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Irrigation Schemes and Poverty Reduction in Zimbabwe the Case of Musena Irrigation in Chirumanzu District, Zimbabwe

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Abstract:
The study assessed the impact of irrigation schemes on reducing poverty in Chirumanzu District. The research gives a comprehensive assessment of the efficacy of irrigation farming on poverty alleviation. Irrigation is a panacea to rainfall variability. This follows extreme weather conditions which have affected Sub Saharan Africa over the past decade. The research approach encompasses mixed methods. Out of a population of 116 farmers a sample of 35 was randomly selected. Data collection were administered through researcher administered questionnaires, focus group discussions, key informant interviews and observation. Furthermore, secondary data were acquired through document analysis. The study presents tables and graphs, through the use of Ms excel. The researcher established that Musena irrigation scheme has reduced vulnerability of farmers and enhanced livelihood outcomes. In the face of challenges which include pests and diseases, lack of financial and human capital. Thus, it can be concluded that irrigation farming has the potential to increase, crop yield and inherently reducing poverty. The study recommends increased capitalisation to farmers and more investment by the government in irrigation, research and extension services.

Keywords: *Irrigation, poverty, livelihood, agriculture*

1. Introduction

The research was conducted in, ward 19, Chirumanzu district of Midlands Province. Which lies 60km north east of Mvuma growth centre. Chirumanzu district borders with Mashonaland West to the north, Mashonaland East to the east, Masvingo Province to the south and Gweru district to the west. The district has an area extent of 45, 911, 496 square kilometres (Madebwe and Madebwe, 2005). According to the 2012 census, Chirumanzu district has a total of 80, 351 people (ZIMSTAT, 2012) with a growth rate of 1.1% per annum. The area's topography is gently undulating with sandy loam soils making it ideal for agriculture. Altitude ranges between 1100 - 1200 metres. The communal area shares common boundaries with commercial farms. The area falls under agro-ecological region 3 thus it is semi-intensive farming area. Where the mean annual rainfall is 650mm, temperature ranges between 12-28˚C. (Geographical Location and Statistical Data, 2016).

1.1. Aim of the Study

To assess the effectiveness of Musena irrigation scheme on poverty alleviation in Chirumanzi district.

1.2. Objectives of the Study

- To identify the constraints farmers face in irrigation farming.
- To assess the contribution of the irrigation scheme in improving farmers livelihood outcomes.
- To examine the impact of the irrigation scheme on poverty reduction.

2. Literature Review

2.1. Irrigation

Mutsvangwa and Doranalli (2006) characterized irrigation systems as the development of land through the simulated use of water to guarantee two-fold cropping and also enduring supply of water in territories where precipitation is inconsistent. Irrigation water guarantees water supply thus limits water shortfall. Insufficient water supply is a constraining element in plant development (Makadho, 1997). Thus, irrigation is by and large fundamental to plant development. Irrigation has extended fundamentally in the course of recent decades. World watered ranges have practically multiplied from 139 million hectares in the 1961 to more than 273 million hectares in 2001. There has been a significant growth of irrigation farming in Asia, mainly India, China and Pakistan (IWMI, 2000). Whilst interest in large scale channel irrigation has diminished since the 1970s, overhead sprinkler irrigation has expanded essentially amid the 1980s and 1990s (Dittoh, 1997).

2.2. Irrigation Development

Punnet (1982) contended that irrigation has been utilised for quite a long time the world over it began with conventional strategies for example the Shaduf in the ancient city that provided water for cultivating crops along the Nile River in Egypt. Irrigation development is an attempt to ensure constant water, keeping in mind the end goal to accomplish an exclusive expectation of consistent cropping. It is common in semi-arid regions were precipitation is low, whilst in some cases it is used as a coping strategy during seasonal variation of water. Thus, irrigation development guarantees stable agricultural production (FAO, 1997). According to Turra et al (2010) though irrigation began many centuries ago, serious and genuine irrigation endeavours started fifty years ago. Between the 1960s and the year 1980, in Sub Saharan Africa around 19,000 hectares was under irrigation. By 2007 the zone under irrigation had extended to 33,800 hectares.

