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## Factors influencing technology adoption among smallholder farmers: a systematic review in Africa

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### Supplementary materials

#### Supplementary material A - Online keyword search string

2000 - 2019	Scopus	Web of Sci	JSTOR	Exclusion	Total
<i>technology* AND adoption*</i>	49,870	31,950	95,329		177,149
<i>technology* AND adoption* AND Africa*</i>	2,017	1,469	24,377		27,863
<i>agric* OR farm* AND technology* AND adoption*</i>	3,706	2,255	15,965		21,926
<i>agric* OR farm* AND technology* AND adoption* AND smallholder*</i>	434	358	932		1,724
<i>agric* OR farm* AND technology* AND adoption* AND smallholder* AND Africa*</i>	194	189	725		1,108
<i>agric* OR farm* AND "technology" AND "adoption" AND "smallholder" AND "Africa"</i>	187	158	81		426
Duplicates				73	353
Not relevant by study area				43	310
Not relevant by subject area				182	128
Selected articles					128





		important factor in its adoption.																				
15	Wale and Yalew (2007)	Farmers' attribute preferences change with development-oriented interventions.	Ethiopia	X		X		X		X	X	X	X						X	X	X	X
16	Khan et al. (2008a)	Farmers' perceptions of the benefits of technology influenced its adoption.	Kenya																	X	X	
17	Khan et al. (2008b)	Net returns achievable from the use of technology drives technology adoption.	Kenya			X				X				X	X	X						
18	Minten and Barrett (2008)	Higher rates of adoption of improved agricultural technologies increases crop yields and lowers food prices.	Madagascar	X	X	X		X														X
19	You et al. (2008)	Seed supply, extension, education, participatory decision making, capital, and household assets influence technology adoption.	Tanzania	X	X	X		X	X					X	X	X						
20	Amudavi et al. (2009)	Technology adoption was influenced by farmers' interactions with neighbouring farmers, group memberships, farmer's age, marital status and farmer's level of education.	Kenya	X	X	X							X									
21	Barbier et al. (2009)	Smallholder farmers adopted a wide range of techniques that are intended to increase crop yield and reduce yield variability.	Burkina Faso							X	X	X	X					X	X			X
22	Baudron et al. (2009)	Farmers' norms, culture and perceptions are also important factors for the widespread adoption of technologies by resource-poor farmers.	Zimbabwe Burkina Faso				X	X	X	X				X	X	X						







		minimum tillage technology.																			
44	Harvey et al. (2014)	Technical, financial and institutional support is needed to improve the adoption of agricultural technology.	Madagascar	X	X	X	X	X		X	X		X	X	X					X	
45	Kabunga et al. (2014)	TC banana adoption increases farm household income and food insecurity.	Kenya		X	X		X	X				X	X						X	
46	Khan et al. (2014)	Awareness of a technology predicted by farmers' access to agricultural information, improved technology adoption.	Kenya												X					X	
47	Kleemann et al. (2014)	Organic-certified farming yields a significantly higher return on investment.	Ghana		X	X		X					X								X
48	Lambrecht et al. (2014)	Awareness about a technology is determined by education. Tryout is influenced by extension interventions. Continued adoption requires high level of financial capital.	DR Congo					X		X		X					X	X			
49	Mathenge et al. (2014)	Adoption of hybrid seed contributes to higher farm annual income and raises the asset value of the smallholder farmers.	Kenya			X		X		X		X			X		X				X
50	Ndiritu et al. (2014)	There are no gender differences in the adoption of specific farm technologies.	Kenya		X		X	X			X		X	X	X			X	X		
51	Nhamo et al. (2014)	The ease of adapting new technologies to local conditions improves adoption.	Burundi Kenya Madagascar Malawi Mozambique Rwanda Tanzania Uganda				X			X		X	X			X		X	X		
52	Rusike et al. (2014)	Household participation influences adoption of improved crop	Democratic Rep. of Congo	X			X	X		X		X					X				





adoption of technologies to control them.																				
62	Ricker-Gilbert and Jones (2015)	Subsidies enable smallholder farmers to purchase post-harvest chemicals.	Malawi	X	X	X					X	X	X				X			
63	Shiferaw et al. (2015)	Agricultural technology adoption in Africa has lagged because of a lack of economic incentives, lack of information, poor seed supply, and credit constraints.	Uganda						X								X	X		
64	Stephen et al. (2015)	This study revealed that simple technologies can enhance the quality of potato used by smallholder farmers every season.	Uganda										X	X	X		X			
65	Dawson et al. (2016)	Relatively wealthy minority smallholder farmers can adopt new technologies, relative to poorer smallholder farmers.	Rwanda	X	X		X	X	X	X	X	X					X		X	
66	Gouse et al. (2016)	Female farmers adopt labour-saving technologies while higher yields are the main reason behind male adoption of technology.	South Africa	X	X	X	X		X	X										
67	Gnahoua et al. (2016)	Fertilizer adoption was essential to increasing cassava yield.	Côte d'Ivoire														X			
68	Hassan et al. (2016)	Farm income, household size, on-farm trials, awareness, extension contact and access to cash are significant factors likely to influence technology adoption.	Nigeria			X	X	X	X	X		X					X	X		
69	Lambert et al. (2016)	Input demand and farm profit of farmers influence the adoption of technologies by smallholder farmers.	Lesotho	X	X	X	X		X								X	X	X	





