



On Smallholder Crop Productivity And On-farm Entrepreneurship: Empirical Evidence From Ndumo-b And Makhathini Irrigation Schemes, KwaZulu-Natal, South Africa.

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Introduction



- Agribusiness and agro-industries account for at least 30% of Africa's GDP.
- Recent global advances and challenges influenced farmers to change.
- Thus, shifting from traditional to modern farming practices
- Hence, entrepreneurial mindset is viewed as a key driver of productivity and economic growth, particularly in developing economies.



Intro...

- To maintain their families and better contribute to the economy, farmers have to be market-oriented and participate in the markets (developing new products, focusing on niche markets etc.)
- Diversifying economic activities, and small scale value addition
- Devt of new skills, new mind-sets, capabilities to survive or remain competitive and enabling policies & strategies.
- The future of profitable farming is synonymous with the prospect of rural entrepreneurship.
- There is proven but untapped entrepreneurship potential among smallholders in Africa (Adegbite et al., 2020)



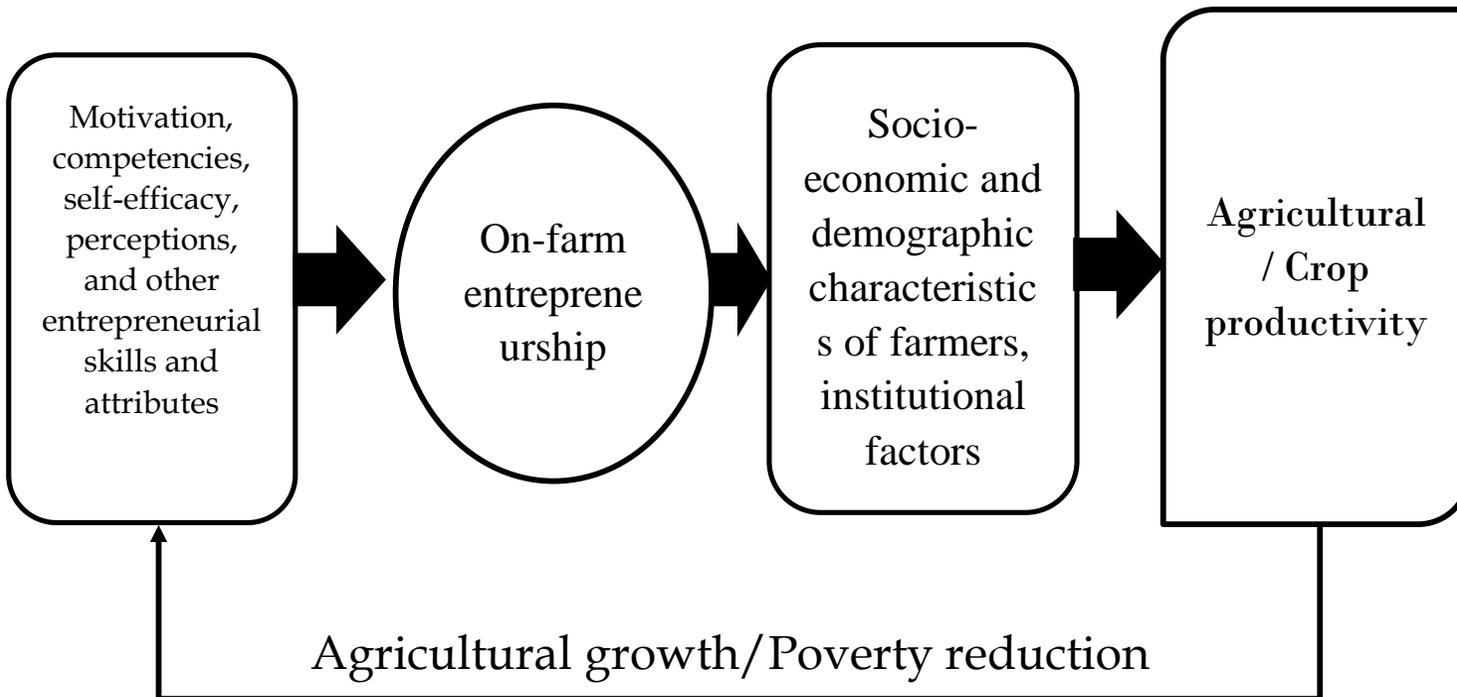
Intro...

