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Characterization of plot holders at Mutale smallholder irrigation schemes in Limpopo province, South Africa

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Abstract
The study was conducted at Rambuda, Folovhodwe and Tshipise smallholder irrigation schemes. The three Smallholder irrigation schemes are situated at Mutale Local Municipality which is part of the Vhembe District Municipality of Limpopo Province in South Africa. The purpose of the study was to determine the characteristics of the plot holders farming in smallholder irrigation schemes who use communal water source. A structured household questionnaire was used to carry out survey on a sample of (N= 170) respondents selected from plot holders using the Flood (furrow) irrigation systems i.e. Folovhodwe N=73, Rambuda N=67 and Tshipise N=30. The gathered information was analyzed and interpreted using Microsoft-excel and statistical analysis system 9.1 version (SAS 9.1) software. The program covers frequency tables, figures and representative's characteristics or values, such as averages and percentages. The main findings showed that there are significant differences which led to poor asset base that compromised their capacity to improve their living standard, make meaningful investments and turnover. The study concludes that in all Mutale smallholder irrigation schemes even if poor asset base is compromised, irrigation income is the most important followed by social grants that consist of pensions and child-care grants. This indicates that farming does generate employment, especially to the unemployed and can serve as their source of livelihood. It is also an alternative employment to females who remain at home while their husbands are looking for employment in cities and other groups who were previously employed.

Keywords: Communal smallholder irrigation schemes, Plot holder's characterization, flood (furrow) irrigation system, Mutale local municipality

1. Introduction
This research was conducted at three smallholder irrigation schemes that had similar features i.e. Rambuda, Folovhodwe and Tshipise irrigation schemes. The three smallholder irrigation schemes are located at Mutale Local Municipality which is part of the Vhembe District Municipality of Limpopo Province in South Africa. These communal irrigation schemes were established during the smallholder canal scheme era (1930-1969), as said by Fanadzo, *et al.*, (2010) [5] at four era of smallholder irrigation schemes historical development. All three schemes extracted their irrigation water from perennial rivers by means of gravity, conveyed from weir to primary and secondary communal concrete-lined canals.
The total area of Rambuda irrigation scheme is 104 ha demarcated into 81 plots of 1.28 ha each. The plots are divided into subplots with sizes ranging between 300 and 900 m^2. There are 103 plot holders, farming at Rambuda Irrigation Scheme. At Folovhodwe irrigation scheme, total area of the scheme is 68 ha demarcated into 112 plots of 0.608 ha each. The plots are divided into subplots with sizes ranging between 300 and 900 m^2 and there are 112 plot holders, farming at Folovhodwe Irrigation Scheme. While, Tshipise irrigation scheme have a total area of 8.48 ha demarcated into 30 plots of 0.28 ha each, and the plots are divided into subplots with sizes ranging between 560 and 700 m^2. There are 30 plot holders, farming at Tshipise Irrigation Scheme.
For many decades' smallholder irrigation schemes have been considered to have the potential to generate economic development in poor and under-developed rural areas (WRC, 2009) [26]. The antiquity of smallholder irrigation schemes in South Africa specify these irrigation schemes suffered considerable neglect and were a mixture of success and failure

during the post developmental planning and operation stage. The study was aimed at accentuating the plot holder characteristics influencing the production performance of smallholder irrigation schemes. The information gathered from the study is important for advance and sustainability of future smallholder irrigation schemes research, irrigation system development and the revitalization of communal smallholder irrigation schemes in Limpopo province and other smallholder irrigation scheme developmental areas.

1.1 Problem statement

Smallholder irrigation schemes were developed to achieve food security and profitable crop production to alleviate poverty. It seems a number of these irrigation schemes have not performed well since established. The socio-economic characteristics of plot holders at Mutale smallholder irrigation schemes reflect household livelihoods. Poor asset base smallholder irrigation schemes compromise plot holders capacity to make meaningful investments and improving their living standard.

1.2 Research objectives

The specific objective was to characterize the household of plot holders at communal smallholder irrigation scheme who use flood irrigation system at Mutale Municipality, Limpopo province of South Africa.

2. Research Methodology

2.1 Site Description

2.1.1 Location

Rambuda, and Folovhodwe irrigation scheme falls within the territory of Rambuda Triditional council whereas Tshipise irrigation scheme falls within the territory of Tshikundamalema Triditional council. Agro- ecological conditions at Rambuda, Folovhodwe (sub-humid) and Klein Tshipise smallholder irrigation schemes (semi-arid) are significantly different, and the farming plots per smallholder irrigation scheme are not alike in size.

This confirms that the variables of smallholder irrigation scheme plot holders in Mutale smallholder irrigation schemes is affected by diversity and similarities attributed to different livelihood needs.

The three smallholder irrigation schemes are located in the Mutale Local Municipality which is part of the Vhembe District Municipality of Limpopo Province in South Africa (Figure 1). Rambuda irrigation scheme lies between 22°47'15"S latitude and 30°27'5"E longitude whereas Tshipise irrigation scheme lies between 22°31 39"S latitude and 30°40'38"E longitude, and Folovhodwe irrigation scheme lies between 22° 34' 67" S and 30° 25' 62"E.

