**Asian Journal of Agriculture and Rural Development**
Volume 8, Issue 1(2018): 28-39

http://www.aessweb.com/journals/5005

# AN EXPLORATORY STUDY IN TO THE BENEFITS AND CHALLENGES FACING SMALL-SCALE FARMERS IN THE TAUNG IRRIGATION SCHEME, NORTH WEST PROVINCE, SOUTH AFRICA

**Gabriel Ekobi** [a] †

**Lovelyne Mboh** [b]

[a] Department of Development Studies, North West University, Corner Luthuli Drive, Mmabatho South Africa.
✉ *gabriel.ekobi@gmail.com* *(Corresponding Author)*

[b] Centre for Indigenous Knowledge Systems, North West University, Corner Luthuli Drive, Mmabatho South Africa.

† Corresponding Author

**ARTICLE HISTORY:**

**Received:** 19-Jul-2018
**Accepted:** 25-Aug-2018
**Online Available:** 10-Sep-2018

**Keywords:**
Irrigation,
Food security,
Poverty,
Livelihoods,
Small-scale farmers

## ABSTRACT

This study examined the benefits and challenges small-scale farmers faced in the Taung irrigation scheme. Irrigation schemes have been identified as the backbone in promoting agriculture in South Africa. Nevertheless, literature have shown that very few studies have been conducted on the benefits and challenges facing small-scale farmers in irrigation schemes, there is a need to supplement this gap. The findings contend that Taung irrigation scheme enabled small-scale framers to generate income. Income made in the scheme permitted small-scale farmers to purchase gardening tools such as watering cans, cattle ploughs and hoes to improve productivity. The scheme also provides a platform for farmers to produce more food therefore, a reduction in poverty incidence in the area. However, challenges such as lack of market, absence of institutional structure, farming capital, transport and loss of harvest through theft are affecting farmers on the scheme. Institutional structure is needed since it allows small-scale farmers to make decision regarding management of the scheme.

**Contribution/ Originality**
This study indicated that Taung irrigation scheme provide a platform for small-scale farmers to generate income which enhances productivity, human capital and physical endowment. The scheme also enable small-scale farmers to produce enough food which improve household consumption thus livelihood. Better management of the scheme would serve as an impetus to employment, income and food security in the area.

DOI: 10.18488/journal.1005/2018.8.1/1005.1.28.39
ISSN (P): 2304-1455/ISSN (E):2224-4433

**How to cite:** Gabriel Ekobi and Lovelyne Mboh (2018). An exploratory study in to the benefits and challenges facing small-scale farmers in the Taung irrigation scheme, north west province, South Africa. Asian Journal of Agriculture and Rural Development, 8(1), 28-39.

## 1. INTRODUCTION

Globally, irrigation plays a crucial part in making water available for food production in rural areas, most importantly, in arid and semi-arid regions (Chazovachii, 2012). Studies have shown that irrigated land has been far more productive than rain fed land over the past four decades and currently constitute 20 percent of the harvested areas in the world (Food and Agriculture Organisation, 2016). Improving irrigation farming contributes significantly to better livelihood of the people in rural areas, as it provides wages through employment. In Africa, irrigation schemes acts as buffer to extreme variability in rainfall, long dry seasons, recurrent droughts, floods and dry spells in order to promote agriculture and food production (Food and Agriculture Organisation, 2014). World Bank (2013) and Cousins (2012), point out that irrigation development in South Africa was introduced due to the unreliability of rainfall in the country making crop production very difficult and risky. Irrigation schemes were seen as a mechanism for eliminating or reducing water deficit in crop production in order to, promote food security and rural development (Government of South Africa, 2013). Irrigated agriculture that covers about 1.3 hectares of land contributes about 30 percent of the country's GDP undertaken by only 10 percent arable land in South Africa even at different provincial levels (Government of South Africa, 2015; Fanadzo *et al.*, 2010; Tekana and Oladele, 2011). In this study, irrigation is seen as the supply of water to agricultural crops by artificial means, designed to permit farming in arid regions and to offset the effect of drought in semi-arid regions (Food and Agriculture Organisation, 2014).