Public interest in irrigation development started under the American regime with the foundation of an Irrigation Division in the Bureau of Public Works in 1908. This division specifically developed and administered 12 irrigation systems in Central Luzon, Ilocos, and the Panay Island in Western Visayas by the late 1920's (FAOSTAT, 2010). The public participation in irrigation development continued to gain momentum, through small scale irrigation development in 1930's and 1940's. During the Second World War, they were stagnation in all forms of development. It was only after the war that significant open support for irrigation system was resumed. This witnessed the restoration of irrigation systems in the 1950's. Thus, common primary irrigation projects in Mindanao and other new regions expanded (Turra et al, 2010). In 1964 the United States of America fortified institutional support for irrigation improvement, this resulted in the formation of the National Irrigation Administration (NIA) an open enterprise set up of the previous Irrigation Division which gave resources and monetary adaptability to farmers. The NIA was connected to the Department of Public Works and Highways, thus the board incorporated the Secretary of Agriculture to guarantee the coordination of irrigation system with other horticultural projects (FAOSTAT, 2000).

Irrigation cultivating assumes a critical part in sustenance creation and nourishment security on the planet today. Around 30% of the world's food production originates from arable land developed under irrigation (FAOSTAT, 1997). There are wide varieties in the extent of irrigated agrarian land in the developing world, with 37% in Asia, 15% in Latin America, 6% in Africa and 4% in Sub-Saharan Africa (FAOSTAT, 2010). It is contended that Africa's poverty levels can be attributed to poor irrigation systems. It is assessed that irrigated agribusiness in West Africa constitutes just 3% of the estimation of all harvest generation. This is despite the fact that 70% of rural livelihoods are based on agriculture, Thus the potential for agriculture to lead to socio-economic transformation is limited. (Dittoh, 1997).

It is widely agreed by many scholars that the Green Revolution in Asia would not have been successful without rapid developments in irrigation systems (Lipton et al, 2003). There is a need to organize irrigation improvement in Africa not just on account of the presence of farming water assets. But also on the efficient and effectiveness of the irrigation methods. This calls for improved water harvesting techniques. Thus, expanding the number of households that can benefit from irrigation farming.

Numerous nations in Southern Africa, Zimbabwe included, have understood the vital part of irrigation in national development. Nourishment creation, and irrigation ventures have expanded tremendously in the region. You et al. (2010) reported that the normal rate of development of irrigated zone in the course of recent years was 2.3% in Africa. The total irrigated land in Africa is assessed to be around 12.2 million hectares and six nations, to be specific Egypt, Madagascar, Morocco, Nigeria, South Africa and Sudan represent almost 75% of this aggregate flooded land (FAOSTAT, 2012). Notwithstanding some remarkable irrigation extension, the formative effect of irrigation in Africa has been constrained and beneath desires (García-Bolanos et al, 2011).

2.3. Irrigation Farming as a Livelihood Strategy

According to FAO (2000) yields per zone, for most harvests have expanded between 100 to 400% due to irrigation system. This has contributed to a decrease in food costs. For instance, the region under irrigation system in India expanded by 30% between 1970–1985, from 31.1 million hectares to 41.8 million hectares, while food grain costs fell by 20% with respect to the value file for all items. These diminishments positively affect livelihoods of the urban and rural poor. Irrigation and production systems development is a vital component to growing high value cash crops. This ensure reliable crop output, thus ensuring sustainable livelihood development. Casual labour on farmers also ensures income to communities leading to poverty reduction. As indicated by FAO (2016) irrigation has placed hope to households with many individuals in semi-arid and arid areas realising output from their fields. In a study in Masvingo Chitongo (2013:646) indicated that "crop production is viable under irrigation hence the need for institutionalisation of small dams as water reservoir's". In Egypt, 80% of the food originates from irrigated grounds (FAO, 1997). It has made higher and more reliable yield conceivable, as products can be planted more than once in a year inside the tropics.

The focus of irrigation as a development tool in developing countries. Has initiated a lot of debate. It has been suggested as a poverty alleviation procedure (Abdulai and Delgado, 1995). In many parts of sub-Saharan Africa, expanded agriculture production constitutes a standout amongst the most vital routes towards poverty diminishment, and interest in irrigation development can be a springboard for financial advancement and poverty reduction. Thus, irrigation has to be introduced to unlock development (Chitongo, 2013). For example, China's rural poverty tumbled from 31.6% in 1978 to 2.3% in 2006 through farming (NBSC, 2006). Ventures in irrigation infrastructure constitutes an imperative poverty reducing system since it would help farming efficiency by decreasing the dangers related with inadequate rainfall.