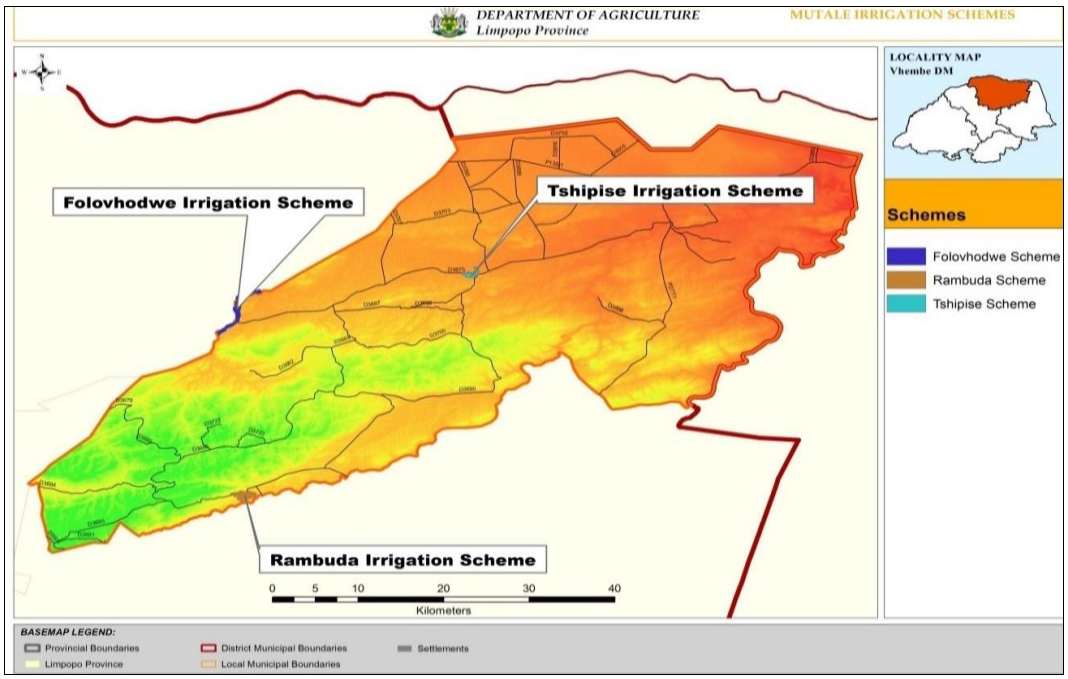

Fig 1: Location of folovhodwe, Rambuda and Tshipise irrigation schemes in Mutale local municipality under Vhembe district of Limpopo Province, South Africa

2.1.2 Socio-economic situation at the study site

A socio-economic impact assessment examines how a smallholder irrigation scheme will change the lives of current and future residents of a community and its local economy.

The availability of land in the Mutale Local Municipality for smallholder irrigation scheme development is limited due to water shortages in rural area. The road infrastructure is predominating gravel roads. The connectivity of roads to rural areas and service centres play a major role in the livelihoods of local residents. Community in this villages rely on these three smallholder irrigation schemes and subsistence farming, and find it difficult to progress into the commercial market.

According to Statistic SA, (2016) [22] for Mutale Local Municipality, the estimated total population was 86321 in 2003, to 115359 in 2013. The Local Municipality population is estimated to have grown by an average growth rate of (3.4%). Therefore, examining population dynamics at Mutale smallholder irrigation schemes is necessary, in order to gain an accurate perspective of those who are likely to be affected by any changes in the daily food provision and local economy.

2.1.3 Climatic condition at the study site

Climatic conditions in Mutale local Municipality are generally sub-tropical, but show considerable local variation.

i) Rainfall

Rainfall declines dramatically towards north and towards lower-lying areas. The results of participatory exercise conducted at Rambuda irrigation scheme indicated that the area receives summer rainfall. The wettest months were stated by plot-holders as February, March, April, November and December with most rain falling during February and March (Nethononda, *et. al.*, 2013) [18].

The above information was also confirmed by Tshikolomo, 2012 [24], who indicated that Mutale Municipality receives an average of 515mm of rain per annum with more than 80% of the rainfall occurring between October and March. According to Tshikolomo (2012) [24], most of the rainfall occurs in January and February with the wettest month being February with a monthly precipitation of 105mm. The source of irrigation water for Rambuda irrigation scheme is Tshala River; which is a tributary of the Mutale River and therefore forms part of the Mutale River Catchment. Similarly, to above, the only source of irrigation water for Folovhodwe irrigation scheme is Nwanedi River; which is a tributary of the Limpopo River and therefore forms part of the Limpopo River Catchment. Whereas the source of irrigation water for Tshipise scheme is Tshipise fountain; which is also a tributary of the Mutale River and therefore forms part of the Mutale River Catchment.

ii) Temperature

Mutale local municipality temperature varies as according to topography of the smallholder irrigation scheme's location. In the escarpments' air temperature increases, giving rise to relatively cool and wet and in the lowlands air temperature are warmer and dryer. In other areas of Mutale local Municipality in a study conducted at Rambuda irrigation scheme, results of participatory exercise shows that plot-holders consider the area is characterized by warm to hot summers, with mild to cold winters. The study further indicated that recorded climatic data showed that September (29.0 °C) and January (30.0 °C) whereas the coldest months shows little differences in temperatures between June (9.4 °C) and July (9.2 °C) (Nethononda, *et. al.*, 2013) [18].

2.1.4 Geology and Vegetation at the study site

The topography of the site can be described as practically gentle flat slope with slightly varying percentage. The study conducted at RAU., (1979) [20], indicates that north of the Soutpansberg, the vegetation is predominantly open tree savannah (sourish mixed bushveld) with *Acacia caffra* the dominant tree, and a denser tree savannah (mixed bushveld) in the northern foothills. This also include in Mutale escarpment. Towards Limpopo River in the dry area (low-lying areas), the vegetation is largely short shrub mopane trees *(Colophospermum mopane)*, with scattered Baobab trees *(Adansonia digitata*) (Acocks 1988) [1].