The Taung irrigation scheme was established in 1939 by the South African government as part of the Vaal-Hartz scheme (Van Averbeke *et al.*, 2011). During the 1970's, political and administrative independence of the Bantustan or native area was encouraged, resulting in the central government's withdrawal and homeland administration taking over. This prompted the incorporation of the Taung scheme into the Bophuthatswana homeland during the independent homeland era which lasted from 1970 until 1990's and was an integral part of the economic development of the homelands (Tekana and Oladele, 2011). The scheme was initially established as 1.7 hectares plots per farmer and was irrigated by floods. On the same, about 200 subsistence farmers used the land to grow crops such as maize and pumpkins. The significance of the Taung irrigation scheme arises from the fact that, the scheme is situated in the economically depressed area with high levels of food insecurity and poverty. Institutions such as South African Breweries and Cotton South Africa (cotton), Department of Agriculture and Department of Water Affairs and Forestry were brought together for better management of the scheme (Golder Associates, 2004; Government of South Africa, 2013). The scheme is operated as a public-private partnership that involves small-scale farmers, Department of Agriculture, Department of Water Affairs and Forestry, Traditional Authority and South African Breweries (SAB). The pivots of the irrigation project are maintained by the Department of Agriculture, water for the scheme is made available by Department of Water Affairs and Forestry through the Water User Associations. The Traditional Authority provides land for the irrigation scheme. Farmers are responsible for minor repairs and the replacement of electrical cable in the case of cable theft. South African Breweries provides off-take contracts to the farmers for both barley and maize, thereby providing the farmers with a secure and stable market for their produce, as long as they are able to produce acceptable quality of, and quantities of, barley and maize (Golder Associates, 2004; Bureau for Food and Agricultural Policy, 2008; Government of South Africa, 2013).

However, despite legal and policy frameworks introduced by the South African government such as the South African Constitution (ACT 108 of 1996), the National Water Act (Act 36 of 1998), Water User Associations of 2005 (WUA), National Extension Recovery Implementation Plan of 2006 and The Provincial Growth and Development Strategy of the North West province of 2004 to propel irrigation development, food insecurity and poverty are major concern in the area (Golder Associates, 2004; Bureau for Food and Agricultural Policy, 2008; Tekana and Oladele, 2011; Government of South Africa, 2013). Besides it seems the scheme is not meeting its objectives it was

created, that is, to continue to uplift the standard of living for all stakeholders involved in the scheme. The scheme was supposed to create job, assure food security and income to rural households in the area (Government of South Africa, 2013). In this study, there is the need to determine if the Taung irrigation scheme still achieves its objectives by providing farmers with better living standard. To explore the benefits and challenges facing small-scale farmers in the Taung irrigation scheme, the study was guided by the following objectives: to describe the contribution of Taung irrigation scheme to income generation and food security and also to identify the challenges plaguing small-scale farmers on the scheme.

## 2. METHODOLOGY

### 2.1. Study site

The Taung irrigation scheme is located in Greater Taung Local Municipality of Dr Ruth Segomotsi Mompati District Municipality, in the North West province of South Africa. The province lies between 22 and 28 degrees longitude east of the Greenwich Meridian and between 25 and 28 degrees latitude south of the Equator (Cowley, 1985). The region is situated 1.200mm above sea level and has an annual rainfall of 430mm. The climate is very dry, especially in winter and summers are hot with temperatures ranging from 16-38 degree Celsius (Dr Ruth Segomotsi Mompati District Municipality, 2015). Taung irrigation scheme irrigates 3 698 hectares of land by means of centre pivot, flood and sprinkler irrigation (Government of South Africa, 2013). Three methods of irrigation are practiced at Taung irrigation scheme. Centre pivot irrigation is the largest area (2 490) and the gravity fed sprinkler irrigation irrigates 967 hectares. There are also 24 farmers using flood irrigation on 41 hectares. About 412 small-scale farmers are presently working on the scheme (Government of South Africa, 2013). Small-scale farmers in the Taung irrigation scheme are selected by the Taung Traditional Authority with the help of the Department of Agriculture (Government of South Africa, 2013).

#### 2.1.1. Selection of the study site

Majority of the population in the area constitutes the historically disadvantaged groups and poverty level in the area stands 49.8 percent. Most of the households in area rely on external economic activities, especially state grants. For instance, studies conducted by Tekana and Oladele (2011) show that pension 33 percent were the greatest contributor of the economy in the area. In addition, agriculture plays an important role in the area with about 60 percent of rural livelihood. Agricultural households in Taung stand at 18, 255, livestock's contributes 38.1 percent of the economy, poultry 41.9 percent, vegetables stands at 6.0 percent and other crops 4.3 percent (Dr Ruth Segomotsi Mompati District Municipality, 2015).

### 2.2. Methods

A descriptive study using a mixed method research involving quantitative and qualitative approaches was adopted to collect and present data (Babbie, 2013). Quantitative and qualitative methods were employed because the study aimed to provide clearer and more precise responses, comprising open and closed-ended questions. There was the need to triangulate these methods in the sense that important information which would have been left out by quantitative was explained by qualitative method (Hesse-Biber, 2010; Babbie, 2013).

