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IMPLICATIONS OF RURAL IRRIGATION SCHEMES ON HOUSEHOLD ECONOMY. A CASE OF LOWER GWERU IRRIGATION SCHEME, ZIMBABWE

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ABSTRACT

Rural poverty is a major challenge in most developing countries especially in Africa where the majority of people are still living below the poverty datum line. In Zimbabwe, poverty is made more severe by occasional droughts associated with climate change, climate variability and failed socio-economic-political governance. One of the ways to mitigate the impact of drought and prevent deepening poverty is the introduction of small irrigation schemes. However, there is a raging debate on the social and economic viability of these schemes on household livelihood security and income. This paper aims at investigating the socio-economic impacts of Lower Gweru Irrigation project in Zimbabwe. A case study approach was used in this study. Primary data was gathered using self-administered questionnaire and complemented by secondary data. Results demonstrated that rural irrigation has a critical role in ensuring sustainable household and community income. Irrigators fared well regarding wealth accumulation, household food security and quality of life as measured through the use of standardised HDI. In light of the above, there is a need to fund and develop more rural irrigation schemes so as to ensure livelihood security and rural development in Zimbabwe.

Keywords: Rural livelihood, Poverty, Climate change, Irrigation, Lower Gweru, Extension.

1. INTRODUCTION

Zimbabwe with a GDP of 10.81billion US dollar in 2012 and a population of 12 973 808 experiences high levels of poverty. Levels of poverty are more pronounced amongst the rural populace with 30 percent of the population considered indigent and 76 percent considered poor (ZimStats, 2012). Zimbabwe's economic meltdown which started much earlier than 2008 Global Economic Crisis saw inflation rising to a world record of 231million in 2008 (Chambers, 2009). The economic meltdown left rural populace more vulnerable to vagaries of poverty and food insecurity. The challenge of rural poverty has been worsened by climate variability and climate change (Sanchez, 2000).

Tackling rural poverty is a matter of international concern and is debated amongst governments, donor community and development agencies (Rodríguez-Pose & Hardy, 2015). The quest for solutions to rural poverty is both local and universal as the implications affect all. In this regard, there is a pressing and urgent need to find ways to reduce the gap between the wealthy and poor to ensure sustainable rural development in Zimbabwe and Africa as a whole. A solution has to be found to alleviate rural poverty soon. To that effect, rural irrigation schemes have been put forward by experts as one of the sectors that can play a leading role in reducing rural poverty and foster development (Sudhir & Yassir, 1997).

This paper assesses the role and contribution of rural irrigation schemes in improving rural household income and the extent to which rural irrigation schemes can go in reducing poverty. A case study approach was used for the empirical study of Lower Gweru Irrigation

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scheme. Insights were drawn from an empirical study for this paper to make specific recommendations, provide insight and recommendation on rural household income.

2. SOCIO-ECONOMIC ENVIRONMENT OF LOWER GWERU DISTRICT

Lower Gweru is a peri-urban environment that lies in the North West of Zimbabwe's 4th largest city of Gweru. It is located 110 km away from Kwekwe, a mining town North East of Lower Gweru. The livelihood is heavily shaped by its proximity to these urban centres (Dube K., 2015). In a country with five agro-ecological regions ranging from 1 to 5 (Mugandani, Wuta, & Makarau, 2012), Lower Gweru lies in region 4 with some areas in Region 5. Region 1 is the wettest region and Region 5 is the aridest region as shown in Fig 1 below. Zimbabwe has two seasons namely summer and winter. Summer is characterised by high temperatures and rainfall that is influenced by the Inter-Tropical Convergence Zone (ITCZ) (Mason & Jury, 1997). Climate variability has led to an increase in midseason droughts, negatively affecting crop production. Zimbabwe has also been hit by the increased El Nino phenomena. Crop failure has been a consequent of unpredictable weather and climatic pattern (Patt, Suarez, & Gwata, 2005). The consequence has been increased poverty and food insecurity. The population is reliant on the donor community and government handouts for food. The settlement assumed a linear pattern along the road and dispersed in remote areas near farms that surround Lower Gweru communal areas. Several business centres are there to cater for the population namely: Insukamini, Maboleni and Lower Gweru Business Centre.