As an on-farm livelihood strategy, irrigation water is a fundamental resource for crop production (Haile, 2008). As a production input to farming, irrigation water increases crop output. Thus, leading to socio economic transformation. This plays a great part in poverty alleviation. Irrigation can likewise turn into a socio economic awful when it prompts issues, for example, waterborne diseases and land degradation including waterlogging and salinity, water contamination and related demolition of living creatures and regular natural

thus negative externalities related with irrigation (Hasnip, 2001). The poor populace, have a dilemma on their survival. In some cases, they have restricted assets that are unable to embrace preventive or protective measures against negative externalities of irrigation.

2.4. Impacts of Irrigation Schemes on Poverty Reduction

Irrigation schemes have turned out to be a practical and appealing alternative for rural people who engage in agricultural activities in developing countries (Burrow, 1987). He asserted that profits from irrigated cultivating even on small plots significantly surpass those from rain-sustained generation. In numerous developing nations, irrigation schemes have led to expanded production. Thus, increasing food security and alleviating rural poverty. Gor Cornist (1999) expressed that irrigation schemes have been found to be fundamentally essential for income generating projects. In addition, it empowers agriculturists to acquire a wage which empowers them to meet some of their fundamental needs as indicated by Kundlande et al (1994) livelihood outcomes generated from irrigated farms creates a sustainable safety net in rural areas. Thus, justifies governments to invest more. In Zimbabwe agriculture and sound irrigation infrastructure in particular has led to development of farming towns such as Marondera in Mashonaland province (Chitongo, 2013). Irrigation improvements have made it feasible for other infrastructure development to be created in regions which could some way or another have stayed without streets, phones, schools and health facilities. As indicated by Webb (1991), in Chenje et al, (1998) in the investigation of irrigation in Chakuda Town in Gambia, water system development has brought about a multiplier effect resulting in more services. Thus, expanded income that was converted into expanded use, venture and exchange. Moreover, irrigated farming is a fundamental segment of any technique to increment worldwide sustenance supply. It brought about lower sustenance costs, higher business and a quicker agrarian and economic advancement. Chitsiko (1999) additionally contends that irrigation schemes are essential in expanding government arrangement of decreasing rural to urban movement.

2.5. Impact of Irrigation to Household Food Security

In numerous drought inclined countries, there has been an idealistic view seeing irrigation system advancement as a methodology to manage agricultural production and guarantee food security. Subsequently, national policies are strongly concerned in irrigation management as a strategy for ensuring food security. In such manner, Leahi (1988) argues that for nations with arid and semi-arid climates, the only hope to reduce vulnerability lies in unequivocally in investing in irrigation as a prime contender to bolster future food techniques in the medium and long term. Also, Dessalegn (1999) recommends that, where rainfall is deficient and inconsistent, rain-sustained farming cannot completely bolster food production. Thus, the need to venture on water management plans which help to increase agricultural production and advance food security.

The requirement for irrigation system advancement in drought inclined districts is additionally advanced by numerous international improvement associations. For example, IFAD (1985) demonstrated that small scale irrigation schemes would settle agricultural production structure and guarantee food supply even in years with insufficient rainfall and increment the general level of harvest production in years with normal precipitation. Irrigation farming boosts production with double or various cropping, taking full favourable circumstances of modern technologies and high yielding product assortments. Besides, it gives farmers a chance to cultivate high value crops like beans, potatoes and other products that require year-round and liberal supply of water to cultivate.

The magnitude of research and extension services of irrigation cultivating in many African and Asian nations by and large demonstrate that irrigation farming has greater impact on household income, food security, dietary status and way of life than rain-fed farming. For example, in India Sing and Misra (1960) looked at the Sarda trench water system and non-inundating towns and mentioned the accompanying objective fact that production increased with the inception of irrigation. FAO (2012) additionally detailed that farmers' incomes from irrigated agriculture are essentially higher than wages from non-irrigated agriculturists.

2.6. Challenges Affecting Irrigation Farming

Rukuni et al (2006) express that various issues have happened to irrigation schemes, for example, poor marketing activities, restricted access to water, failure to meet operational expenses because of poor charge structures, money related practicality and poor supervision. Gyasi et al (2006) further express that in numerous nations, institutional shortcomings and execution wasteful aspects of public irrigation offices have prompted high expenses of improvement and operation of irrigation schemes. Thus, poor governance in the form of poor upkeep and absence of viable control over irrigation systems have brought about the downfall of numerous irrigation systems.

The FAO (1997) report recognized various limitations in irrigation schemes in Zimbabwe. These are absence of suitable irrigation technology for the farmers, deficiency of human resources at expert and agriculturist levels, poor catchment administration and absence of decentralized irrigation service.