2.2 Research approach

In the context of the exploration of this study, it was noticeable that a solitary devoted approach will not be sufficient to answer the research questions appropriately. Therefore, study also includes the flexibility combination of the attributes of both quantitative and qualitative methods. In line with the segments of this study, the context and phases under which research approach should be applied, and it include target population, sampling strategy, data collecting instrument, data analyzing, interpreting and reporting data in researched surveys. Research approach stands critical in directing the researcher about the methods interpretive logic to employ during the study.

2.2.1 Target population and Sampling strategy

The three smallholder irrigation scheme population was targeted because plot holders on the three irrigation schemes displayed a diversity of livelihood types and farming styles. The smallholder irrigation scheme populations' demographic features (population size, gender and age distribution) and demographic indicators (education, employment and income) forms integral part of the economic development, therefore it need to be examined in order to predict the future of the smallholder irrigation scheme economic viability.

The population in question is the Mutale smallholder irrigation schemes identified as promising locations which can change the lives of current and future plot holders through uplifting their livelihoods. Identified plot holders in the irrigation schemes, belonging to the total of 180.41 ha of production area at Mutale Local Municipality Irrigation Schemes. In these three smallholder irrigation schemes, Rambuda is having 103 plot holders, Folovhodwe is 112 plot holders and Tshipise is 30 plot holders. The total smallholder irrigation scheme plot holders at Mutale local municipality is 245.

Table 1: Plot holder representatives

Name of irrigation scheme	Total Mutale SIS hectares	Total No. of plot holders	No. of plot holders interviewed	Percentages interviewed
Rambuda Smallholder irrigation scheme	104	103	67	65%
Folovhodwe Smallholder irrigation scheme	68	112	73	65%
Tshipise Smallholder irrigation scheme	8.41	30	30	100%
Total	180.41	245	170	77%

Source: Mutale SIS Survey results, 2016

The simple random sampling method was applied to selected respondent at this study, guided by Guidelines for sampling (Stoker (1985) [23] (Table 2). Sampling was done as a process of selecting units from a population of interest, so that by studying the sample, the results obtained from the sample may be generalized to the population from which the sample had been chosen (Leedy and Ormrod, 2005) [8].

A representative sample was based on the number of plot holders per smallholder irrigation scheme. At Tshipise smallholder irrigation scheme, there are 30 plot holders and 24 plot holders were suggested to be randomly sampled but all plot holders were interviewed (Table 1). In Rambuda smallholder irrigation scheme, there are 103 plot holders and 47 plot holders were suggested to be randomly sampled

but 67 plot holder were interviewed, whereas in Folovhodwe smallholder irrigation scheme, there are 112 plot holders and 50 plot holders were suggested to be randomly sampled but 73 plot holder were interviewed. The reason for selecting percentage higher than it should be, were implemented to control sampling errors. In case of time for sampling, the best time was towards harvest when the farmers still remember most of the information that happen during the production period.

Table 2: Guidelines for sampling

Population	Percentage suggested	Number of respondents
20	100%	20
30	80%	24
50	64%	32
100	45%	45
200	32%	64
500	20%	100
1000	14%	140
10 000	4.5%	450
100 000	2%	2000
200 000	1%	2000

Source: Stoker (1985)

2.2.2 Data collection instrument and analysis

This research study will be applying both primary and secondary data collection instruments. Primary data will be collected using a questionnaire and village walk (observation).

i) Questionnaire

The questionnaire was developed to collect both qualitative and quantitative data. A structured questionnaire was used to collect plot holder's primary data at these three smallholder irrigation schemes. The questionnaires were administered on face-to-face interviews which embrace both open- and close-ended questions. The questionnaire was developed based on the social and economic characteristics as the other assets of the livelihoods framework.

ii) Village and Smallholder irrigation scheme walk

The path village and smallholder irrigation scheme walk is a primary data collecting instrument through carrying out physical observation of points of interest related to social and economic characteristics. The walk carried out with a group of representatives from the Mutale smallholder irrigation schemes who explained relevant social and economic aspects of their irrigation schemes. During the walk, the physical observations regarding social and economic characteristics were noted. Some of noted physical observations regarding social and economic characteristics verified the information furnished on the questionnaire. Informal interviews with people encountered on the way also form part of primary data collected. In many cases, it was useful to have informal talks with plot holders which visited, or persons accompanying the walk to further dig into examples of how plot holder survived through smallholder irrigation scheme.

iii) Secondary data collection

For Secondary data collection, existing related documents was collected from some NGOs offices, government departments and ministries, academic or research institutions, journals and use of personal advantage to contact the scholars, researchers, and friends who have done their researches concerning these issues in order to get in-depth understanding about this study. The above related documents and information collected also served as guarding the information furnished by plot holders.

iv) Data analysis

Collected primary and certain secondary raw data were cleaned, captured using MS Excel statistical analysis Package 9.1 version (SAS 9.1) software (SAS Institute Inc. 2009) [21] and transcribed. The Procedure FREQ of SAS was used to generate simple frequency tables for variables of interest. Selected data were summarized in Excel Spread-sheet to develop figures. Descriptive analysis techniques were also used in the study to capture the perceptions of respondents mainly the qualitative data. The characterization of plot holders at the smallholder irrigation schemes were determined and compared.

3. Results and Discussion

The discussion in this study focused on household demography and socio-economic characteristics of plot holders in the study area, namely: household demography (plot holder's gender, marital status, position in the household and household size; age and age class; educational and skills status); socio-economic characteristics (employment status and occupational status; income class generated through farming; assets and income source and its classification outside irrigation scheme). Also included in the discussion is the extent to which farming households in the area are dependent on smallholder irrigation scheme. Information on plot holders characteristics and attributes for farming potential will influence the design and implementation of policies on farmer selection and development (Randela, *et al.*, 2006) [19].