### 2.3. Sample size

Out of the 412 small-scale farmers involved in the Taung irrigation scheme, 203 small-scale farmers were selected in this study using the Yamane formula (1967):

$$n = \frac{N}{1 + N(e)^2}$$

Where
N= population of the study

n = Sample size
e = error term in this case = 0.05% considering that the confidence interval was 95%

Furthermore, a simple random sampling approach was utilised to recruit respondents for the survey. This was done to give equal chances for respondents to be chosen to take part in this study as this reduces bias. In regards to identifying participants for the qualitative study, this study employed purposive sampling in recruiting the key informants and those for the focus groups discussions. Key informants included the officials from the Department of Agriculture, Water Affairs and Forestry, development agents from the South African Breweries and the Tribal Authority in the Taung area.

### 2.4. Data collection

Data was collected through interviews, structured questionnaires and; focus group discussions consisted of semi-structured interview guide was utilized to get information from small-scale farmers. Questionnaires were formulated in such a way so as to produce responses on the demographic data, income generated, types food produced as well as to explore the challenges facing small-scale farmers on the scheme. The focus groups consisted of three groups of 6-10 members each was employed in the study. Unstructured interview guide was also utilised to obtain data from the key informants that is the officials from the Department of Agriculture, Water Affairs, South African Breweries and Traditional authority. The study also employed secondary data to obtained information which was very relevant to the study. Secondary information was obtained from sources such as the Department of Agriculture, Statistics South Africa, Department of Water Affairs and Forestry, Provincial Government of North West, Mafikeng Municipal Council and Greater Taung Local Municipalities.

### 2.5. Data analysis

Descriptive statistics[1] were used in the analysis of the results to show demographic profiles of small-scale farmers, types of food as well as income generated. The qualitative data (Transcripts and field notes) for focus group and other stakeholders was analysed using Taylor-Powell and Renner's (2003) approach.

## 3. RESULTS AND DISCUSSIONS

This segment deals with the results and discussions of the benefits and challenges faced by small-scale farmers in the Taung irrigation scheme.

### 3.1. Demographic profiles of small-scale farmers

**Table 1: Demographic profiles of respondents (n=203)**

| Demographic Profiles | Frequency | Percentage |
|---|---|---|
| Gender | | |
| Male | 126 | 62% |
| Female | 77 | 38% |
| Age group | | |
| 19-24 years | 2 | 67.5% |
| 25-30 years | 4 | 25.2% |
| 31-36 years | 9 | 4.5% |
| 37-42 years | 51 | 22.9% |
| 42+ | 137 | 68.6% |
| Marital status | | |
| Married | 65 | 32.1% |
| Single | 101 | 49.7% |

[1] Quantitative data was analysed using SPSS version 22

| | | |
|---|---|---|
| Widowed | 37 | 18.2% |
| Educational level | | |
| Illiterate | 19 | 9.4% |
| Literate (Read and write only) | 63 | 31.1% |
| Grade 1-4 | 73 | 35.9% |
| Grade 5-8 | 31 | 15.3% |
| Grade 9-12 | 12 | 5.9% |
| Tertiary | 5 | 2.4% |
| Income level a month | | |
| Less than R800 | 101 | 69.6% |
| R900 – 1600 | 49 | 24.1% |
| R1700 – R2200 | 8 | 3.9% |
| R2200+ | 5 | 2.4% |
| Size of household | | |
| 1 – 2 | 22 | 10.8% |
| 3 – 4 | 42 | 20.6% |
| 5+ | 139 | 68.6% |

Small-scale farmers in the Taung irrigation scheme were predominantly males (62%) as compared to females (38%). This is due to the fact that when the scheme was introduced in the area, men were given preference over women and also, men felt that women could not cope with the demands of the scheme (Tekana and Oladele, 2011; Government of South Africa, 2013). Age groups that participated in the study fell under the age of 42 years or more were the majority (68.6%). This implies that young people in the area do not see agriculture as a sector that can provide them with job or income. This corroborates Anyanwa in Akinbile *et al.* (2007), study which acknowledged that active participants in farming activities were between 40 and 50 years. Majority of the small-scale farmers earned less than R800 per month (69.6%). Most of the households consisted of more than five (68.6%) people living in it. Implying that large household can be used in improving production on the scheme and sustain family income. Nearly half of small-scale farmers were single (49.7%) which means the scheme was used to cater for the vulnerable group in the society. Educational level among small-scale farmers in the Taung irrigation scheme was low. This implies the lack of understanding and knowledge on how to use technology such as pesticides, tractors, access better market and herbicides. Mutambara and Munodawafa (2014) acknowledged that low educational levels, resulted to lack of understanding of commercial farming concepts and limited access to information which are both very crucial in sustaining high production levels.