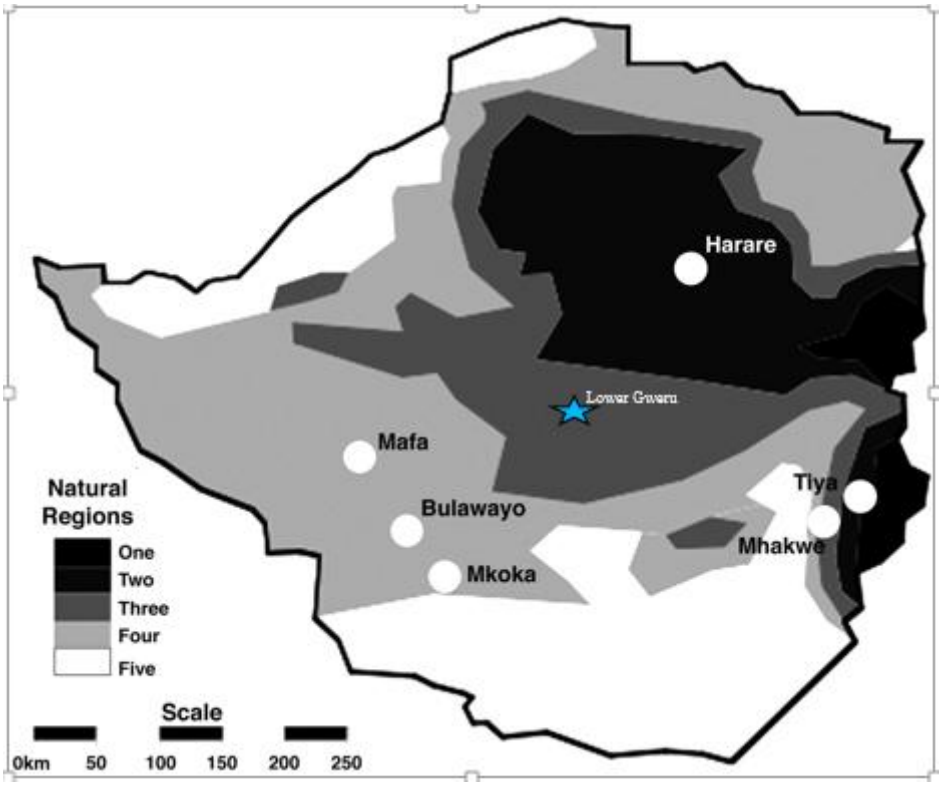

Figure 1. Zimbabwe Agroecological Regions and Lower Gweru Location (after Patt et al. 2005)

Peasant farming is practised in most parts of the area. Crops commonly are grown ranges from the staple food maize, sweet potatoes and small grain crops being grown as a buffer for semi-arid conditions that prevail in the area. Market gardening is a crucial source of revenue

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in most parts of Lower Gweru. Farmers grow cabbages, spinach, tomatoes and onions among others to augment food supply and family income. A minority population not engaged in farming work for shops and some practise alluvial gold panning.

The following section presents research findings. This is a culmination of conclusions from the empirical research integrated with findings from the scientific literature and other scholars so as to give perspective to the study. The literature review will be followed by a look at how the research was conducted followed by result analysis and discussion of the results.

3. IRRIGATION SCHEMES AND SUSTAINABLE LIVELIHOODS

In Africa, where irrigation levels are very low with only 3% of crops being produced under irrigation a paralleled slow pace in poverty alleviation has been experienced. World Bank (2001) postulated that Sub-Saharan Africa was worst affected by poverty with 47,7% and 46,3% of its population being reported poor in 1990 and 1998 respectively. In other parts of the world such as India, a correlation was drawn between irrigation development and poverty reduction. Irrigation development in India allowed for the adoption of agricultural technology that saw the use of fertilisers and pesticides that further enhanced irrigation production. The boost in agricultural technology led to rural economic development and decline in poverty levels.

Researchers highlight that intensive crop production that is facilitated by irrigation schemes increases land productivity and output per unit area. Irrigation allows a certain degree of crop diversification that one cannot afford to achieve using rainfed agriculture (Liao, Zhang, & Bengtsson, 2008; Tan et al., 2009 and Mwaba, 2013). Crop intensification in irrigated conditions enables households to cultivate during wet and dry seasons and, therefore, has a high land augmentation effect. Per hectare, labour employment is greater in irrigated settings than in rainfed settings such that access to irrigation infrastructure generates almost an extra month of jobs during the wet season alone.