3.1 Plot holder's demography

The demographic features of the Mutale smallholder irrigation schemes are explored in this section. This will provide an overview of the socio-economic characteristics of the irrigation scheme communities, highlighting the population strengths, opportunities, threats and weaknesses. The overview will also assist in identifying smallholder irrigation scheme issues influenced by demographic dimensions.

a) Plot holder's gender

The reason for analyzing gender was seeking answers to fundamental questions such as who are the main active participants in the smallholder irrigation farming practices at Mutale smallholder irrigation schemes. The results show that out of 170 plot holders on the Mutale smallholder irrigation schemes, (57.76%) of the plot holders were female and (42.24%) males (Figure 2). This percentage includes those females whose husbands are deceased, divorced or never married. The reason for female domination could be that most men work far away from their homes and women are the ones left at home to take care of the children and do farming. The involving of women's participation in the smallholder irrigation farming practices can reduce the men's burden of becoming the only sole source of income at the rural household. This also can alleviate poverty and grow the local economy of Mutale municipality, whereas according to Dinku, *et al.*, (2004) [3] Lack of women's access to rural economic resources mostly emanates from their exclusion, which was deep rooted in the

socio-economic, religious and cultural relations.

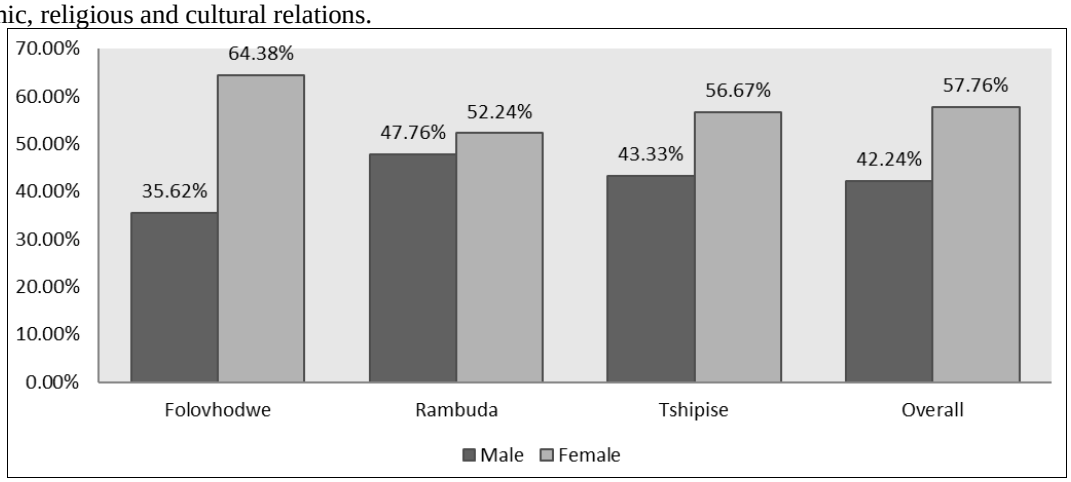

Fig 2: Plot holder's gender

b) Marital status: After overall plot holder's marital status was analyzed, more than (52.94%) of the respondents are married. The proportion of widow takes the second position (29.41%) followed by unmarried (14.71%) and unmarried (2.94%). But, Tshipise smallholder irrigation scheme shows that married plot holder were (36.67%) exceeded by widow, considered to be (53.33%) (Table 3). The results explain that the widow was previously married, and their husband had already passed on. The high proportion of married can bring positive impact on household's access to alternative income sources such as formal employment, social grants and additional household labour.

Table 3: Plot holder's marital status

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Plot holder 's marital status				
N	73	67	30	170
Married	57.53	55.22	36.67	52.94
Widow	20.55	28.36	53.33	29.41
Divorced	0.00	4.48	6.67	2.94
Unmarried	21.92	11.94	3.33	14.71

c) Position in the household

The plot holder's position in the household were analyzed and most plot which is farmed currently (72.04%) is utilized by head of the household (either men or women) (Figure 3). It may be pensioners, full-time plot holder (either men or women), widow or any member of the household who owns farming plot at the smallholder irrigation scheme. In a member of the household position, (27.96%) which is headed by member of the household refers to any member of the household who are farming at the smallholder irrigation scheme while the owner migrated home in search of off-farm employment in the big cities of South Africa. This could be explained by the fact that even if the men has migrated home in search of off-farm employment in the big cities of South Africa, the remaining as remained head of the household will make sure the family allocated plot will be utilized fully. Both the head of household and member of the household are still the person who led the family and make sure there is food on the table, even though the mobility of women, on the other hand, is quite limited (Ncube, 2014) [15].