### 3.2. Contribution to food security

**Table 2: Types of crops grown on the scheme (n=203)**

| Types of crops | Frequency | Percentage |
|---|---|---|
| Barley | 32 | 15.8% |
| Potatoes | 13 | 6.4% |
| Groundnuts | 18 | 8.9% |
| Lucerne | 129 | 63.6% |
| Millet | 3 | 1.4% |
| Onions | 8 | 3.9% |
| Total | 203 | 100 |

Irrigation schemes provide a better platform for small-scale farmers to cultivate various types of crops due to the availability of water throughout the year which improved productivity. The different types of food grown on the scheme provide enough income for farmers to acquire basic commodities and services that improve living standard. Table 2 indicates that majority of small-scale farmers

(63.6%) preferred growing Lucerne since it is more profitable than other crops. In the focus group discussion including interviews with the Traditional Authority and Officials from the Department of Agriculture (Irrigation manager and extension officers), Water Affairs and Forestry, and the South African Breweries, most of the small-scale farmers reported they grow different types of crops on the scheme. However, according to the small-scale farmers, they preferred growing Lucerne. Lucerne is cheaper to grow and yields average high output since the prices are good. The farmers went on to explain that they preferred producing Lucerne as there is a ready market for the produce. Growing Lucerne helps in preventing parasites and diseases which affect crops. One farmer reported that cultivating Lucerne enabled them to cover losses of other crops due to fluctuation in prices and climate change. Another farmer stressed that growing Lucerne provide enough income for him and his families to acquire better health which prevents ill-health. Although some farmers reported that they prefer cultivating barley as the demand from South African Breweries is always high.

However, some farmers reported that growing more than one crop throughout the year is more profitable. According to these small-scale farmers growing onions, potatoes, millet and groundnuts provided them not only with income but food security therefore, a reduction in poverty incidence in small-scale farmer's households. One farmer confirms irrigation scheme gives small-scale farmers the opportunity to cultivate high value crops like potatoes and tomatoes that need regular supply of water to cultivate. Also, another farmer stressed that the scheme enables them to earn an income through the various types of food grown, according to this farmer he is far better than those farmers who depend on rain fed agriculture. Another farmer also confirmed that the scheme allowed them to grow additional crops like tomatoes, spinach and pumpkin that are sold or consumed by them. One farmer said she would cover her costs by growing onions and potatoes but point out that cultivating more than one type of crop was no easy task since it demands both inputs and labour. The different type crops grown on the scheme like Lucerne, Barley, potatoes, onions, millet and tomatoes provide income to small-scale farmers and also broaden their nutritional requirements. One farmer stressed that besides increasing productivity of crops due to the access to irrigation, increases the demand for agricultural labourers and therefore, a wage rates for those who are not part of the scheme. Some farmers further reported that the access and availability to irrigation infrastructure, coupled with access to new technologies like tractors, pesticides, herbicides and fertilizers has facilitate production of varieties of crops on the scheme. This findings is line with Mutsvangwa and Doranalli (2006), vegetables, and other crops affect customer's diet and health not only to rural households but also to those who buy them through local markets and more so food crops have a special role in supplementing the diet of small children at weaning age and lowering the lack of protective foods.

**Table 3: Enough food to small-scale farmers using the scheme (n=203)**

| Enough food | Frequency | Percentage |
|---|---|---|
| Yes | 133 | 65.5% |
| No | 70 | 34.5% |
| Total | 100 | 100 |

Small-scale farmers involved in the Taung irrigation scheme were able to produce enough for the throughout the year that improved household consumption. Farmers were able to build household assets such as different livestock with the availability this directly reduces vulnerability to shocks in time of hardship. Table 3 shows that majority 65.5% of small-scale farmers indicated that they produce enough food for their household and; 34.5% indicated that they do not produce enough food for their households. In the focus group discussions, majority of small-scale farmers, the Irrigation Manager, and extension officer, development agent (South African Breweries) and Traditional Authority reported that farmers had managed to produce enough food to support their households, despite the fact that they lacked fertilizers, chemicals, seeds, pesticides and proper farming skills. Small-scale farmers explained that some of the food produced is consumed by them to provide them with nutrients, since working on the scheme requires a lot of energy. Small-scale farmers reported

they were able to support themselves and their dependents with food produced from the scheme and this prevented hunger and malnutrition. Hunger leads to fatigue, weight loss, stunting of growth, and frequent colds most especially among children. Undernourished pregnant women are more likely to bear babies with low birth weight, and the babies are then more likely to experience developmental delays that can lead to learning problems. One farmer also revealed that due to the introduction of the scheme, he had physical and economic access to safe, sufficient and nutritious food at all times which improved their health and that of their children. According to the farmers due to abundant of water throughout the year, they owned vegetable gardens such as cabbages, tomatoes, spinach and pumpkin in his backyard.

