

# THE IMPACT AND FINANCIAL VIABILITY OF RURAL WOMEN'S FOOD SECURITY PROJECTS IN SOUTH AFRICA

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## ABSTRACT

Small-scale farming is usually intended to contribute to food security, which could assist in the reduction of poverty. Despite South Africa being food secure at the national level, food insecurity exists at household level. In South Africa, the implementation of household level food security programmes, including women's food security projects, have been some of the most important interventions. This article aims to evaluate the financial viability and sustainability of women's food security projects in South Africa. A cross sectional study of women's perceptions about the impact of the food security projects on their households was undertaken. Data was collected from 45 female food security project participants for the 2012/13 agricultural season. Gross margin analysis was used to assess the financial viability and straight line depreciation was used to assess sustainability. The results show the projects as financially viable and are perceived to be contributing significantly to household issues of food security. The

lingering question is whether such programmes can be scaled up. Governance systems can be used for the scaling up process. In smallholder irrigation systems, communities are slowly getting involved in the management of natural resources and enhancing or replacing state-based governance systems. Water user associations have been developed on smallholder irrigations systems. Through the inclusion of specific conditions in the constitutions of such governance systems, scaling up and sustainability could be achieved.

**Keywords:** Food security, women, viability, sustainability, governance, South Africa.

## INTRODUCTION

The South African population is estimated at nearly 55.6 million (Statistics South Africa, 2016) of which eighty-eight percent live in rural areas (Madzivhandila & Masenya, 2014). Smallholder agriculture is used as a vehicle for improving both rural incomes and food security. In South Africa, one of the legacies

of the apartheid era is that agriculture is dominated by corporate and large-scale producers (Groenmeyer, 2013). However, South Africa is no exception to the sub-Saharan reality that smallholder agriculture can be used to alleviate poverty and food insecurity (Abdu-Raheem & Worth, 2011). De Janvry and Sadoulet (2001) argue that rural households use multiple pathways to alleviate or to get out of poverty and achieve food security. Agriculture plays an important part in most, if not all, the pathways. It is, therefore, important to develop agriculture, especially smallholder agriculture that directly affects rural households. Establishing household food security is widely recognised as an important milestone in improving the living standards of the poor (Abdu-Raheem & Worth, 2011).

The statistics on how many rural households engage in agriculture in South Africa differ. According to Aliber (2009, in Hart, 2011), there are 2.5 million households involved in agricultural production with most of them residing in the former homelands. From a survey conducted in Molati village in the Mopani district of Limpopo in South Africa, Hart observes that

Agricultural production was the most widespread livelihood activity with 90 percent of households cultivating crops in homestead food plots and 59 percent producing livestock – mainly poultry... For most households, agriculture was not a source of income. Eighty-three percent of those who cultivated crops did so to provide an extra source of food for the household. (Hart, 2011:235)

According to Backeberg and Sanewe (2010), 1.3 million households actively produce food

on 3.3 million hectares (ha) with plots ranging from 0.5 to one ha for 83 percent of the households. Altman, Hart and Jacobs (2009) point out that there was a marked increase in black households engaged in agriculture, in South Africa, between 2001 and 2004, but also point out that very little is known about own production. Schreinemachers *et al.* (2015:97) also lament: "Home based vegetable production has been recognised as a nutrition and gender-sensitive intervention that has the potential to improve nutrition in developing countries, yet evidence is lacking". There is also the issue of the gender bias of African agriculture. In South Africa, more than sixty percent of those involved in farming are women (Altman, Hart & Jacobs, 2009). Kholif and Elfarouk (2014) point out that it is important to involve women in national projects. The statistics and arguments about involving women in development projects suggest that both smallholder agriculture development and the role of women cannot be ignored. The question is, what objective(s) will such development be used to achieve; income, inequality reduction, food security, poverty alleviation or all of these critical aspects?

## **FOOD INSECURITY IN SOUTH AFRICA**

Abdu-Raheem and Worth (2011) note that globally enough food is produced to achieve food security, but the number of global undernourished increased from about 840 million, in 1996, to about 925 million, in 2010. Thus, the production of food is a necessary but not sufficient condition for achieving household food security. South Africa produces enough food to be food secure at national level (Abdu-Raheem & Worth, 2011). However, there is

food insecurity in South Africa at household level (De Cock *et al.*, 2013).

Pinstrup-Andersen (2009) asks what food security is and how this complex concept can be measured. It can be measured at national, regional or household level, in economic (supply and demand) terms, access terms (because availability does not ensure access) or dietary (energy sufficiency or dietary quality) terms (Pinstrup-Andersen, 2009). Food security, in supply terms, may still not assure nutritional security, as this may depend on other factors such as disease and access to health care (Pinstrup-Andersen, 2009). Pinstrup-Andersen (2009:7) further argues that "Food security is a valuable concept if used with a clear understanding of what it means...".