Sikwela, (2008) noted that the belief in the successes of irrigation schemes by the Zimbabwe government led to massive investment in irrigation and dam construction soon after independence. The aim of such investment in irrigation development was to reduce dependency on government, attain food security and foster rural development and alleviate poverty. In embracing the initiative, the government sought to bring communal farmers into the central economy and allow them to participate in the main economic market so that they generate household income and community development.

Rukuni & Eicker, (1994) reiterated that "since independence in 1980 the government has undertaken several initiatives to meet these priorities including the following,

- Improving physical infrastructure such as road network development in communal areas.
- Guaranteeing incentive prices for food and cash crops.
- Encouraging irrigation development in semi-arid areas."

In recent past, hard questions have been asked with regards to agricultural technology and its contribution to food security and economic significance in Africa (Sen, 1998). The desire for further investigation into irrigation technology development and its impact was precursed by descriptive statistics earlier researchers were obsessed with (IFPRI, 2001). If investment in

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agricultural technology was to be continued, a multi-faceted impact assessment was crucial. Moreso an analysis on livelihood and economic value to rural populace had to be ascertained.

A partnership between Europe Aid and Ministry of Agriculture at a cost of six million Euros had led to extended benefits to Gondo irrigators in Zimbabwe. The irrigation project helped 90 communities and 3600 beneficiaries. The project managed to reduce hunger per season from an average of 6 to 0 months. Gondo, irrigation scheme farmers, managed to increase maize yield from 1.1 to 4.5 tonnes per hectare. Income from the irrigation project enabled beneficiaries to pay for children's school fees resulting in a school dropout decreasing from 13% to almost 0% and improved nutrition (Europe Aid, 2011).

Agritex (1999) in its evaluation of Chitora, Hama, Mavhaire, Mzinyathi and Wenimbi irrigation schemes noted that small irrigation projects can be reliable sources of income. The assessment revealed that irrigators were earning as much as Z$ 5 833 per farmer from plots of 1ha while dry land revenues were Z$1 000 per month per 6 ha plot size. The income was higher than the minimum wage of Z$400 per month paid to unskilled workers and the lowest wage of Z$600 per month paid for skilled labourers in the agriculture industry. Agritex propounded that from a social perspective, an irrigator is better off than workers in the urban industries who have to deal with urban related multiple expenses such as rent, water and electricity charges on their incomes. Armed with that information the government had channelled more resources to smallholder irrigation development.

Mupawose (1984) however questioned the economic viability of smallholder irrigation schemes in Zimbabwe pointing out that some smallholder projects had failed and were underutilised. He attributed this to poor management and lack of inputs and irrigation inexperience by farmers. In the same report, Mupawose called for reduced subsidies towards smallholder irrigation as he cited increased irrigation losses. A request was made for cost recovery mechanisms to be put in place in irrigation schemes.

4. ZIMBABWE'S LOWER GWERU IRRIGATION SCHEME

A compliment of qualitative and quantitative methodology paradigms was used in this research with qualitative methodology forming the base foundation. Thus, the approach fell in both quantitative and qualitative paradigms. The two methods complemented each other, providing different perspectives and answering various specific questions within any one broad area.

A self-administered questionnaire was designed to identify the financial aspects of the irrigation scheme. The survey captured all the quantifiable crop production expenses, type of crops produced and the output. The number of cropping seasons per year was also recorded. It also recorded on the amount of crops sold, consumed by the family and exchanged crop products. This was compared with crop production records and cash sales receipts. Receipts and evidence of any assets purchased from receipts of irrigation sales were also investigated.

A quota sampling method was used to identify 30 respondents for the self-administered questionnaire from the irrigation scheme and stakeholders. A separate self-administered questionnaire was designed for stakeholders that included the education institution representatives, health practitioners, agriculture extension officers and community leadership.

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The livelihood approach formed the basis for results analysis. Some studies on irrigation assessment studies have applied the livelihood approach in rural Africa. The livelihood approach evolved from the 1980s and succeeded in winning the attention of the major policy makers and donor institutions in the early 1990s. At this time, the approach was highly successful because of two broad factors. The approach had a broad international climate that favoured people-centred approaches and a particular need to mark out a new era of development practice (Solesburg, 2003). The sustainable livelihoods approach forms the foundation for understanding important concepts of vulnerability. Rural livelihood is shaped by amongst other things access to capital assets such as land and water in most rural communities.