Small-farmers also reported that the scheme led to the increase household's consumption and reduced expenditure on buying food. The scheme made food available and affordable to farmers who spent a major part of their monthly income expenditure on basic food. Sufficient and affordable food can be very crucial to the improvement of nutrition and health which was beneficial in promoting small-farmers skills and capabilities. One farmer claim that food produced from the scheme played at least some role in preventing frequent hunger and meeting the objectives of the scheme. Irrigation schemes like the Taung irrigation scheme continue to act as an impetus in poverty reduction by providing protection against famine, food security and intensifying job opportunities. Some farmers stressed that the Taung irrigation scheme beneficiaries that encountered poor harvest and crop failure in the past years before joining the scheme dramatically declined. The scheme helps in the production of enough food which enabled farmers to meet their basic needs associated with enhancements of their overall economic happiness such as protection against poor harvest due to insufficient rainwater supplies and employment which enable people to move out of the poverty cycle. Sinyolo (2014), corroborated this finding where it was found out that irrigation continues to be a plausible approach for achieving high agricultural production, food security among households and reduction in rural poverty in less developed countries.

### 3.3. Income generated from the sale of produce on the scheme

**Table 4: Small-scale farmer's income from the scheme (n=203)**

| Income | Frequency | Percentage |
|---|---|---|
| Less than R4000 | 64 | 31.5% |
| R4001=8000 | 126 | 62.0% |
| R8001+ | 13 | 6.4% |
| Total | 203 | 100 |

The scheme was very successful in enabling small-scale farmers acquire a certain amount of wealth through income generated suggesting that farmers involved in the scheme have shown significant improvement in their livelihoods, and earn higher incomes than those that are not part of the scheme. The Taung irrigation scheme do not only offer income to the rural population of the area but also act as an alternative source of employment. The scheme doubles small-scale farmers' income and this augments household food security greatly. In the survey, majority of the small-scale farmers earned between R4001-8000 in a month from the scheme (62.0%). During the focus group discussion and interviews with the manager of the scheme, small-scale farmers reported that they were able to generate income from the scheme. Income generated from the scheme enhances productivity and returns to human capital and physical endowment. Income made through the scheme enabled small-scale farmers to purchase gardening tools such as watering cans, cattle ploughs and hoes. These were critical assets for daily use within the scheme and home gardens. One farmer went on to stressed that income generated from the scheme, were therefore vital in influencing access to better and affordable quantities of assorted variety of food for sufficient nutrition.

Despite the fact that, the income made from the scheme is low, the amount received has also enabled farmers to solve their daily problems like education, health, housing, education, health and transport. Small-scale farmers further reported that the income made from the scheme, is far better than the social grant package given by the government of South Africa. According to these small-scale farmers, their lives are better than those that were unemployed in the area, or civil servants who went unpaid for many months. The scheme also enabled farmers to accumulate assets such as livestock's and landed property that contributed to wealth accumulation and poverty reduction. One farmer said she is able to buy livestock's such as cattle, goats, pigs, camel and sheep with money obtained from the scheme. Cattle for instance, were very significant in promoting households income since it was seen as an indicator of wealth. Also, cattle produced manure that is rich nutrients and also assists in retaining soil moisture, unlike chemical fertiliser.

In addition, cattle and camel play a central role in the agricultural sector as it provides draught power for tillage purposes. Another farmer confirmed that families with cattle could plough a greater portion of land and get better harvest ultimately when they applied manure to their crops. The owners of these cattle have the capacity to generate wealth either through direct use or to hire out their cattle as the draught power to those who did not have them accumulating, even more, income in the process. One farmer further revealed that cows also provided milk for household use and for selling to community members at a competitive price. Small-scale farmers also reported that they relied on goat milk, as it was nutritious and delicious. Goats provided much-needed protein to farmers and were less vulnerable to theft, unlike cattle. Also, some farmers further reported that the scheme has enabled them to further their education and that of their children which improve human development. Education is critical to crop production, especially in a rapidly changing technological or economic environment. More so, income generated from the scheme allowed farmers to afford better quality education of their children, increasing chances of those students to further education in tertiary institutions.

Human capital development through the acquisition of education is very important factor for agricultural growth and rural poverty reduction. The scheme also enables small-scale farmers to meet some of their basic needs like paraffin, cloths, electricity and water bills and cooking oil. Taung irrigation scheme was very crucial in reducing poverty through income generated from the scheme. This was a significant contribution to the community and national development, as it contributed towards the national skilled labour force. This finding was in line with studies conducted elsewhere by Food and Agriculture Organisation (2001) and Sarkar *et al.* (2014) where it was found out that irrigated agriculture contributed about a 30-60% share of the Gross Domestic Product, employed about 40-95% of the workforce and provided food, subsistence and income to the majority of developing countries' population.