The different measures of food security used in South Africa demonstrate a lack of clarity about the meaning of even household, let alone individual, food security. Haddinott (in Abdu-Raheem & Worth, 2011) observes that there are about 200 definitions of food security. The different measures and understandings of food insecurity lead to different estimates of food insecurity in South Africa. Altman, Hart and Jacobs (2009) point out that only 10 percent of rural households can afford a nutritionally adequate food basket compared to 25 percent of their urban counterparts, and that poor households tend to allocate a greater part of their expenditure to food. South African national statistics show that in 2007, 41 percent of households were food insecure with the figure increasing to 52 percent in 2008 (Hart, 2011). Consistent with these national figures, Hart, from a study in Molati village of Limpopo, South Africa, concluded that

half of the households were food insecure. According to Backeberg and Sanewe (2010), 59 percent of South African households are food insecure. Madzivhandila and Masenya (2014) estimate that 60 percent of South Africans experience food insecurity. Variable though they may be, the estimates show that food insecurity exists in South Africa and could affect between 40 and 60 percent of South African households. This compares to 10 percent of households in the United States of America who are estimated to experience food insecurity (Carney *et al.*, 2012).

## **OBJECTIVES**

There are two main objectives this article seeks to address:

- Evaluating the financial viability and sustainability of women's food security projects in South Africa.
- Describing the perceptions of women about the impact of the food security projects on their household's food security and livelihoods.

An attempt is made in the article to ensure that these two complementary objectives are addressed on the core issues of food security.

## **STUDY AREA AND DATA COLLECTION**

The study for this article was conducted at Ntsako and Jopi villages, which are situated within the Greater Tzaneen Local Municipality in the Mopani District of Limpopo Province, South Africa. The Limpopo Department of Agriculture, now the Department of Agriculture and Rural Development, afforded

the Ntsako and Jopi communities an opportunity to start agricultural food security projects. During the project establishment, in 2002 in Jopi, there were 80 women but the number has reduced to 20; about 60 women left the project. At Ntsako, during the project establishment in 2003, there were 36 women and now there are 15 left. All 20 and 15 women remaining respectively at Jopi and Ntsako village food security projects were included in the study. Input-output, assets and price data for the 2012/13 agricultural production season were collected using structured questionnaires. Data were collected to enable the computation of gross margins and the financial sustainability assessment. All production decisions at the two projects were done communally and all the crops were produced under drip irrigation. Data were also collected on the perceptions of the women regarding the impact of the food security projects on the household food security and livelihoods.

## **RESULTS AND DISCUSSION**

### **Gross Margin Analysis**

Tables 1 and 2 on the following two pages summarise the results of the gross margin analysis for the Ntsako and Jopi women's food security projects.

Table 1 shows that Ntsako women's food security project achieves a gross margin of just under R950 000 and a per capita gross margin of just over R63 200.

Table 2 shows that Jopi achieves a gross margin of just under R1 290 000 with a per capita gross margin of just under R64 300. Spread over a year, the per capita gross margins are equivalent to the monthly salary of about R5 300.

In an analysis of income sources, De Cock *et al.* (2013) found that 75 percent of South African households derive their income from social grants, 31 percent from a formal salary, 15 percent from farming, and 13 percent from remittances<sup>1</sup>. Under the existing condition, farming is not the major source of income. It is further estimated that the average household income was R2 953. This is 56 percent of the gross margin achieved from the food security projects of Ntsako and Jopi. This analysis shows that although the projects can contribute directly to food security (by providing food) they are also capable of providing income. Therefore, smallholder production has the potential to contribute towards both income and food security. Altman, Hart and Jacobs (2009) ask whether the question of the contribution of smallholder production to food security is an unusual question in a middle income country like South Africa. We argue that this is not really an unusual question.

For more than 300 years, the apartheid regime ran two separate economies in South Africa, a low income underdeveloped largely black economy and a highly sophisticated, high income largely white economy. These were dubbed the second and first economies, respectively, by the second democratically

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<sup>1</sup>Because income sources are not mutually exclusive, one can have more than one source. For example, a grant holder might also be farming and receiving remittances so the percentages add up to more than 100 in this case.