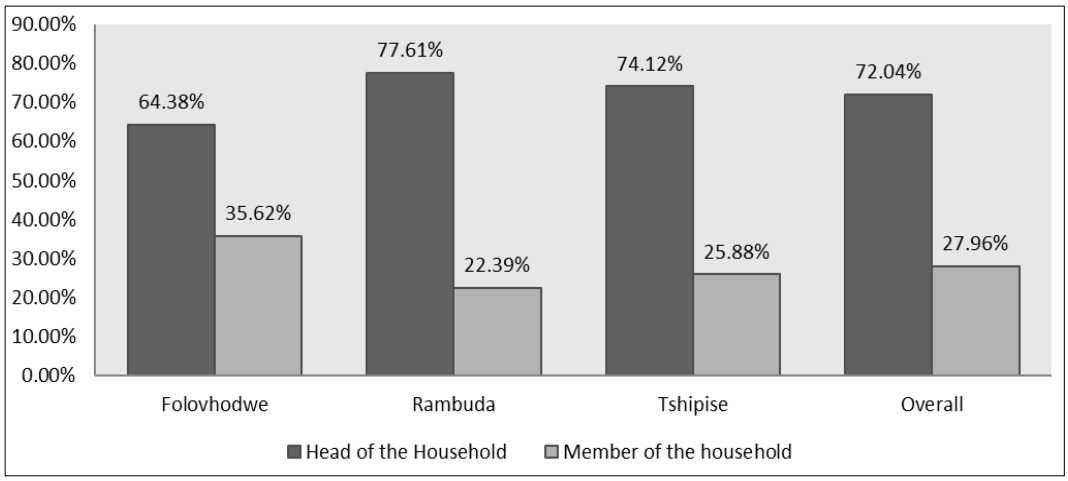

Fig 3: Plot holder's position in the household

d) Plot holders' household size

Agricultural production is influenced by the size of farming household. Larger households provide more farming labour resulting in increased production. Also, the quantity of resources demanded for household consumption increases with an increase in the number of people living in the household and this may result in less availability of resources for agricultural production (Tshikolomo, *et al.*, 2012a) [25].

Agricultural production in the smallholder irrigation scheme is inclined by the size of farming household. Table. 4 below shows that in Mutale irrigation scheme, small plot holder's household size has (60.26%) i.e. (1-5) members are the most followed by medium families (36.32%) i.e. (6-10) members and large families with more than (3.42%) i.e. (>11) members are few. The advantage of having more family members in the household is that, the household plot holders develop interest in farming in return they assist in laboring and reduce hiring costs during plating, weed eradication and other practices which needs labour. In supplement of the above, Nesamvuni, *et al.*, (2014) [17] indicated that agricultural production is influenced by the size of farming household. Larger households provide more farming labour resulting in increased production. In household with few people in the household, the plot holders will require labour for working at the irrigation scheme and this can lead to increased labour costs. The chance of increasing the local economy of Mutale local municipality is high, because small family which is more, few of their produce can be used at the household and most on making profit which can be used to buy other complementary goods and services for the family.

Table 4: Plot holders' household size

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Household size				
N	73	67	30	170
Small (1-5)	54.19	62.68	63.33	60.26
Medium (6-10)	42.46	29.85	36.67	36.32
Large (>11)	2.75	7.47	0	3.42

e) Plot holder age and Age class

The aim of examining the plot holders age was to determine the age groups of plot holder involved in farming practices at Mutale smallholder irrigation schemes. The research findings revealed plot holder's age as there were more pensioners plot-holders (48.00%) than middle aged plot-holders (43.00%) and less youth plot holders (9.00) in all smallholder irrigation scheme, as shown in Table 5. In contrary, at Folovhodwe and Rambuda, the middle age is more than in overall, may be this shows that lack of employment and retrenchment make people to see farming as an alternative way of poverty alleviation and source of income. The youth inclusion in farming at mutale smallholder irrigation schemes is viewed as low to worse, more-specially at Tshipise were there is no a single youth involved in farming. This indicates that successional farming plan in smallholder irrigation scheme is at risk and creation of employment through farming, reduce rural urban migration cannot easily meet at these smallholder irrigation scheme communities. The involvement of pensioners might indicate that they are still willing to work hard and provide for their families while they are old even though they might not be able to work for longer hours. The fact that there is this senior age group amongst household heads brings the advantages of experience and well developed networks in the community. Its drawback is the inability of older people to adopt and take up new technologies and skills quickly, compared to those in a younger age group (Ncube, 2014) [15].

Table 5: Plot holder age and Age class

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Plot holder age and Age class				
N	73	67	30	170
Youth age (18-35)	11.00	15.00	0.00	9.00
Middle age (36-59)	45.20	58.00	26.70	43.00
Pensioner (>60)	43.80	27.00	73.30	48.00

f) Plot holder's Educational levels

According to Ledwaba, (2013) [9], the levels of education results indicate that people with better qualifications have also started to see farming as an alternative. In support of the above, Mupaso, *at al.*, (2013) [13], indicate that plot holders with better qualifications have now started to see farming as an substitute for other income incurred from off-farm employment. The educational levels of farmers in the smallholder irrigation scheme shows that the level of most of the plot holder hold secondary qualification (30.59%), followed by those who never went to school (26.47%) and others constitute less than (10.00%) each (Table 6). Farmer's level of education has a direct impact on his/her ability to properly manage a given irrigation technology but lack of formal training in agriculture for most farmers could pose a limitation to their productivity.