- Literature focused on challenges E.g. record keeping, distinguishing family & farming operations etc.
- There is less empirical literature on the role of entrepreneurship to the productivity of smallholder farming, especially in the irrigation schemes.
- Thus, the objective of this study is to examine this link.
- This also responds to achieving SDG Goals 1 (no poverty), 2 (zero hunger), and 8 (no extreme poverty) (decent work and economic growth).





Theoretical and conceptual framework



- Subsistence theory on entrepreneurship.
- Individuals seeking to create a living by serving the informal economy
- Poverty and frantic attempts to survive

Methodology



- **Study area:** Ndumo-B and Makhathini irrigation schemes are situated in Jozini Local Municipality, KZN.
- The municipality is close to the Swaziland and Mozambique borders in Northern KZN.
- **Data Collection :** 221 farmers were chosen at random from the baseline survey.
- 114 scheme irrigators, 46 independent irrigators, 24 home gardeners, 22 non-irrigators and 15 community gardeners.



Methodology

- The **entrepreneurship index** was created using Principal Components Analysis (PCA).
- Each component was considered as a linear weighted account for a mixture of the initial entrepreneur attributes and abilities, with no correlation between them.
- Kaiser's criterion that takes into account eigenvalues greater than one and the Pearson correlations was used.
- Three main components (PC1, PC2, and PC3) representing self-efficacy, motivation, aggressiveness, and risk-taking behaviour were used as on-farm entrepreneurship indices



Methodology

- The influence of **on-farm entrepreneurship** on **agricultural productivity** was examined in three stages using distinct methods:
- **Gross margin analysis, Cobb-Douglas production function, and one-limit Tobit regression.**
- Different socio-economic, institutional and production factors were identified, drawing from the literature

Results and Discussions

Table 1: Continuous socio-economic variables description

Variable definition	Scheme Irrigators (n = 144)		Independent Irrigators (n = 46)		Home Gardeners (n = 24)		Community Gardeners (n = 15)		Non-irrigators (n=22)		F-test
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	
Age	48.529	11.3	49.9	14.01	49.1	10.75	50.5	11.8	50.5	11.8	1.48
Household_size	5.9	2.7	5.4	2.4	5.9	2.66	4.4	1.7	5.7	1.9	1.34
Labour	6.4	1.2	6.3	1.1	5.9	1.7	4.5	2.5	5.3	2.6	6.24** *
Education	4.93	4.3	3.6	4.71	5	5.4	3.07	4	3.1	2.5	1.8
Farm_experience	12.21	9.5	15.7	15.1	12.8	9.7	15.73	13.7	18.3	10.1	1.9*
Distance_Scheme (Minutes)			69.7	43.8	64.1	48.6	46.7	24	48.1	28.6	2.45**
Farm-size (ha)	2.05	3.24	1.56	3.14	0.23	0.34	0.77	0.9	0.9	0.9	2.89**
Livestock_value	9.30	26.1	12.20	25	9.20	28.8	7.40	11.10	10.30	28	0.145

Results and Discussions

Variable definition	Scheme Irrigators (n = 144)		Independent Irrigators (n = 46)		Home Gardeners (n = 24)		Community Gardeners (n = 15)		Non-irrigators (n=22)		F-test
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	
Social_Grant	1.70	2.90	1.40	1.50	0.80	0.80	0.70	0.90	1.30	1.20	1.4
Crop_income (Rand/kg)	10.90	18.30	8.30	17.80	24.40	9.40	3.70	3.20	0	0	3.4***
Child_grant	2.38	1.9	2.4	1.8	2.9	1.55	2	1.07	2.33	1.3	0.8
Years_child grant	6.5	4.1	8.67	4.8	10.3	4.92	9	3.6	9	4.3	4**
Old_grant	1.9	2.6	1.6	1	1	-	1.33	0.6	1.1	0.4	0.9
Years_Old age_grant	35	4.1	18	8	2	8.5	3	6.7	7	6.1	0.1
ChildGrant_recipient	2	-	-	-	1	-	-	-	1.5	0.7	2.*
DisGrantt_recipient	1.3	0.7	1	-	1	-	-	-	1	-	0.9
DepGrant_recipient	4.3	1.2	1	-	-	-	-	-	-	-	0.6