3. Methodology

The study applied both experimental design and contextual analysis. The experimental design looked at the net incremental benefit. Between before irrigation infrastructure and after the irrigation was established. Whilst the content analysis looked at the qualitative data captured from the questionnaires, key informant interviews (KIIs) and focus group discussions (FGDs). Thus, the qualitative analysis examined the vulnerability status before irrigation scheme, emphasising on how households in Chirumanzu have improved their food security through irrigation farming. In the process examining the challenges encountered in order to recommend ways to enhance efficiency and effectiveness. Purposive sampling was done on 3 key informants a local authority member, agricultural, research and extension officer (AREX) and a traditional leader. Furthermore, the researcher used observation to validate data. The justification being that this method has the capacity to acquire unwavering answers to justify what would have been collected from the

qualitative approach (Bhattacharjee, 2012). Out of a population of 106 farmers the researcher randomly selected a sample of 35 farmers which is approximately 30% (Best and Khan 1993). Quantitative data were presented as graphs and tables using Ms Excel 2013.

4. Results and Discussion of Findings

The majority of respondents were females. Chenje et al (1998) affirmed that agriculture in communal regions is essentially a female obligation as men are worried with off farm duties, they often migrate to urban areas in search of greener pastures. In Musena irrigation scheme, 64% of irrigation farmers do not have a farming qualification. Human capital is fundamental particularly with regards to farming knowledge were new technologies that are convoluted are used. Furthermore, education is critical as educated farmers are more resilient to shocks and trends, than the less educated.

4.1. Contribution of Musena Irrigation Schemes to Livelihood Development

All the irrigation farmers noted that their crop yields increased after the inception of irrigation. Chenje et al (1998:16) highlighted that "The most successful small-scale irrigation schemes have been able to churn out all year-round incomes for the farmers." Increased yields have inherently led to increased income. This has subsequently improved the standard of living of beneficiaries. Figure 1 below shows expenditure patterns of farmers.

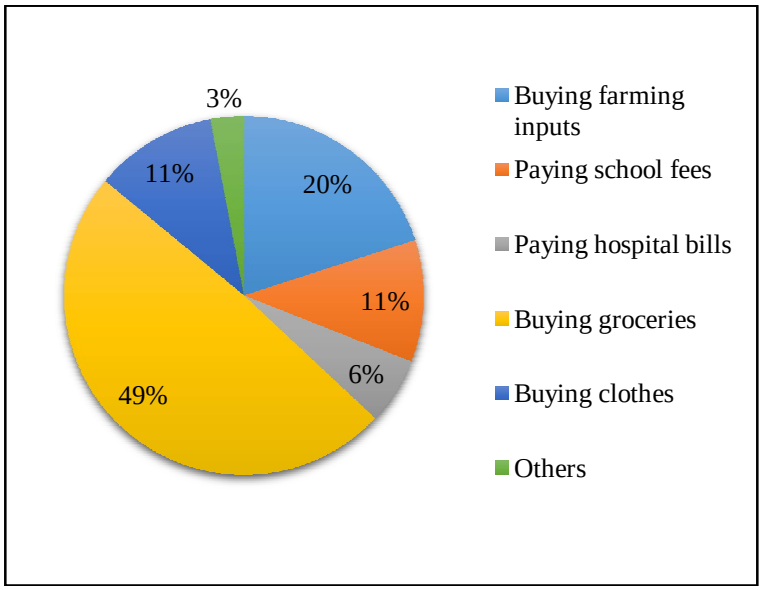

Figure 1: Expenditure of income of respondents
Source: (Field Survey, 2016)

Food security has been enhanced this is reflected by 49% of respondents who indicated that they use income generated from irrigation farming to buy groceries. However, an AREX officer noted that:

- The farmer's income is sometimes affected when the market is flooded. This causes a reduction in market values

Thus, market prices are fundamental to the sustainability of agriculture.

4.2. Asset Ownership

Irrigation scheme beneficiaries have managed to purchase both farming and household assets, such as spike harrows, scotch carts and livestock. However only 6% of respondents managed to acquire motorised vehicles. This shows that the income generated is only sufficient for food security. Thus, surplus accrued is not sufficient for luxury expenses. This concurs to findings by Chazovachii (2012) who noted that irrigation farming improves food security but rarely is sufficient to decrease the poverty severity index. Therefore, in order to reduce poverty, other livelihood diversification strategies should be adopted.