Table 6: Plot holder's Education and skills

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Level of plot holder education				
N	73	67	30	170
Never went to school	28.77	16.42	43.33	26.47
ABET	1.37	16.42	10.00	8.82
Primary school	21.92	7.46	26.67	17.06
Secondary school	31.50	34.33	20.00	30.59
Post-matric certificate	8.22	17.90	0.00	10.59
Post matric diploma	2.74	4.48	0.00	2.94
University Degree	5.48	2.99	0.00	3.53

This factor makes it easy for other stakeholders to effect capacity building programmes for the irrigators without worrying about issues of illiteracy (Ndlovu, *et al.*, 2015) [16]. In supplement the above, education plays a key role in the household's decision to adopt technology, it creates awareness and encourages innovation and invention (Mengistie, *et al.*, 2016) [12].

g) Plot holder's Agricultural skills

Plot holder's Agricultural skills in this research refers to skill development trainings in agriculture or attending of courses meant for agricultural improvement in any of the different agricultural subsectors such as agricultural enterprise development, Natural agricultural resource management, crop and cultivar choice, Basic grain production, Basic vegetable production, soil tillage practices, crop and soil fertility management, irrigation and water management, crop protection and marketing. Out of all, the plot holder indicates that they have acquired skills in basic vegetable production, basic grain production, crop and soil fertilization management and Book keeping which part of enterprise development. Plot holder essential skills acquired, basic vegetable production is high (57.68%) as compared to basic grain production (18.28%), crop and Soil fertilization management (12.40%) and Book keeping (11.67%) (Figure 4). Farmers with more years of schooling in the Sekhukhune District of Limpopo Province had more use of hybrid seed technology, and this resulted in increased crop yield (Diale, 2011) [2]. This affirmed the findings by Ekoja (2004) [4] that the rate of adoption of new technology is positively related to the level of education. Educated farmers were able to read and understand the contents of the print media that is rich in technical information for the agricultural sector; hence they used hybrid seed technology more than their less schooled counterparts

According to the figures below, it is proper indicates that in the smallholder irrigation schemes plot holders prefer to plant vegetable most. This is showed through plot holder having acquired trainings skills in abundant, followed by basic grain production because currently some plot holder start to plant gain out of season e.g. maize and Dry beans planted in winter because the climate conditions allows. The reason for planting off-season may be that the product demand is high and plot holder determine the price of the product because is scarce at the market. But in overall there is shortage of agricultural skills transfer to plot holder to produce up to optimum production in the mutale smallholder irrigation schemes. FAO, (2000) [6] shows the importance of acquiring agricultural skills so that the irrigators can search for marketing information and develop cropping programmes which fit the market.

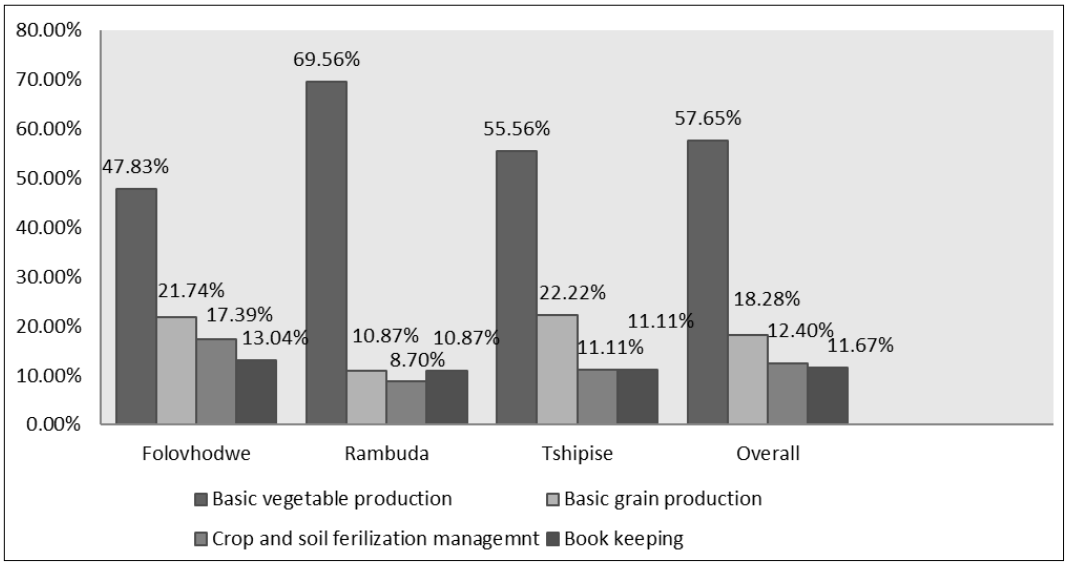

Fig 4: Plot holder's Agricultural skills

3.2 Socio-economic characteristics of the plot holders.

The purpose of examining socio-economic characteristics of the household plot holders is to provide an updated socio-economic profile and determine whether the smallholder irrigation schemes utilization add value to the plot holder's household. This will provide an overview of the current living standard of community resides within Mutale smallholder irrigation schemes. This will allow to

identifying the comparative advantages, the vulnerability and the welfare of the community resides within Mutale smallholder irrigation schemes.

a) Plot holder's employment and occupational status

Plot holder's employment and occupational status was to determine whether farmers were employed, and if that was the case to find if it was part-time or full-time. Household food security cannot be attained without income. Household income is correlated to food security and poverty alleviation because income is used in procurement of food, procurement of inputs and infrastructure for production of food crops. The outcomes show that at Mutale smallholder irrigation schemes (80.00%) farm full-time whereas only (20.00%) farm as part-time farmers (Table 7). In support of the above, Mupaso, *et al.,* (2014) [13], confirms that the introduction of irrigation schemes in the area had contributed to employment creation for both the beneficiaries and non-beneficiaries as well. The study also focuses on whether there was any source of earning to supplement farming income. The finding outcome shows that (49.41%) are unemployed followed by (40.59%) who are pensioners, those who owns business are (4.71%), formally employed are (4.11%) and who work as administrators (clerks) are (1.18%) (Table 7). This displays that farming does generate employment, especially to the unemployed and serve as their source of livelihood. It is also an alternative employment to females who remain at home while their husbands are looking for employment in cities and other groups who were previously employed.