5. RESULTS AND DISCUSSION

5.1 Sustainable Livelihoods in Lower Gweru Irrigation scheme:

Lower Gweru's Insukamini area has a population of 5008 people who rely on Makepesi Clinic for basic health care facilities. The irrigation scheme comprises of 120 households who are directly involved in the irrigation project. The 120 members have plots on the irrigation scheme whose size ranges from a quarter to half a hectare. The irrigators practise commercial farming (irrigation), and they are involved in agriculture activities throughout the year through multi-cropping of food crops and cash crops. Summer and winter cropping exists with some farmers having three cropping schedules per year.

Farming is the primary economic activity undertaken by farmers In Lower Gweru. Complementary income comes from family members working in surrounding towns of Kwekwe, Gweru, Bulawayo and Harare and some working outside the country such as Botswana and South Africa. Irrigators, however, indicated that they hardly ask for external assistance unless it is a family emergency as irrigation income is sufficient for self-sustenance (Dube & Sigauke, 2015)

Most households in Insukamini are small scale or subsistence producers. Limited non-agricultural activities are undertaken. The majority of farmers are involved in both dry land and market gardening of vegetables and fruits. Farming activities are heavily reliant on family labour for production. Extra labour is hired on small irrigation schemes.

5.2 The Impact of Irrigation scheme in Zimbabwe's rural economy

This paper seeks to examine the role that can be played by rural irrigation systems in ensuring rural household income, reducing poverty and providing future recommendations for development. The small scale farmers in irrigation systems have a higher amount of disposable income compared to people in other sectors of the economy. It is hard to quantify the exact profits being made by farmers due to the poor record keeping system. The study found that the benefits depended on the type of crop farmers chose to grow. Profit figures range between US$3500.00 and US$5000.00 per cropping season. Reported average profit was US$2750.00. All irrigators who borrowed either input from government GMB or Agribank managed to settle debts without defaulting. This points to fiscal discipline and independence on the part of the irrigators.

The income gained by irrigators is substantially higher than the wages of farm employees and other primary economic sectors. Farm labourers earned between US$30 and US$45 a month

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while other staff working in other areas of the economy earned an average salary of $130 per month. In light of the above and comparison to other employees, irrigators have a lot more disposable income than general workers elsewhere. The other groups of employees, some working in the urban areas have other expenses to pay such as rentals and food resulting in diminished disposable income. Rural irrigators who earn between US$4000.00 and US$7000.00 have a higher purchasing power even after factoring in inputs purchases. In this regard, it can be concluded therefore that rural irrigation schemes play a pivotal role in ensuring sustainable income for families and communities.

Irrigators' families live way above the national and provincial poverty datum line. Irrigators'families average disposable income isUS$458.33 against the poverty household datum line for Midlands Province standing at US$157.48 and the national figure standing at US$161.56. High disposable income irrigators have enabled them to live a better quality of life. Irrigators were able to build better houses and furnish them to match urban housing standards. These houses are well equipped with gadgets such as television, radio and telephone sets being bought from irrigation income proceeds. One farmer purchased a car which is a valuable asset in many African countries.

Hussain & Hanjra, (2004) also noted that irrigation development could lead to new opportunities in agricultural trading. Increased wealth from irrigation often resulted in increased goods and services demand in Asia creating new nuclei of growth and attracting external investments for remote areas. In that regard irrigation scheme is an important developmental initiative in fighting rural poverty. Irrigation can act as rural development nucleus in many sectors. Insukamini Irrigation Scheme has supported a thriving business centre where farmers purchase their daily requirements. The business centre employs people of multiple skills and hence the consequent ripple effect of the irrigation scheme. Irrigation systems in that light afford rural communities an opportunity to embark on sustainable projects not only in agriculture but other economic sectors.

Melvyn, (2003) reiterated this by highlighting that irrigation has numerous potential benefits for Africa. Irrigation can significantly contribute towards food security and trigger rural economic development at the household level. Most often, irrigation development also leads to general infrastructural improvements, better roads (thus better access to health services) rural electrification and housing improvements. Japan Bank for International Cooperation, (2007) supported this by pointing out that households in irrigated settings had a better quality of life (as measured using housing index). They also had better access to electricity and other infrastructure. The research found that irrigators showed better health and lower incidence of malnutrition as measured using Body Mass Index (BMI) of household heads. A successful irrigation scheme leads to general infrastructural development much to the benefit of irrigators and surrounding communities that host these projects. Lower Gweru as a consequence of the irrigation project enjoys better communication and transport networks as compared to the generality of rural areas which do not have irrigation projects.