**TABLE 1: Ntsako women's food security project: Crop budgets by season**

Attribute and Unit	Season					
	Summer			Winter		
	Maize	Green Beans	Butternut	Green Beans	Okra	Cabbage
Area (ha)	3	1	1	2	1	1
Output (t)	10.00	30.42	30.00	35.00	7.45	40.00
Yield (t/ha)	3.33	30.42	30.00	17.50	7.45	40.00
Price (R/t)	5 000.00	7 708.33	2 166.67	13 750.00	10 002.86	1 916.50
<b>Gross value of output (R)</b>	<b>50 000.00</b>	<b>234 487.50</b>	<b>65 000.00</b>	<b>481 250.00</b>	<b>74 521.29</b>	<b>76 660.00</b>
<b>INPUTS</b>						
<b>SEED (R)</b>	<b>280.00</b>	<b>600.00</b>	<b>100.00</b>	<b>800.00</b>	<b>300.00</b>	<b>150.00</b>
<b>LAN</b>						
Rate (kg/ha)	67.00	150.00	150.00	100.00	150.00	150.00
Price	4.92	4.92	4.92	4.92	4.87	4.92
<b>Amount (R)</b>	<b>984.00</b>	<b>738.00</b>	<b>738.00</b>	<b>984.00</b>	<b>730.00</b>	<b>1 230.00</b>
<b>MAP</b>						
Rate (kg/ha)			50.00		50.00	
Price			5.96		5.96	
<b>Amount (R)</b>			<b>298.00</b>		<b>298.00</b>	
<b>KLC</b>						
Rate (kg/ha)	17.00					250.00
Price	5.40					5.40
<b>Amount (R)</b>	<b>270.00</b>					<b>1 350.00</b>
<b>Deltamethion</b>						
Rate (kg/ha)	27.00					
Price	8.25					
<b>Amount (R)</b>	<b>660.00</b>					
<b>Cypermethion</b>						
Rate (kg/ha)			70.00			70.00
Price			11.20			12.57
<b>Amount (R)</b>			<b>784.00</b>			<b>880.00</b>
<b>Thiocarb</b>						
Rate (kg/ha)	10.00					
Price	11.53					
<b>Amount (R)</b>	<b>3 460.00</b>					
<b>Copper Oxchloride</b>						
Rate (kg/ha)		150.00		175.00	125.00	
Price		16.00		10.80	15.20	
<b>Amount (R)</b>		<b>2 400.00</b>		<b>2 700.00</b>	<b>1 900.00</b>	
<b>Benomyl</b>						
Rate (kg/ha)			130.00			
Price			7.85			
<b>Amount (R)</b>			<b>1 020.00</b>			
<b>Bendioxide</b>						
Rate (kg/ha)		200.00		150.00		
Price		15.70		13.00		
<b>Amount (R)</b>		<b>3 140.00</b>		<b>3 900.00</b>		
<b>Paraquat</b>						
Rate (kg/ha)						180.00
Price						2.24
<b>Amount (R)</b>						<b>440.00</b>
Rate (kg/ha)	4.00					
Price	9.65					
<b>Amount (R)</b>	<b>386.00</b>					
<b>Floxyfop-R-Methyllester</b>						
Rate (kg/ha)			280.00			
Price			6.04			
<b>Amount (R)</b>			<b>1 690.00</b>			
<b>Variable Costs</b>						
<b>Gross margin (R)</b>	<b>43 960.00</b>	<b>227 609.50</b>	<b>60 370.00</b>	<b>472 866.00</b>	<b>71 293.29</b>	<b>72 090.00</b>
	<b>Total Summer = 331 939.50</b>			<b>Total Winter = 616 249.29</b>		
	<b>Grand Total = 948 188.79</b>					
<b>Per capita gross margin (R) (15 farmers)</b>	<b>63 212.59</b>					