Table 7: Plot holder's employment status

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Plot holder's farming Status				
N	73	67	30	170
Full time Farmer	95.89	58.21	90.00	80.00
Part time Farmer	4.11	41.79	10.00	20.00
Plot holder occupational status				
N	73	67	30	170
Unemployed	52.06	40.30	23.33	49.41
own business	2.74	11.94	0.00	4.71
Worker (clerk)	2.74	0.00	0.00	1.18
Pensioner	41.09	40.30	70.00	40.59
Formally Employed	1.37	7.46	6.67	4.11

b) Plot holder's Income class generated through farming

According to Mango, *et al.,* (2018) [10], the adoption of small-scale irrigation farming was found to have a significant positive impact (at a 5% level) on agricultural income. This could be because farmers who use small-scale irrigation farming can intensify and diversify their agricultural activities, which increases their production. Smallholder irrigation Scheme households would afford technologies and production inputs and would unlikely become successful farming entrepreneurs if plot holders don't make profit. This section was to determine whether there was any income received by plot holders (Rand per annum). The distribution of income class generated through farming in households specified as (70.58%) make profit of < R5000 per annum where those who profit between R5000 – R14999.99 are (28.24%), followed by (1.18%) who make R15000-R24999.99 and plot holder make > R24999.99 profit (Table 8). The income class generated through farming at Folovhodwe, Rambuda and Tshipise smallholder irrigation scheme are varied. In affirming to the above statement, Mutambara, *et al.,* (2014) [14] indicated that income level of the farmers suggests that the farmers may not be able to make meaningful investments into their schemes to boost their productivity neither can they be able to absorb any natural or economic shock that may affect the scheme.

In the issue of any other form of income derived apart from farming, this demonstrates the importance of income derived apart from farming contributing to household's livelihood. Though this does not imply that income from irrigation scheme is always negative, it shows that most households are engaged in other income source activities like include social grants (pensions, and child grants), formal jobs and piece jobs to supplement a Mutale smallholder irrigation schemes income for their household.

According to Nesamvuni, *et al.,* (2014) [17], there is a negative relationship between non-farm income and smallholder irrigation scheme production. Nesamvuni, *et al.,* (2014) [17], further indicates that this might be true, considering the fact that an increase in non-farm income may decrease household's dependence on farming and this would then lead to a decreased participation in farm production practices.

At Mutale smallholder irrigation schemes, the other form of income derived apart from farming in the study area are led by Social grant receiver (58.82%), followed by those who have temporary employment (18.23%) Permanent employment e.g. Educator (15.89%) and lastly Self-employed e.g. Taxi owner (7.06%). With the reported the size of households (Table 4), who use social grant as other form of income derived apart from farming, members of these families were likely to be of pensionable age while others could still be young children, both of which might qualify for some social grant. The receipt of the social grants by the farming households in the study area may sometimes serve as a discouragement to farming in the smallholder irrigation schemes. The temporary employment also contributes besides smallholder irrigation schemes to the household of the plot holders.

The numbers above indicate that the Mutale Smallholder Irrigation Scheme plot holders are hugely dependent to social grant, self –employed as any other form of income derived apart from farming. The number of temporary employment as compared to the permanent employed reveals that they may be not freely supplement the production practices in the smallholder irrigation schemes because they are permanent employed, they have no enough time as they are mostly committed to work duties.

Table 8: Plot holder's income

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Income class generated through farming (Rand per annum)				
N	73	67	30	170
< 5000	82.19	44.78	100.00	70.58
5000 – 14999.99	16.44	53.73	0.00	28.24
15000 – 24999.99	1.37	1.49	0.00	1.18
25000 – 34999.99	0.00	0.00	0.00	0.00
35000 – 44999.99	0.00	0.00	0.00	0.00
>50 000.00	0.00	0.00	0.00	0.00
Any other form of income derived apart from farming				
N	73	67	30	170
Social grant	61.69	50.75	70.00	58.82
Self-employed e.g. Taxi owner	4.10	8.95	10.00	7.06
Temporary employment	23.25	16.42	10.00	18.23
Permanent employment e.g. Educator	10.96	23.88	10.00	15.89

c) Plot holder's income source and its classification outside irrigation scheme

The Plot holder's income source and its classification outside irrigation scheme at Mutale smallholder irrigation scheme are diverse, it includes main economic provider of the house hold, Any other form of income derived apart from farming and income class of any other form of income derived apart from farming. The reasons for ranking various plot holders' income source and its classification outside irrigation scheme sources indicate understanding to the contribution of income type to the livelihood of the households. The income source of the household serves as a remunerative income from work done by main economic provider of the house. The economic provided also grow its contribution to the livelihood of the household and also to farming in particular. Household income is a strong determinant of the access and use of agricultural resources (Tshikolomo, *et al.,* 2012a) [25]. At Mutale smallholder irrigation schemes, the main economic provider of the household in the study area is husband represent (41.18%), followed by spouse (28.23%), then Son/daughter (19.41%), Relatives in the household (6.48%) and Relatives somewhere else (4.70%), but contrary to overall at Rambuda smallholder Irrigation Scheme the Son/Daughter contribute (23.89%) which is more than spouse (20.89%) (Table 9).

The success of any agribusiness enterprise needs finance to make turnover, as this determines the enterprise's ability to access important resources such as production inputs. High level of household income is a solid element of success in smallholder irrigation schemes. In similarity of the above, households with low incomes, the costs of inputs may impede adoption of new technologies (Hassan and Karanja, 1997; Mazuze, 2004) [7, 11]. In this section the study explores household class who get any other form of income derived apart from farming per month. The highest earner but still involved in farming are earn between R60000 – R74999.99 and are only (0.59%), followed by (2.94%) who earn between R45000 – R59999.99, (14.11%) who earn between R30000 – R44999.99, (15.30%) who earn between R15000 -R29999.99 and (67.06%) who are the less earner <R15000 and their high number in involved in the Smallholder Irrigation Scheme practices (Table 9).