5.3 Implications on rural employment patterns

Dhawan & Datta, (1992) observed that irrigation has stability effects because of reduced reliance on rainfall. He further noted that irrigation projects play a pivotal role in lowering variance of output and employment. Increased yields help to reduce adverse consequences of drought. Japan Bank for International Cooperation, (2007) further note that crop intensification in irrigated conditions enables households to cultivate during both the wet and

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dry seasons, therefore, has a higher land management effect. Irrigators employ non-irrigators to work as security guards for their crops in the evening mostly and to assist in other irrigation activities such as land clearance, weeding and mostly harvesting. Per hectare, labour employment is greater in irrigated settings than in rainfed contexts. Access to irrigation infrastructure, therefore, generates almost an extra month of work during the wet season alone for crop production in the labour force for crop production only. Irrigation scheme, therefore, plays a significant role in providing seasonal employment to those not participating in the irrigation projects. Various personnel of different skills are employed within the irrigation scheme. The Insukamini scheme employs security guards and other general workers from local communities on an annual basis, reducing unemployment levels within the community through the provision of much-needed jobs. The irrigation employees are better placed to cater for their families. Further household level access to irrigation infrastructure reduces inter-season variability in labour employment for both hired and family labourers. Therefore, irrigation generates higher and stable employment throughout the year. Further, irrigation enables households to earn higher daily wages, and this difference in daily wages is sufficient to uplift people out of poverty.

Rural irrigation schemes create a multiplier effect due to increased incomes. Shops, grocers and small bakeries are opened to service farmers as noted by the research. Demand for better housing and other facilities that were constructed also created employment opportunities in the construction industry and the earlier mentioned sectors. Irrigation schemes also create entrepreneurial opportunities for non-farmers such as petty traders for green irrigation produce as noted by the study in Insukamini.

5.4 Impact of Irrigation Scheme on quality of life

The quality of life as accomplished through increased revenue and improved nutrition that rural irrigation schemes have led to improved rural livelihood in Insukamini. The scheme resulted in the quality of life improvements as espoused by the Human Development Index, developed by Alkire & Eli, (2010).Through increased economic activities necessitated by the irrigation scheme, 100% of irrigators reported that they had access to tapped water or borehole water. This was against a backdrop of 80 % of non-irrigators who indicated that they had access to clean water, however, increased as one moved away to communities far away from the scheme. This demonstrated the significance of the irrigation project in as much as the improvement of people's standard of life was concerned.

Brooks, Adger, & Kelly (2005) highlighted that one of the benefits of irrigation schemes is that they led to asset accumulation that assists in poverty reduction and wealth accumulation. This study noted that 75% of irrigator's homes had electricity and relied on either electricity or paraffin or stoves for cooking. In contrast, 5% of dryland farmers had electricity with heavy reliance on firewood for the kitchen. All irrigators' homes had either television or radio sets and had one or two mobile phones for communication. The area within a radius of the irrigation scheme had access to all three mobile phone operators in the country; Econet Wireless Zimbabwe, Telecel Zimbabwe and Netone. Moving further away from the system signal was lost indicating no coverage for dryland farmers further off the irrigation project. Communications technology is a vital tool for development. It necessitates both voice and data communication. Through ICT, farmers can access market and compare prices for their commodities and conduct research on best farming methods to enhance productivity. In this regard, the study concluded that the irrigation scheme helped in improving the quality of life for the Lower Gweru community in and around the irrigation project.

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Regarding housing, the research noted that 85% of respondents had clean floors made out of concrete and cement. This is against the majority of respondents who indicated that their houses were either under asbestos roofing or corrugated iron sheets. The bulk of Lower Gweru, however, has less asbestos roofing and corrugated iron sheets with the majority of the houses predominantly being under grass thatching.

The irrigation scheme is linked by a narrow tarred road that is in a dangerous condition. This road makes communication easier with Gweru town. The tar ends a little more than 10km from the irrigation scheme. The transportation of inputs and agricultural produce is made easier through the improved road network system. However, the benefits of a better highway network extend to other sectors of people's lives.

5.5 Irrigation and Education

The role of education in irrigation schemes has for long been studied in Africa and abroad (Mock, 1981; Huffman, 1973; Hossain & Byerlee, 1995; Alene & Manyong, 2007). The consensus among academics is the fact that education is critical for irrigation success, development and consumption. Education in agriculture is crucial in adapting to various technological advances within the sector. Studies indicate that education may enhance farm productivity directly by improving the quality of labour. In addition, education is critical to crop production, especially in a rapidly changing technological or economic environment. Most importantly, however, was the assessed impact of irrigation on education quality and levels. Irrigators and their families tended to have achieved higher levels of education and higher literacy levels compared to rainfed farmers as shown in Fig1.