At time of writing 1 USD = R 13.86

Source: Authors

**TABLE 2: Jopi women's food security project: Crop budgets by season**

Attribute and Unit	Season						
	Summer			Winter			
	Maize	Green Beans	Chillies	Green Beans	Okra	Tomatoes	Onions
Area (ha)	2	2	1	2	1	1	1
Output (t)	8.00	30.00	3.00	30.00	8.25	50.46	30.30
Yield (t/ha)	4.00	15.00	3.00	15.00	8.25	50.46	30.30
Price (R/t)	6 500.00	9 500.00	8 333.33	13 750.00	13 330.00	4 640.00	6 250.00
<b>Gross value of output (R)</b>	<b>52 000.00</b>	<b>294 120.00</b>	<b>27 500.00</b>	<b>412 500.00</b>	<b>109 972.50</b>	<b>234 143.68</b>	<b>189 375.00</b>
<b>INPUTS</b>							
<b>SEED (R)</b>	<b>200.00</b>	<b>800.00</b>	<b>130.00</b>	<b>800.00</b>	<b>250.00</b>	<b>140.00</b>	<b>80.00</b>
<b>LAN</b>							
Rate (kg/ha)	100.00	100.00	50.00	100.00	100.00	350.00	200.00
Price	4.92	4.92	4.92	4.92	4.92	4.92	4.92
<b>Amount (R)</b>	<b>984.00</b>	<b>984.00</b>	<b>492.00</b>	<b>984.00</b>	<b>492.00</b>	<b>1 722.00</b>	<b>984.00</b>
<b>MAP</b>							
Rate (kg/ha)	37.50				50.00		50.00
Price	5.11				5.54		5.54
<b>Amount (R)</b>	<b>388.00</b>				<b>277.00</b>		<b>277.00</b>
<b>KCL</b>							
Rate (kg/ha)		50.00		50.00			
Price		5.40		5.40			
<b>Amount (R)</b>		<b>540.00</b>		<b>540.00</b>			
<b>Lime</b>							
Rate (kg/ha)					80.00		
Price					4.00		
<b>Amount (R)</b>					<b>320.00</b>		
<b>Mancozeb</b>							
Rate (kg/ha)						100.00	100.00
Price						5.96	5.96
<b>Amount (R)</b>						<b>596.00</b>	<b>596.00</b>
<b>AZOXYSTROBIN</b>							
Rate (kg/ha)		400.00					
Price		6.50					
<b>Amount (R)</b>		<b>5 200.00</b>					
<b>CAPTAB</b>							
Rate (kg/ha)		75.00					
Price		4.13					
<b>Amount (R)</b>		<b>620.00</b>					
<b>Alpha-Cypermethrin</b>							
Rate (kg/ha)			180.00	80.00		80.00	80.00
Price			5.31	5.44		11.50	11.50
<b>Amount (R)</b>			<b>956.00</b>	<b>870.00</b>		<b>920.00</b>	<b>920.00</b>
<b>Copper Oxychloride</b>							
Rate (kg/ha)			150.00		150.00		
Price			16.00		16.66		
<b>Amount (R)</b>			<b>2 400.00</b>		<b>2 400.00</b>		
<b>Acetochlor</b>							
Rate (kg/ha)	35.00						
Price	5.13						
<b>Amount (R)</b>	<b>359.00</b>						
<b>EPTC</b>							
Rate (kg/ha)		90.00		90.00			
Price		15.44		15.44			
<b>Amount (R)</b>		<b>2 780.00</b>		<b>2 780.00</b>			
<b>Trifluralin</b>							
Rate (kg/ha)						40.00	
Price						12.25	
<b>Amount (R)</b>						<b>490.55</b>	
<b>Oxyfluorfen</b>							
Rate (kg/ha)							130.00
Price							4.77
<b>Amount (R)</b>							<b>620.00</b>
<b>Variable Costs</b>							
<b>Gross margin (R)</b>	<b>44 254.00</b>	<b>288 060.00</b>	<b>24 478.00</b>	<b>406 526.00</b>	<b>106 553.50</b>	<b>229 955.68</b>	<b>185 898.00</b>
	<b>Total Summer = 356 792.00</b>			<b>Total Winter = 928 933.18</b>			
	<b>Grand Total = 1 285 725.18</b>						
<b>Per capita gross margin (R)</b> <b>(20 farmers)</b>	<b>64 286.26</b>						

At time of writing 1 USD = R 13.86

Source: Authors



elected president of South Africa, Thabo Mbeki. Thus, although this can be an unusual question in the first economy, it is not at all unusual in the second economy of South Africa. In fact, the data from this study show that smallholder production may actually be one of the most sustainable approaches that can be used to address household food insecurity and possibly poverty and income inequality. Altman, Hart and Jacobs (2009) argue that for smallholders, increased access to appropriate extension, research support, access to input and output markets can contribute significantly to income. The evidence from the gross margin analysis supports this proposition. Backeberg and Sanewe (2010:2) observe that, "In the decade following the transition to democracy... village agriculture extension and advisory assistance has targeted group projects, rather than individual or household initiatives. This approach was adopted to enable government programmes to reach more people simultaneously". The approach does manage to increase the reach of the extension services but its effectiveness in improving food security and alleviating poverty is still to be tested and evaluated.

One method of assessing the viability and financial sustainability of a project is to evaluate if it can replace the assets used in the project when they reach the end of their useful lives. Table 3 summarises this evaluation for Jopi and Ntasko's women's food security projects.

Table 3 also shows major investment items, their establishment costs, when the projects were established and their life spans. Using the straight line depreciation method, we estimate how much the project must set aside annually in order to replace itself at

the end of its lifespan. Each farmer at Jopi needs to set aside R2 727.50, and at Ntsako R2 344.44 annually for replacement. This is less than 5 percent of the per capita gross margin for both projects. The annual replacement cost is equivalent to a monthly capital outlay of less than R230.00. This is affordable, given the monthly gross margin of R5 300.00. We, therefore, conclude that the projects are financially sustainable. Since we did not have estimates of what it would cost to establish the projects in 2012, the year from which data were collected, we used the costs at establishment in 2002 and 2003, respectively, for Jopi and Ntsako projects. We also provide the current establishment costs in brackets in Table 3. Even though we only adjust the costs (and not the gross margins) to current prices, this does not alter our conclusion regarding the financial viability of the projects.