Table 9: Plot holder's income source and its classification outside irrigation scheme.

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Main economic provider of the house hold				
N	73	67	30	170
Husband	36.99	44.78	43.33	41.18
Spouse	32.88	20.89	33.33	28.23
Son/Daughter	17.81	23.89	13.33	19.41
Relatives in the household	8.22	4.47	6.67	6.48
Relatives somewhere else	4.10	5.97	3.34	4.70
Income class of any other form of income derived apart from farming per Month				
N	73	67	30	170
<15000	76.71	50.74	80.00	67.06
15000 -29999.99	13.70	17.91	13.34	15.30
30000 – 44999.99	6.85	26.87	3.33	14.11
45000 – 59999.99	2.74	4.48	0.00	2.94
60000 – 74999.99	0.00	0.00	3.33	0.59
>75000	0.00	0.00	0.00	0.00

d) Plot holder assets

One proxy measure of wealth status that is used to differentiate households is the number and types of assets owned (Ncube, 2014) [15]. The section tries to examine whether the plot holder can afford to have simple assets like livestock, vehicle and house The study outcomes shows that, Mutale smallholder irrigation scheme on the availability of simple assets shows that most of the plot holders have livestock (53.53%), followed by house (34.12%) and least vehicle (12.35%) (Table 10). Cattle are used as draft power for tilling and cultivating the fields, and also assumed that there would be a relationship between cattle ownership and full utilization of irrigation plots (Mutambara, *et al.*, 2014) [14]. Owning a house means provision of shelter to the household whereas having a vehicle in this situation provides the liberation, suitability and elasticity for plot holders either to transport inputs or their produce to various markets. As concurred to the above findings ZimVac, (2012) [27] indicates that the majority of plot holder households generally owned most of the livestock asset. The importance of livestock asset is that (a) they provide kraal manure which supplement inorganic fertilizer in the smallholder irrigation schemes, (b) they were used as animal draft before and (c) they are also used as another source of plot holders' household income, and livestock are vital as an investment or as a form of savings to deep rural farmers.

Mupaso, *et al.*, (2013) [13] indicate that improvement of the farmers' livelihoods was measured in terms of the farm implements, livestock and household assets, which were bought using returns from irrigated farming. In dissimilarity to the above, (58.24%) of Mutale smallholder irrigation scheme assets are bought or build using the money outside from farming whereas 41.76% of the above assets are bought or build using the money generated from farming. Lack of enough money to buy assets by plot holders ideally means high production costs as plot holders are then forced to hire and further compromise the profitability of their farming activities.

Table 10: Plot holder's assets

Irrigation schemes				
Variable	**Folovhodwe SIS %**	**Rambuda SIS %**	**Tshipise SIS %**	**Overall SIS %**
Assets owned by plot holder				
N	73	67	30	170
Livestock	61.65	37.32	70.00	53.53
Vehicle	5.48	22.39	6.67	12.35
House	32.87	40.29	23.33	34.12
Assets bought using money generated from farming or not				
N	73	67	30	170
Yes	53.43	28.36	43.33	41.76
No	46.57	71.64	56.67	58.24

4. Conclusion and Recommendations

a) Conclusion

In conclusion, the study showed that the households of small-holder irrigation schemes in Mutale was characterized by diversity and similarities attributed to different condition and among them, namely (a) plot holder's gender, (b) marital status, (c) position in the household and household size; (d) age and age class; (e) educational and skills status; (f) employment and occupational status; (g) income class generated through farming; (h) income source and its classification outside irrigation scheme and assets.

In all Mutale smallholder irrigation schemes production was affected by the fact that most plot holders were females, who are loaded by other complicated responsibilities like taking care for the children, the old granny and other domestic works which dedicate restricted time to farming. The youth were only involved to a lesser extent further jeopardizing the productivity of Mutale smallholder irrigation schemes.

Plot holders with better qualifications and skills have now started to see smallholder irrigation scheme as an alternative means of living. This confirms that the introduction of smallholder irrigation schemes in the area had contributed to employment creation for both the beneficiaries and non-beneficiaries as well. The returns types received by the plot holders are quite different; irrigation income is the most important followed by social grants that consist of pensions and child-care grants and employment which consist of self-employed, temporary and permanent employment. The uses of the incomes received by Mutale smallholder irrigation scheme plot holders include food security and poverty alleviation. This indicates that farming does generate employment, especially to the unemployed and serve as their source of livelihood. It is also an alternative employment to females who remain at home while their husbands are looking for employment in cities and other groups who were previously employed. Lastly, Lack of enough money to buy assets by plot holders ideally means high production costs as plot holders are then forced to hire and further compromised the profitability of their farming activities.

b) Recommendations

The study also recommends that agriculture as the rural nature of the Mutale local municipality can creates the potential for future growth of the agricultural sector if considered. Mutale local municipality and agricultural department can encourage the member of the household more-especially young ones to always assist in the farming as this would help (a) to develop interest in farming, (b) increase number of youth involved in farming for better successional plan, and (c) reduce the costs of labouring in order to increase profit. Lastly, plot holders are also encouraged to diversify as the importance of livestock asset is that (a) they provide kraal manure which supplement inorganic fertilizer in the smallholder irrigation schemes, (b) also used as another source of plot holders' household income, and livestock are vital as an investment or as a form of savings to deep rural areas.

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