenge of Growth and Poverty: The South African Economy Since Democracy, Johannesburg.