We realise some caveats with this analysis as follows:

- Gross margin analysis does not take into account fixed costs so the net return is less than the gross margin.
- Straight line depreciation does not take into account the time value of money. It, therefore, underestimates the replacement value.
- The gross margin we use is a point estimate subject to annual variation.
- However, we feel that, all things considered, the replacement value will still be a low proportion of the net return so that the financial sustainability conclusion that we reach will not be affected.

**TABLE 3: Annual replacement costs for Jopi and Ntsako women's food security projects**

	Project							
	Jopi				Ntsako			
	Number	Establishment Cost/Value (R)	Life Span (Yrs)	Annual Replacement Value (R) <sup>1</sup>	Number	Establishment Cost/Value (R)	Life Span (Yrs)	Annual Replacement Value (R) <sup>1</sup>
Project Size (ha)	8	N/A	N/A	N/A	6	N/A	N/A	N/A
Arable (ha)	7	N/A	N/A	N/A	5	N/A	N/A	N/A
Borehole	3	120 000 (160 000)	20	6 000 (8000)	1	28 000 (33 000)	15	1866.67
Irrigation System	N/A	77 000 (110 000)	4	19 250 (27500)	N/A	20 000 (37 000)	5	4000
Buildings	1	25 000 (48 000)	25	1 000 (1920)	1	25 000 (48 000)	25	1000
Tractor	1	119 000 (170 000)	10	11 900 (17000)	1	119 000 (170 000)	10	11900
Mouldboard Plough	1	32 000 (44 000)	5	6 400 (8800)	1	32 000 (44 000)	5	6400
Disc Plough	1	25 000 (36 000)	5	5 000 (7200)	1	25 000 (36 000)	5	5000
Fence		50 000 (72 000)	10	5 000 (7200)		50 000 (72 000)	10	5000
<b>Total</b>				54 550.00 (77 620.00)				35 166.67 (51 720.00)
<b>Per capita annual contribution towards replacement (20 and 15 farmers, respectively) (R)</b>				2 727.50 (3 881.00)				2344.44 (3 448.00)
<b>Monthly outlay (R) for replacement</b>				227.29 (323.42)				195.37 (287.33)
<b>Per capita annual contribution towards replacement percent of per capita gross margin</b>				4.2 (6.0)				3.7 (5.5)
<sup>1</sup> Based on straight line depreciation								

Source: Authors

Mwale, Sarfo-Mensah, Zwane, Netshandama & Mudau (2012) argue that the issue of sustainability has not been adequately addressed for community-based agricultural projects that are meant to achieve food security and alleviate poverty. One of the necessary conditions for sustainability is financial viability. Our analysis demonstrates that the projects can be financially viable. Mwale *et al.* (2012) also concluded that the most viable agricultural projects were vegetable and piggyery projects. This study

provides further evidence to this observation regarding vegetable projects.

## PERCEPTION-BASED ANALYSES

### Perceptions About Economic Status

The women were asked how they perceived the economic status of their households. About 11 percent of the women perceived their households as very poor, 46 percent as poor, 40 percent as experiencing medium poverty and



**TABLE 4: Level of agreement with statements on livelihood and food security**

Statement	Level of Agreement				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The project improved the food security of my family	63	31	3	3	0
The project assisted me to purchase a television set	11	3	3	17	66
The project assisted me to purchase a stove	11	3	0	20	66
The project assisted me to purchase a refrigerator	6	17	0	0	77
The project has affected the livelihood of my family positively	57	37	6	0	0

Source: Authors

three percent as rich. Using one-way analysis of variance, we tested whether there was a relationship between perceived economic status and the amount received from the project as food. Given the significant level of 0.388, we conclude that there is no such relationship. We thought that maybe those households that considered themselves poor would be getting more food from the project but, apparently, that was not the case. When asked what the project wanted to achieve, 26 percent said to improve food security, 14 percent said job creation, 46 percent said poverty alleviation and 14 percent said to empower women. Women do need various forms of empowerment given that only 37 and 31 percent respectively could read and write. The women's perceptions of the projects show the realisation that these projects can play more than just a food security role. This is also evident from the gross margin analysis.

### **Perceptions of the Contribution of the Project to Livelihoods**

Table 4 above shows the results for the agreement/disagreements with statements on a few selected parameters used to reflect

how the project has impacted on the women's livelihoods.