Source: Survey Data



Results and Discussion



Table 2: Categorical variables description

Variable definition	Categories	Scheme Irrigators (%)	Independent Irrigators (%)	Home Gardeners (%)	Community Gardeners (%)	Non-irrigators (%)	χ^2 -test
Gender	1 = Male	40.4	39.1	29.2	40.0	27.3	2.18*
	0 = Female	59.6	60.9	70.8	60.0	72.7	
Marital	1 = Single	43	56.5	50	33.3	18.2	10.58
	2 = Married	52.6	41.3	45.8	60.0	72.7	
	3 = Widowed	4.4	2.2	4.2	6.7	9.1	
Main_occupation	1 = Fulltime farmer	90.4	93.5	45.8	73.3	54.5	59.18***
	2 = Regular salaried job	0.9	0	8.3	20.0	18.2	
	3 = Temporary job	1.8	2.2	8.3	6.7	13.6	
	4 = Unemployed	2.6	2.2	25.0	0	9.1	
	5 = Self- employed	0.9	0	8.3	0	4.5	
	6 = Retired	1.8	2.2	4.2	0	0	
	7 = Aged	1.8	0	0	0	0	
Credit		30.7	50.0	29.2	33.3	18.2	8.544*
Credit_Reasons	Interest rate is high	15.19	17.39	11.76	40	27.78	32.80***
	Could not secure the collateral	7.59	4.35	11.76	10	22.22	
	Got my own sufficient money	12.66	8.70	17.65	10	22.22	
	It isn't easily accessible	49.37	17.39	23.53	30	16.67	
	I am risk averse	15.19	52.17	35.29	10	11.11	
Credit_Source	Relative or friend	31.43	21.74	14.29	0	25	28.55*
	Money lender	14.29	13.04	0	0.00	50	
	Savings club	28.57	34.78	14.29	100	25	
	Output buyer	5.71	0	0	0	0	
	Financial institution	17.14	30.43	71.43	0	0	
	NGO	2.86	0	0	0	0	
Able to pay back loan in time? 1 = Yes 0 = No		68.6	82.6	71.4	80	100	2.965

Table 3: Yield and gross margin statistics on major crops cultivated in the study areas

Crop	Farmer Type (N = 159)	Mean yield (kg/ha)	Std. Deviation	F-test	Mean gross income (Rands/ha)	Std. Deviation	F-test	Mean TVC (Rands/ha)	Std. Deviation	Mean TVC (excluding family labour) (Rands/ha)	F-test	Mean gross margin (Rands/ha)	Std. Deviation	Mean gross margin/ha (excluding farm labour) (Rands/ha)	F-test
Cabbage	Scheme irrigators	32.526	694	5.6***	49.806	26.332	3.9**	15.942	5.084	13.871	2.3*	33.864	24.594	35.935	2.7*
	Independent irrigators	19.712	716		35.712	35.219		11.771	5.153	10.507		23.941	32.895	10.695	
	Home gardeners	9.306	427		15.054	30.431		10.474	5.805	8.155		6.087	29.105	8.406	
	Community gardeners	25.058	846		46.229	22.359		17.953	13.539	16.313		28.277	13.765	29.917	
Maize	Scheme irrigators	3.208	1.598	0.9	22.870	12.212	1.8	13.200	10.747	13.201	0.7	10.558	9.987	1.3315	0.8
	Independent irrigators	2.604	1.914		14.929	13.117		15.952	12.110	15.952		6.543	12.681	11.144	
	Home gardeners	1.975	1.025		12.819	7.326		5.238	9.121	5.238		951	12.214	5.238	
Beans	Scheme irrigators	1.422	1.024	5.3**	20.050	13.542	4.7**	12.497	4.506	8.755	3.6**	7.553	11.864	11.295	2.1
	Independent irrigators	469	439		7813	7.641		7.631	5.942	5.389		182	8405	2.424	
	Home gardeners	1.200	-		19.200	-		10.204	-	3.004		8.996	-	16.196	
Tomatoes	Scheme irrigators	2.000	-	1.3	16.000	-	1.1	6.996	-	4.956	2.9*	9.004	-	11.044	1.2
	Independent irrigators	11.056	12.550		31.044	35.031		2.424	1.478	1.904		28.620	33.628	29.140	
	Home gardeners	2.083	3.926		10.000	18.847		7.283	2.900	5.700		27.167	17.550	4.300	
	Community gardeners	10.313	9.865		42.667	40.058		10.313	4.920	6.710		32.354	35.769	35.957	

Notes: ***, ** and * means significant at 1%, 5% and 10% levels, respectively.