## 4. CHALLENGES FACED BY SMALL-SCALE FARMERS

### 4.1. Marketing

Small-scale farmers reported marketing as the major challenge on the scheme. According to the small-scale farmers, only one buyer was allowed to purchase their produce and sell to neighboring countries. This buyer was arranged by the Department of Agriculture and South African Breweries. The buyer exploit farmers by paying a minimal amount for their produce and this affected their income level negatively. This in line with findings from a study conducted by Woldeab (2003) that points out that, market information is limited to small-scale farmers involved in irrigation system in North of Ethiopia and this has hampered marketing of their agricultural products. Also, Langat *et al.* (2011) studies explained that in the Eastern Cape Province in South Africa, it is often difficult for smallholder farmers to partake in market due to a number of obstacles that reduced the motivation for partakers. These may be reflected on the hidden costs that made access to markets and productive assets difficult.

### 4.2. Institutional structures

The sustainability of the scheme depends on the establishment of appropriate institutional structures (organisation and management) which involves the formation of farmers groups (FSU's) and a management committee to manage the scheme. Nevertheless, the scheme does not have a Management Committee to formally represent all the farmers. The absence of this has resulted in the farmers not having proper and communicable channels through which they can raise their concerns, needs and problems with the strategic partners. Also, this led to poor relation with other stakeholders hence poor management of the scheme. Also, small-scale farmers complained that they were never part of the decision making body of the scheme. The Farmers Support Units that was supposed to represent small-scale farmers at the management committee is non-existent. According to the small-scale farmers, the above made them to resort to vandalizing the office of the scheme in order for the Department of Agriculture to meet their demand. This is consistent with Mudau (2010) study which revealed that smallholder irrigation was exposed to improper institutions and organisational approaches, as well as a lack of the capacity to provide the necessary assistance to smallholder farmers.

### 4.3. Lack of capital

Small-scale farmers reported the lack of capital to buy inputs such as fertilizers, seeds, pesticides as a challenge. One farmer claim that the absence of capital and refusal of the banks to grant credit to small-scale farmers forced them to use unspecified organic fertilizers or just plants which resulted to low productivity. Another farmer reported that due to lack of capital she cannot afford to buy watering can, cattle and shovel to facilitate production. Nyamutule and Ayessaki (2009) work found out that smallholder farmers access to funds from organizations such as governments and Non-Governmental Organisations was very difficult due to low output, commodities, market risk, lack of collateral, farmer's poor track record in managing the farm and the loan repayment, lack of risk alleviation for production, high transaction costs, poor timing of the payment of funds, a negative attitude of the financial institutions that considered smallholders non-bankable. These challenges were serious threats to small-scale farmers in the scheme since finance is needed to pay for water and also to buy farm inputs like chemicals, pesticides, tractors and fertilisers to ease production.

### 4.4. Water charged

Small-scale farmers indicated that, the price of water charged by Department of Water Affairs and Forestry (Water User Associations) was too high. Farmers in Taung irrigation scheme were supposed to be charged in accordance with the number of plots they owned; instead they were charged at a higher rate (R154 per hectares for a year). This has made them to accumulate large amount of debts. As a result, small-scale farmers were forced to temporarily abandon cultivation of their plots and instead resorted to increasingly leasing or renting their plots of land. Liao *et al.* (2008) study conducted in China revealed that water pricing hike methods threatened the sustainability and viability of irrigation projects. This has made some irrigation schemes in China to collapse thus causing food insecurity in the area.

### 4.5. Transportation

Small-scale farmers reported that the scheme did not have available vehicles to transport their produce to the market, since they were the people taking their produce to the market. Coupled with the above, roads leading to farms were inaccessible. Small-scale farmers explained that due to the above challenges, their livelihoods were not improving since they did not make enough profits from the scheme. As a result they were getting poorer thus, hindering development in Taung area. This finding is equal to Ngomezulu (2010) work which acknowledged that transactional costs are barriers to the efficient participation of farmers in different markets. The transaction costs are generally high for smallholder producers because of poor road infrastructures. In addition, other constraints, such as poor fencing, winter, contract farmers (European farmers), theft of crops, absence of title deeds and ownerships of land by farmers, extension officers low level of education, levy paid on electricity and tractors, the constant changing of Ministry (Member of the Executive Council) and lack of

proper sanitation (Clean water and sewerage) to farm houses were reported as challenges affecting small-scale farmers working on the scheme.

## 5. WAY FORWARD

### 5.1. Institutional structure

Institutional structure plays a very vital role for the success or failure of any irrigation system. Without a good institutional structure in an irrigation scheme, the failure of the scheme is high. The study revealed that institutional structure was a problem plaguing small-scale farmers in Taung irrigation scheme, leading to discontent between small-scale farmers and the Department of Agriculture. The study therefore, recommends that small-scale farmers should establish cooperatives to enable them have more powers to influence the decision making process of the scheme. Also cooperatives would enable small-scale farmers to afford legal representatives to negotiate contractual agreement between South African Breweries, Department of Agriculture and small-scale farmers to avoid being exploited. Secondly, small-scale farmers and other partners (Department of Agriculture, Department of Water Affairs and Forestry, South African Breweries, Traditional Authority) need to form a Management Committee with small-scale farmers having a better representation. Formation of Management Committee would provide a smooth platform for communication among the members of the scheme. Lastly, small-scale farmers' inputs concerning the scheme should be highly considered since this is their project.