		discussed in this article.																																				
86	Schreinemachers et al. (2017)	Agricultural policy, investment and technology adoption reoriented towards contemporary nutritional challenges will give high returns on investment.	Tanzania																										X									
87	Toth et al. (2017)	The general lack of knowledge about technology was identified as the main constraint to adoption. Others are lack of market access, inconsistent training, gender disparities, poor land quality, and issues of land tenure.	Malawi	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
88	Verkaart et al. (2017)	Increasing access to improved chickpea is a pathway for rural development.	Ethiopia	X		X												X	X																			
89	Wesseler et al. (2017)	The gradual adoption of the technology is delayed by uncertainty and perceived ease of use of the technology.	Benin Niger Nigeria Kenya Uganda	X	X	X	X	X												X	X																	
90	Wossen et al. (2017)	Access to extension services and group membership positively impacts the adoption of technology among cassava farmers in Nigeria.	Nigeria	X													X		X	X																		
91	Achandi et al. (2018)	Institutional support, access to agricultural inputs, type of technology, household type, socio-cultural characteristics and extension were identified as major constraints to uptake of technology by women farmers.	Ethiopia Madagascar Tanzania						X												X	X	X	X	X													
92	Adejuwon (2018)	Technology adoption fails when it is beyond the financial capability of farmers and culturally incompatible.	Nigeria												X	X	X																					



		household income were major factors influencing the adoption of sustainable intensification practices.																				
102	Makate et al. (2018)	Various socioeconomic factors can be associated with adoption and use of climate-smart agriculture practices in smallholder farming.	Zimbabwe	X	X	X	X	X		X	X	X	X	X		X				X		
103	Mekonnen et al. (2018)	There is a statistically significant and positive relationship between networks and the technology adoption.	Ethiopia	X	X		X	X						X		X	X	X	X	X		X
104	Michalscheck et al. (2018)	Gender, managerial skills, and costs are important factors in adoption decision making.	Ghana	X	X						X					X		X				X
105	Mukasa (2018)	The use of these modern inputs is found to decrease risk. However, the higher their purchasing costs, the greater the cost of farmers' private risk bearing.	Tanzania Uganda	X	X		X							X		X			X			
106	Muriithi et al. (2018)	Technology adoption can be achieved through promoting awareness of the technology and offering training through field days.	Kenya	X	X		X	X					X	X	X	X		X				X
107	Mponela et al. (2018)	Key determinants that govern farmers' decisions to adopt new technologies to improve soil fertility include the socio-demography of the farmer, extension access and access to fertilizer.	Malawi Mozambique Zimbabwe Zambia	X	X		X						X			X		X				X
108	Nakano et al. (2018)	Farmer-to-farmer extension programs and training are an effective method to enhance technology	Tanzania												X					X		









**Supplementary material A - Distribution of literature by crops and location of study**

	Countries	Crops																				
		Banana	Cassava	Coffee	Cotton	Fodder shrub	Legumes	Maize	Napier	Oil palm	Pineapple	Rice	Sunflower	Sorghum	Potato	Teff	Vegetables	Wheat	Yam	Millet	Barley	Total
1	Benin	1					1	2				1					1		1			7
2	Burkina Faso				1			1									1					3
3	Burundi										1											1
4	Côte d'Ivoire		1									1										2
5	DR Congo	1	2				1	1					1	1								7
6	Ethiopia		1	1			4	16			1		1		2		4				1	31
7	Gambia										1											1
8	Ghana		2				1	4			3	1		1								12
9	Guinea										1											1
10	Kenya	4	1			2	9	25	1		2		1	2		2						49
11	Lesotho							1														1
12	Madagascar							3			4						2					9
13	Malawi		1			1	7	21			2		1				1					34
14	Mozambique		1				1	9			1	2		1			1					16
15	Niger	1					1	1														3
16	Nigeria	1	2				1	6		1	1		1									13
17	Rwanda					2	2	1			1											6
18	South Africa				1			3														4
19	Tanzania	1	1			2	5	12			4	1	1				3					30
20	Uganda	4	1		1	2	6	15			4		1	2							1	37
21	Zambia				1		1	5									1					8
22	Zimbabwe		1		1		5	8			1		1				1					18
	<b>Total</b>	<b>13</b>	<b>14</b>	<b>1</b>	<b>5</b>	<b>9</b>	<b>45</b>	<b>134</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>28</b>	<b>1</b>	<b>10</b>	<b>5</b>	<b>2</b>	<b>11</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>293</b>