The statements in the table are presented as they were asked to the respondents in the questionnaire. The table shows direct answers from the respondents. In response to the statement that the project improved the food security of the family, 94 percent agreed, of which 63 percent strongly agreed. This shows the strong food security impact the projects are perceived to be capable of producing. On the assumption that even food security projects may have other livelihood impacts, the women were asked whether the project assisted them to purchase other household items.

Eighty-three percent disagreed that the project assisted them to purchase a television. However, 14 percent agreed, with 11 percent strongly agreeing. The response pattern was similar for the purchase of an electric stove. Eighty-six percent disagreed that the project assisted them to purchase a stove but 14 percent agreed, of which 11 percent of this figure strongly agreed. Regarding assistance with purchasing a refrigerator, 77 percent

**TABLE 5: Level of agreement with community perceptions of the projects**

Statement	Level of Agreement				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The project received sufficient financial support from the Department of Agriculture and Land Reform for establishment	100	0	0	0	0
This was the right project for the community	86	14	0	0	0
The community supported the project	49	51	0	0	0
The community shows appreciation towards the project	60	40	0	0	0
The extension officers supported the project with training	100	0	0	0	0
I would recommend a similar project for another community	77	23	0	0	0

Source: Authors

strongly disagreed and 23 percent agreed with only six percent strongly agreeing. Asked about whether the project has had a positive impact on the livelihood of the family, six percent were neutral, 94 percent agreed with 57 percent strongly agreeing. Many of the women disagreed with whether the project assisted them to purchase the selected household items. This may be a result of the fact that the income increase from the projects may not have been sufficient to impact the acquisition of such items or simply that the priorities may be elsewhere. However, from the few women who perceived that the project impacted the purchase of these household items, it can be observed that, even though such projects are meant to have impact on food security, they are capable of producing other livelihood impacts.

### **Support for and Community Perceptions of the Project**

We asked the women about the support of the project and community perceptions of the project. Table 5 summarises these results.

Asked about whether the project received enough funding from the Department of Agriculture and Rural Development, all the women strongly agreed. All the women also thought the project was the right one for the community with 86 percent strongly agreeing. All the women agreed that the project was supported by the community with 49 percent strongly agreeing. All the women agreed that the community showed appreciation of the project. Perhaps we should have followed up on this statement to probe more into the nature of the appreciation. All the women strongly agreed that the project was supported by the extension worker and that they were offered training. Again, it is essential to follow up and find out what kind of training the women received. Asked if they would recommend the project to another community, all the women agreed with 77 percent strongly agreeing. These results suggest that such projects are highly appreciated and supported by the community as they appear to directly address the needs of the community.

**TABLE 6: Responses to food security and other income-related statements**

Attribute	Response					Before/After Project	T	Sig
	Very Good	Good	Neutral	Poor	Very Poor			
Access to cereals for consumption	11	6	26	37	20	Before	5.950	.000
	60	29	6	3	3	After		
Access to vegetables for consumption	0	11	17	34	37	Before	15.377	.000
	94	6	0	0	0	After		
Ability to cope with food security shocks	3	3	29	51	14	Before	12.549	.000
	77	20	0	3	0	After		
Income	3	6	34	17	40	Before	2.805	.008
	6	34	26	9	26	After		
Ability to send children to school	3	11	43	14	29	Before	2.071	.046
	6	29	34	9	23	After		
Ability to access health facilities	0	17	34	9	40	Before	2.666	.012
	17	20	26	11	26	After		

Source: Authors

### **Before and After Project Establishment Analysis**

In trying to assess the impacts of the project, the women were asked about their perceptions of their food security, income, self-esteem and social networks before and after the project. Table 6 summarises the results.

The paired sample t-test was used to test if the distribution of the responses before the project was significantly different from the distribution of the responses after the project. Responses were given on a five-point Likert scale of very good, good, neutral, poor and very poor. For instance, the women were asked to rate their perceptions of their household's access to cereals for consumption before and after the project. Assuming there were positive impacts, then the response distributions before and after the project would show statistically significant difference and there would be more responses on the very good and good side of the scale after the project, compared to before the project. Since this type of analysis does not address

the issue of possible confounding factors, we use twelve attributes assessing different perceptions of the project. The results are, at most, indicative, since we did not conclusively address the issue of confounding factors.