Results and Discussions

Table 4: On-farm entrepreneurship ranking according to farming group

Ranking (N = 159)	Scheme irrigators (%)	Independent irrigators (%)	Home gardeners (%)	Community gardeners (%)	χ^2 -test
Least entrepreneurial	22	31.6	29.2	13.3	15.43*
Moderately entrepreneurial	34.1	18.4	16.7	6.7	
Fairly entrepreneurial	25.6	15.8	25	46.7	
Most entrepreneurial	18.3	34.2	29.2	33.3	

Notes: * means significant at a 10% level

Results and Discussion



Table 5: One-limit Tobit regression estimation of a cabbage production function

Variables	Coefficient (Std. err.)	t	P>t
<i>Socio-economic factors</i>			
Age	0.177 (0.109)	1.62	0.127
Age_Sq	-0.002* (0.001)	-2.03	0.062
Gender	-0.103 (0.430)	-0.24	0.814
Marital	0.020 (0.299)	0.07	0.947
Education	-0.122** (0.046)	-2.69	0.018
Type_Farmer	-1.048*** (0.220)	-4.76	0.000
Main_Occupation	0.002 (0.080)	0.03	0.976
Farm_Experience	-0.158*** (0.038)	-4.22	0.001
<i>Production factors</i>			
Farm_size	0.269*** (0.056)	4.81	0.000
Fertilizer (kg)	0.003** (0.001)	3.49	0.004
Top_dressing	0.011** (0.003)	3.1	0.008
Manure (Kg)	0.006 (0.004)	1.61	0.129
Herbicides (litres)	0.012** (0.004)	2.62	0.020
Pesticides (litres)	0.017 (0.062)	0.27	0.791



Results and Discussion

Variables	Coefficient (Std. err.)	t	P>t
Pesticides (litres)	0.017 (0.062)	0.27	0.791
<i>Institutional factors</i>			
Membership	1.112** (0.458)	2.42	0.029
Credit	0.876** (0.399)	2.19	0.046
Training_vp	-3.511 (6.150)	-0.57	0.577
Training_mp	-1.997** (0.844)	-2.37	0.033
Training_irr	5.773 (6.151)	0.94	0.364
<i>On-farm entrepreneurship</i>			
On-farm entrep (PC ₁)	-0.326 (0.227)	-1.44	0.173
On-farm entrep (PC ₂)	0.623** (0.246)	2.53	0.024
On-farm entrep (PC ₃)	0.020 (0.277)	0.07	0.944
_cons	5.178 (2.414)	2.15	0.050
LR chi ² (22)	74.34		
Prob > chi ²	0.0000		
Pseudo R ²	0.4830		
Log likelihood	-39.785		

Notes: ***, ** and * means significant at 1%, 5% and 10% levels, respectively.



Conclusion and recommendation

- On-farm entrepreneurship is considered the most important attribute which motivates farmers to be profit-oriented and commercial, contributing to transforming smallholder farming.
- An increase in on-farm entrepreneurship, scheme irrigators tend to increase the number of crop enterprises and quantities which lead to an increase in productivity.
- Compared to independent irrigators who had better entrepreneurial attributes, **scheme irrigators were found to have the lowest levels of entrepreneurial competency** followed closely by home gardeners

Conclusion and recommendation

- Cabbage mean yield specifically was well below the Department of Agriculture commercial yield targets for smallholder farmers.
- Training programs have to give special attention to relevance.
- Future on-farm entrepreneurial growth paths should be explored depending on the nature of the development domains (farmer typology).
- Each type of farmer will require distinct forms of technology, cultural practices, and other strategies.



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THANK YOU !!!