4.3. Challenges in Irrigation Farming

Irrigation farming remains a challenge in developing countries (Mujere et al, 2010). In Musena irrigation scheme, financial capital is the major constraint faced by farmers. Moreover, marketing has also affected profitability. Chazovachii (2016:106) in a research on conditions influencing the sustainability of smallholder irrigation schemes in Masvingo, noted that "In all the irrigation schemes eighty percent of smallholder irrigation farmers revealed that they did not have access to lucrative markets. Moreover, they were resource constrained, especially regarding input supplies and financial capital needed for their operations. This limited the competitive potential of the farmers." Figure 2 below summarises the challenges encountered.

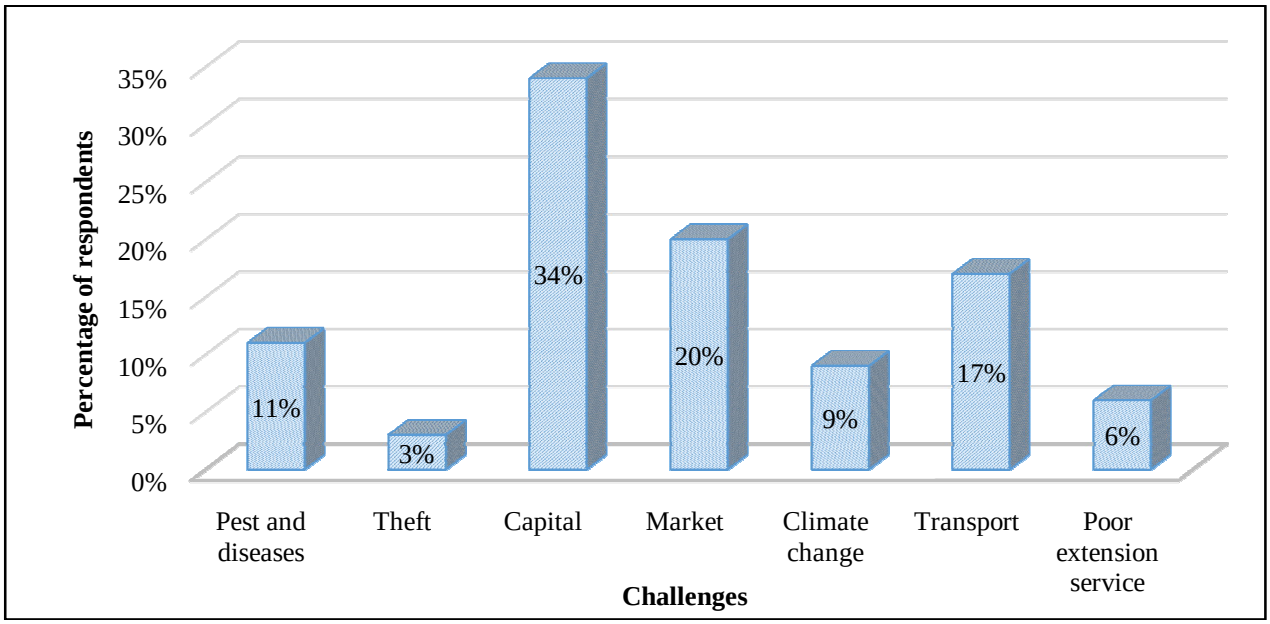

Figure 2: Constraints farmers face in irrigation farming
Source: (Field Survey, 2016)

4.4. Financial Capital

Farming is a capital-intensive venture. It is essential for the purchasing of certified seeds, chemicals, farming machinery and fertilizers. Failure to acquire inputs in time and in the right quantities result in poor yields.

- Irrigation farmers had problems in securing capital to buy inputs such as seeds, fertilizers and chemicals. Due to such problems farmers end up using unspecified organic fertilizers. This results in poor yields thus threatening the efficiency and sustainability of the irrigation scheme.

Remarked a traditional leader

4.5. Marketing

A poor marketing strategy affects agricultural productivity. In a FGD one farmer outlined that:

- Transport cost is high we sell our products in Masvingo which is 100kms away or Gweru which is 76kms away. This reduces our profit margins.

Furthermore, a Chirumanzu Rural District Council (CRDC) representative recommend that:

- There is need for government subsidies for the benefit of the farmers with regards to market price. As an incentive to boast production. He further noted that:
- Although we seek markets for the irrigation farmers from nearby boarding schools, Chicken Inn and Chicken Slice, it still falls short of the required volumes produced.