### 5.2. Capital support

Capital is very important to small-scale farmers in the scheme since it is needed to pay for water and also to buy farm inputs like chemicals, pesticides, tractors and fertilisers to ease production. The study showed that capital was a serious challenge facing small-scale farmers in Taung irrigation scheme. In this regard, it is recommended that community based bank should be introduced to meet the financial needs of the small-scale farmers in the scheme. The North West Provincial Government through the bank needs to provide capital in the form of inputs such as fertilisers, seeds, chemicals and pesticides of up to 60 percent, and then the community can provide the rest. The rate of percentage of lending money should be below the cost of operation of the scheme. Secondly, cooperatives should be established by the small-scale farmers as this would enable them to obtain loans from banks involved in agricultural development since they would be able to pull their resources together. Thirdly, the Department of Agriculture should organise workshops to educate small-scale farmers on how to acquire loans from banks and the importance of repaying the loans. Lastly, the Department of Agriculture needs to encourage banks involved in agricultural development to assist farmers involved in the irrigation scheme.

### 5.3. Marketing support

Freedom to market produces by small-scale farmer's results to improved livelihoods, since it will generate high income to farmers. From this study, it is evident that small scale farmers are struggling to market their produce. Therefore, the study recommends that the Department of Agriculture and the Greater Taung Local Municipality needs to assist small-scale farmers in marketing their produce. This can be done by holding market fairs and agricultural trade exhibitions. Also they can assist small-scale farmers by using media platforms to advertise their produce. The one buyer system of marketing introduced by the Department of Agriculture and South African Breweries should be addressed so that small-scale farmers would be able to market their produce with freedom. With access to market information, the Department of Agriculture, South Africa Breweries, private and governmental organizations needs to constantly supply market information to small-scale farmers. Department of Agriculture and Greater Taung Local Municipality should organise workshops to educate the farmers on how to use the market information. Also small-scale farmers should establish cooperatives as this will enable them to acquire power to influence the market.

## 6. CONCLUSION

Taung irrigation scheme was a tool implemented to uplift the lives of the people through income generation and; most especially to provide food security and livelihoods in Taung area. This study attests that the scheme enabled some small-scale farmers to produce more food which has helped in improving household nutritional levels. The scheme was also very instrumental in providing the platform for small-scale farmers to generate income. Some small-scale farmers were able to acquire assets such as livestock and farming tools with income made from the scheme although limited. However, the income generated has not been able to address food security and livelihoods among small-scale farmers in Taung due to challenges. These challenges include; lack of proper markets, institutional problems, lack of capital such as finance to purchase inputs, low level of education of extension officers, high presence of European contract farmers, high water rate charged, poor transport and theft of crops which hindered production to be done on a large scale. Some recommendations were made to help address the challenges that small-scale farmers were facing on the scheme. Cooperatives should be established by small-scale farmers as this will enable them to solve the problem of institutional structures of the scheme. Cooperative establishment will also enable small-scale farmers to have access to markets and even capital.

**Funding:** The study was supported by the North West University (NWU) post-graduate bursary, South Africa.
**Competing Interests:** No conflict of interest was reported by the authors.
**Contributors/Acknowledgement:** This work was part of the master's research project, the problems faced by small-scale farmers in Taung irrigation scheme, North West Province, South Africa.



## References

Akinbile, L. A., Salimonu, K. K., & Yekinni, O. T. (2007). Farmer's participation in Agroferestry Practices in Ondo State, Nigeria. *Research Journal of Applied Science, 2*(3), 229-232. *view at Google scholar*

Babbie, E. (2013). *The practice of social science*. Belmont CA, Thomas Wadwoth. *view at Google scholar*

Bureau for Food and Agricultural Policy (2008). *National agricultural research and development strategy*. URL: http//www.bfap.co.za/documents/baselines/BFAP_Baseline_2012.pdf.

Chazovachii, B. (2012). The impact of small-scale irrigation on rural livelihoods: the case of Panganai irrigation scheme Bikita District Zimbabwe, Harare. *Journal of Sustainable Development in Africa, 14*(4), 52-55. *view at Google scholar*

Cousins, B. (2012). *Smallholder irrigation schemes, agrarian reform and accumulation from below*: *Evidence from Tugela ferry*. University of Cape Town, Durban. *view at Google scholar* / *view at publisher*

Cowley, J. W. (1985). *Bophuthatswana: The land and the people*. University bookshop publishers, Mafikeng. *view at Google scholar*

Government of South Africa (2013). *Abstract of Agricultural statistics.* Government printer, Pretoria, South Africa. *view at Google scholar*

Government of South Africa (2015). *South Africa year book 2014/2015*. Republic of South Africa.