When asked about their perceptions on access to cereals for consumption before the project, 37 percent of the women reported that they perceived it as poor with 20 percent reporting that they perceived it as very poor. After the project, 89 percent reported that they perceived it as good, with 60 percent reporting that they perceived it as very good. The t-statistic ( $0.000 < 0.05$ ) shows that the two distributions are significantly different, suggesting there was a perceived improvement in cereal access as a result of the project. When asked about access to vegetables for consumption before and after the project, 71 percent of the women reported that it was perceived as poor with 37 percent reporting that they perceived it as very poor. Ninety-four percent reported that after the project, access to vegetables for consumption was perceived as very good. The response

**TABLE 7: Responses to statements about personal attributes**

Attribute	Response					Before/After Project	T	Sig
	Very Good	Good	Neutral	Poor	Very Poor			
Self-confidence	3	3	40	46	9	Before	14.215	.000
	77	23	0	0	0	After		
Respect in the household	9	54	29	9	0	Before	7.854	.000
	74	23	3	0	0	After		
Respect in the community	0	26	49	23	3	Before	12.046	.000
	86	11	3	0	0	After		
Marketing skills	3	11	11	26	49	Before	11.756	.000
	83	14	3	0	0	After		

Source: Authors

distributions show a statistically significant difference ( $p=0.000<0.05$ ), implying a perceived improvement in access to vegetables for consumption as a result of the project.

Asked about the ability to cope with food security shocks, 65 percent of the women reported that it was perceived as poor before the project while 97 percent reported that it was perceived as good after the project. Given the t test ( $p=0.000<0.05$ ), we conclude that strategies to cope with food security shocks were perceived to have improved as a result of the project. It is important to follow up on the nature of the influence that the project had on coping strategies.

Using the same logic as above we conclude that the project was perceived to have had positive impacts on income ( $p=0.008<0.05$ ), ability to send children to school ( $p=0.046<0.05$ ), and ability to access health facilities ( $p=0.012<0.05$ ).

### **Perceptions Based on Women's Personal Attributes**

Table 7 summarises the women's responses on perception on personal attributes. For

instance, the women were asked about how they perceived their self-confidence before and after the project.

Eighty-six percent reported that before the project they perceived their self-confidence to be poor but all the women reported that it was perceived as good with 77 percent reporting that it was perceived as very good after the project. The t-statistic ( $p=0.000<0.05$ ) is statistically significant, showing that there was a change in the women's perceptions of their self-confidence before and after the project. Similarly, the results indicate that the women perceived that they gained respect both at the household level ( $p=0.000<0.05$ ), and at the community level ( $p=0.000<0.05$ ) after the project compared to before it. We also asked whether the women perceived themselves to have gained any marketing skills, because the success of a garden project depends on this, given the assumption that they will most likely produce more than they consume. Seventy-five percent of the women reported that they perceived their marketing skills as poor before the project but after the project none of the women perceived themselves as having poor marketing skills.

**TABLE 8: Responses to statements about social networks**

Attribute	Response					Before/After Project	T	Sig
	Very Good	Good	Neutral	Poor	Very Poor			
Social network	3	9	3	6	80	Before	1.234	.226
	6	9	6	6	74	After		
Access to social clubs	0	9	23	40	29	Before	2.916	.000
	74	14	6	3	3	After		

Source: Authors

### Perceptions on Social Networks

Social networks can be important vehicles for development, given their potential to disseminate information. Social networks can be effectively used for communication and are thus capable of increasing group cohesion. Table 8 summarises the women's responses to questions about social networks.

The women were asked whether they perceived their social networks to have improved as a result of the project. Given the t-statistic ( $p=0.226>0.05$ ), we conclude that the women did not perceive social networks to have improved as a result of the project. However, when asked whether access to social clubs improved, the t test ( $p=0.000<0.05$ ) shows that access to social clubs was perceived to have improved as a result of the project.

### The Potential of Governance Systems on Irrigations Schemes to Promote Sustainability

One of the questions that is often asked is whether the beneficiaries have the management capacity to sustain the project after the implementers have left. It is demonstrable that, although they can be enhanced, the management parameters of these projects are well within the women's capabilities. In

a discussion about the issue of upscaling technologies, Professor J. Nga'mbi (personal communication) of the University of Limpopo, South Africa, mentioned that there is an upscaling model that they are using for a livestock project. The way the model works, using the women's project as an example, is that each project would be given the start-up funds conditionally, the condition being that they will be sustainable (meaning the project can replace itself) and that within a certain period (say 5 to 10 years) the project must be able to finance the establishment of a similar project elsewhere, and that the next project also gets its funds on the same condition. The period chosen should be such that the funding is realistically within the women's project ability and that it is not so long as to make the scaling up ineffective. The model requires a management structure, which hopefully can be provided by the Limpopo Department of Agriculture and Land Reform. The results of the gross margin analysis show that it is worthwhile attempting to use this upscaling model, otherwise the projects all end up as one-time acts. We posit that governance systems on smallholder irrigation systems can provide a vehicle for such an upscaling system.