4.6. Pests and Diseases

Production has been affected by outbreaks of pests and diseases. Crops are affected by maize stalk borer, caterpillars, locusts, grain weevil, corn root worm, bean steam maggot. According to an AREX officer:

- Maize stalk borer reduces crop quality, locusts reduces photosynthesis, caterpillars reduces transportation of minerals and water and on beans fungi causes bacterial blight

However, irrigation schemes have also further detrimental impacts on the environment beyond the cop production phase. Water loss through unproductive evaporation, seepage and percolation, possibly inducing problems of waterlogging and salinization have been found to be important potentially negative consequences of irrigation. The biggest negative impact is via water-related diseases, especially malaria. For example, when the Karnataka Irrigation Project was approved in 1978, the river valley was malaria free, yet owing to massive vegetation which choked drainage canals, and seepage that caused pools of standing water malaria returned (Jones, 1995).

4.7. Poor Extension Services

There is poor agriculture and research extension services in Musena irrigation due to limited financial support by the government. An AREX officer acknowledged that:

- We offer some trainings here and there about soil sampling, pest control methods, land preparation and use of agriculture machinery. But we are having challenges on transport to visit farmers frequently as we have to walk long distances. In the case of Musena irrigation scheme the problem is exercabeted by poor road infrastructure. There is only form of transport a

bus: "unotomira kuti bus rigosimuka 4:00pm zuva rese unozoswera wakangogara basa rakamira zvinoita kuti tisanyanyoendeko" translated to: The one bus available travels arrive at the irrigation scheme at 10:00 am and will come back to collect us around 4:00 pm, hence it is not worth to spend the whole day waiting for the bus at the expense of other duties.

Training of irrigation farmers is a crucial tool required particularly in the utilization of technology in irrigation schemes (Ellis and Biggs, 2001). The major objective of irrigation is to produce optimum economic returns through increased productivity by maximizing water use efficiency while reducing irrigation costs (Heerman et al. 1990). Thus, Martn et al (1990) posit that, successful irrigation depends on the proper understanding of irrigation scheduling principles and the development and utilization of appropriate management plans.

4.8. Impacts of Irrigation Schemes on Poverty Reduction

4.8.1. Impact on Food Security

Households have become more food secure, due to irrigation. There has been a diversity of crops grow such as beans, maize and potatoes. The farmers are now able to produce surplus, thus even the number of meals per day have also increased. This is supported by Nhundu (2010) who argues that irrigation aids household safety net during extreme weather conditions such as drought. Thus, the majority can now afford three or more meals per day. Figure 3-5 below show quality of crops grown.



Figure 3: Beans *Figure 4: Potatoes* *Figure 5: Maize*

Figure 3-5 Quality of crops grown
Source: (Field Survey: 2016)

All the 3 Figures show that the crops grown are of good quality. The income generated is used for other off-farm or non-farm livelihood strategies. As noted by a participant in a FGDs:

- After selling our produces some female participants' have formed a savings account called (Chirumanzu Zibagwe Women's Bank), these savings help in assets and inputs purchases.

4.8.2. Impact on Yields

Crop yield	Before (tons/ha)	After (tons/ha)
Maize	1-2	10-16
Sugar beans	1	3-4
Wheat	0	6-8
Potatoes	6-8	20-30

Table 1: Impact on crop yields
Source: (Field Survey, 2016)

According to an AREX officer:

Yields per hectare of all crops grown has increased.

This is attributed to reliable water sources however production has been affected by the challenges that have been outlined in this research. This concurs to findings by Mutambara and Munodawafa (2014:88) who noted that "many irrigation schemes are facing sustainability challenges which have left some of them in a state of disrepair or operating below their design capacity despite the critical value for food security, stabilisation of agricultural production, employment creation and poverty alleviation." However, it should be noted that irrigation mitigates the effects of drought, which is the number one environmental factor reducing yields. In addition, irrigation results in more consistent yields which allow for better economic planning particularly with regards to an ever-increasing population.

5. Conclusion

The study revealed that irrigation farming at Musena has increased food security and improved livelihood outcomes of beneficiaries. Farmers are now able to grow various crops such as sugar beans, wheat, potatoes and maize. The income obtained has enabled them to buy assets such as ploughs, livestock, scotch carts and vehicles these assets improved their standards of living. Assets such as scotch carts and motorised vehicles have enabled beneficiaries to be more efficient in the production systems. All the positive developments have taken place a midst an array of challenges. Which include pest and diseases, limited financial capital, poor marketing, extreme weather conditions and poor agriculture extension services. Thus, research concludes that the scheme has greatly contributed to poverty alleviation in Mvuma district.

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