Dr Ruth Segomotsi District Municipality (2015). *Implementation of the integrated development plan*. Government Gazette, Vryburg.

Fanadzo, M., Chiduza, C., Mnkeni, P. N. S., Van der Stoep, I., & Stevens, J. (2010). Crop production management practices as a cause for lowwater productivity at Zanyokwe irrigation scheme. *Water SA, 36*(1), 27-36. *view at Google scholar* / *view at publisher*

Food and Agriculture Organisation (2001). *Smallholder irrigation technology: prospects for Sub-Saharan Africa: international program for technology and research in irrigation and drainage knowledge synthesis*. Rome, Italy. *view at Google scholar*

Food and Agriculture Organisation (2014). *Did you know . . . ? Facts and figures about irrigation areas*. Rome, Italy, FAO.

Food and Agriculture Organisation (2016). *AQUASTAT: Total withdrawal by the sector*. URL: http://www.fao.org/nr/water/aquastat/data/query/.

Hesse-Biber, S. N. (2010). *Mixed methods research: merging theory with practice*. The Gulfard Press. New York. *view at Google scholar* / *view at publisher*

Golder Associates Pty Limited (2004). *Resuscitation plan for Taung irrigation scheme*. (Report Number: 5874/001), Department of Agriculture, Conservation and Environment, Johannessburg.

Langat, B. K., Ngeno, V. K., Sulo, T. K., Nyangweso, P. M., Korir, M. K, Kipsat, M. J., & Kebenei, J. S. (2011). *Household food security in a commercialized subsistence economy: a case study of small tea in Nandi South District, Kenya*. Department of Agricultural Economics and Resource Management, Niarobi. *view at Google scholar*

Liao, Y., Gao, Z., Bao, Z., Huang, Q., Feng, G., Xu, D., Cai, J., Han, H., & Wu, W. (2008). *China's water pricing reforms for irrigation: effectiveness and impact.* Colombo, International Water Management Institute, Sri Lanka. *view at Google scholar*

Mudau, S. K. (2010). *Farmers' strategies and modes of operation in smallholder irrigation schemes in South Africa*. A case study of Mamuhohi irrigation scheme in Limpopo Province, PhD thesis, University of Pretoria. *view at Google scholar*

Mutambara, S., & Munodawafa, A. (2014). Production challenges and sustainability of smallholder irrigation schemes in Zimbabwe. *Journal of Biology, Agriculture and Healthcare, 4*(15), 87-96. *view at Google scholar*

Mutsvangwa, T., & Doranalli, K. (2006). *Agriculture and sustainable development*. The Hague University Press, Netherland.

Ngomezulu, S. (2010). *Formal marketing of cattle by communal farmers in Eastern Cape Province of South Africa*. Animal Production Group, Mthata. *view at Google scholar*

Nyamutule, R., & Ayessaki, B. (2009). Proceedings of the regional workshop on agricultural financing across commodity specific chains. Summary held at fairway hotel-Kampala/Uganda.

Sarkar, M. K., Rahman, M. D., Ahmed, F. G. M., Kabiraj, R., Uddin, A. T. M. J., Biswas, A., & Kabir, M. H. (2014). Climate change and green technology for enriching agriculture. *America Journal of Agriculture and Forestry, 2*(1), 7-14.

Sinyolo, S., Mudhara, M., & Wale, E. (2014). The impact of smallholder irrigation on household welfare: The case of Tugela Ferry irrigation scheme in KwaZulu-Natal, South Africa. *Water South Africa, 140*(1), 302-304. *view at Google scholar* / *view at publisher*

Taylor-Powell, E., & Renner, M. (2003). *Analysing qualitative data: Extension cooperative publishing operations*. Madison, University of Winsconsin.

Tekana, S., & Oladele, O. (2011). Impact analysis of Taung irrigation scheme on household welfare among farmers in north-west province, South Africa. *J Hum Ecol, 36*(1), 69-77. *view at Google scholar* / *view at publisher*

Van Averbeke, W., Denison, J., & Mnkeni, P. N. S. (2011). Small holder irrigation schemes in South Africa: A review of knowledge generated by water research committee. *Water South Africa, 37*(5), 797-808. *view at Google scholar* / *view at publisher*

Woldeab, T. (2003). *Irrigation practices, State intervention and farmers: life-worlds in drought prone Tigray*. Wageningen University, Netherland.

World Bank (2013). *World development report 2012: Agriculture for development*. World Bank, Washington DC. *view at Google scholar*

Yamane, T. (1967). *Statistics, an introductory analysis*. Harper and Row, New York. *view at Google scholar*