For a long time, the management of natural resources has been the responsibility of the

state. However, due to the fact that state governance has not always met expectations, a recent trend is that local communities are increasingly accounting for a larger share of the management of natural resources, especially on smallholder irrigation systems. One of the institutions used for increasing the local share of system management is through water user associations (Frey, Villamayor-Tomas & Theesfeld, 2016). In some instances, water user associations have been introduced in order to address the problems and challenges associated with government centralised systems (Madigele, 2018). Whatever the motivation of introducing different governance structures, we posit that governance systems, including water user associations, have the potential to improve system sustainability.

Both history and current events show that commonly, the governance improvements on smallholder irrigation systems target increasing the involvement and influence of irrigators in terms of irrigation water supply. Often the argument is that involving irrigators, in irrigation system governance, improves the sustainability of irrigation systems. This is largely seen through the potential of (good) governance to improve system productivity. The potential role of governance in sustainability is, therefore, usually assessed at the micro (project performance level) and not at the macro (project replication level). We posit that project replication and, therefore, long-term sustainability through upscaling can also be enshrined in system governance.

Before we elaborate on our thesis we would like to start by understanding the definition of governance. Abernethy (2010:32)

mentions that dictionaries provide definitions such as "The act, manner, or function of governing". Such definitions do not make it very clear what the role of governance is in specific circumstances such as smallholder irrigation systems. In an attempt to contextualise governance to the circumstances of irrigation systems, Molden (in Abernethy, 2010:32) defines governance as:

...the way authority is organised and executed in society, and often includes the normative notion of the necessity of good governance. The Global Water Partnership defines water governance as "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society" ... Governance is therefore a broad term that includes institutions, organisations, and policies. The World Bank broadens the definition to include the process by which those in authority are selected, monitored, and replaced and the effectiveness of government in implementing sound policies... (Molden, in Abernethy, 2010:32)

Following the definition of Molden (in Abernethy, 2010), we believe that (good) governance systems can offer a key to the long-term sustainability of smallholder irrigation systems. According to Abernethy (2010), the components of governance systems include ownership, making and amending rules, control and decision-making, avoiding and resolving disputes, and mobilising financial and labour resources. We argue that it is some of these components, including, but not limited to, making and amending rules, control and decision-making and mobilising



financial and labour resources, that offer an opportunity to include the concept of replicating the system for upscaling and long-term sustainability.

The gross margin analysis clearly demonstrates that smallholder systems have the potential to set aside funds for the replacement of the initial outlay so that they can perpetuate themselves and avoid the donor funding syndrome where, when donor funds become unavailable, the project also winds down. Further to this, we also posit that the systems have the ability to set aside, within a specified period, say five years, the funds necessary to finance another system. Thus, the constitutions of the governance systems, be they water users associations or other structures, could include statements such as:

The system shall set aside the funds that will be used to replace all equipment used on the scheme to enable project sustainability.

and

The system shall set aside, over a period of five years, funds to be used to develop a similar system for other beneficiaries.

These conditions should be agreed upon before system establishment, which means that the governance structures should be put in place before the system is in operation. This could be made mandatory on schemes funded by the government. In this way, both project sustainability and project upscaling can be ensured. The gross margin analysis shows that it is not beyond the irrigation systems. In instances where the system genuinely fails to achieve the required sustainability and replication conditions, say in

a severe drought which lowered the water table so much as to affect performance, then the government can step in with the necessary additional funds.

## CONCLUSION

These results show that the projects are appreciated by both the community and the participating women. From the women's perceptions, it seems clear that the projects are having a positive impact on their food security and income. The gross margin analysis, though based on one year, shows that it is possible for the projects to be financially viable and sustainable. The question becomes: How can such projects have a large-scale impact? Can they be scaled up? What are the conditions that need to exist for such projects to have similar impacts on a larger scale? One of the major gaps in such development efforts is the absence of models for scaling up development. Obviously, a study like this one cannot provide all the answers to these concerns, but it can certainly give glimpses into possibilities.

One of the possibilities is that governance systems can be used as a vehicle for the sustainability and upscaling of smallholder irrigation systems. Communities are slowly taking responsibility for the management of natural resources through either enhancing or replacing state-based governance systems. On smallholder irrigation systems, water users associations have been used for such development. We argue that the inclusion of conditions that lead to system sustainability can be enshrined in the constitutions in such community-based governance systems, especially in government-funded schemes. This can rid

development efforts of the donor syndrome where projects wind up once donor funds are no longer available.

From this study, there are some questions that need to be followed up:

- It needs to be understood why some women left the project. Would they like to come back to the project? If yes, under what conditions can they do that?
- Is the Limpopo Department of Agriculture willing to provide the management support for the upscaling model suggested in this study?
- At what level of production efficiency are the women's projects currently operating?
- Can networks be used to assist communication in the upscaling process?

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