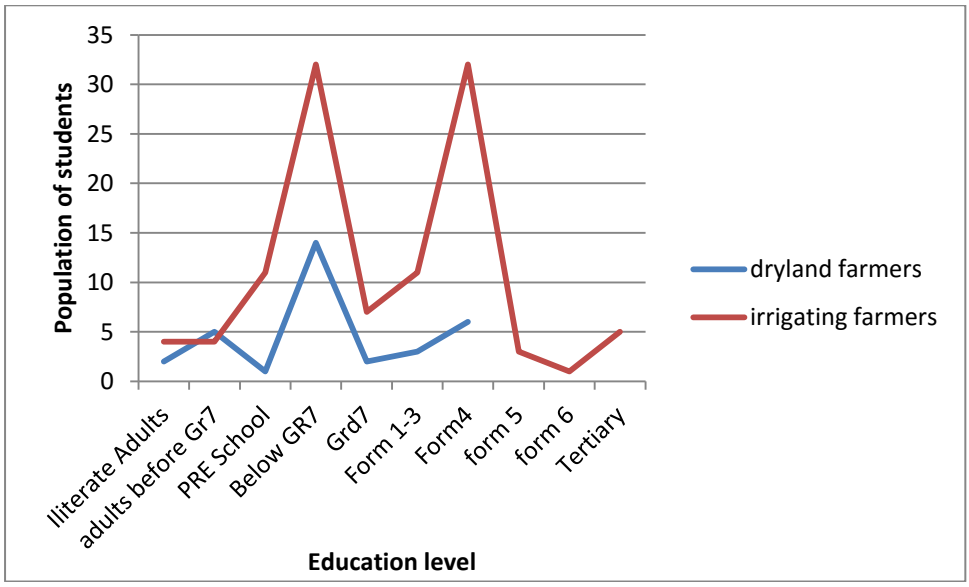

Figure 2. Education levels: Source Original Material Field Survey Data.

The study found that parents from irrigation scheme are capable of taking their children to schools in the nearest town due to the availability of disposable income. Finance from irrigation activities affords the irrigator's children better quality of education, increasing chances of those students to further education in tertiary institutions. This is a significant contribution to the community and national development as it contributes towards a national skilled labour force.

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The research found that irrigators comparatively spent a longer time at school than other segments of the population. Children from families in irrigator's families are on average 11.5 years in school. Dryland farmer's children spend 10.9 years in school against a national average of 11 schooling years. The dropout rate for irrigators' children was also low compared to dryland children's at 0.01% and 1.2% respectively. The variance can be attributed the fact that irrigations avail funds that are used to send children to school. Of note was that some irrigators reported that they were sending children to upmarket schools in the town where education quality is higher than rural areas.

As Education is an important indicator in Human Development, it is, therefore, correct to conclude that rural irrigation contributes towards a higher Human Development Index. "Human Development Index (HDI) is a summary measure of human development. It quantifies the average achievement in a country in the three basic dimensions of human development namely: a long and healthy life, access to knowledge (education), and a decent standard of living." The HDI is the geometric mean of normalised indices measuring achievements in each dimension, (Klugman & Choi., 2011a).The HDI is the geometric average of the three dimension indices: (I life⅓· I Education ⅓· I Income ⅓·). Proceeds from irrigations provide necessary funds for the education career positively contributing to the country's Human Development Index.

5.6 Irrigation and Livestock

The sampled population indicated that the dominant animal in Insukamini is cattle. The sampled population reveals that there is a larger population as compared to other livestock. Cattle is an important aspect of Zimbabwean people's lives as it is of cultural and economic significance. Cattle is an indicator of wealth and plays a central role in the agricultural sector as it provides draught power for tillage purposes. Moreover, cattle produce manure that is rich nutrients and also assists in retaining soil moisture, unlike chemical fertiliser. Families with cattle can plough a greater portion of land and get better harvest ultimately when they apply manure to their crops (Barrett, 1992). Figure 3 graph below shows the distribution of animal population amongst farmers in Insukamini before scheme and post project establishment respectively. Given the economic significance of cattle, it is the most populous animal amongst irrigators with each family having, at least, two animals that are enough to pull a plough. Although livestock theft was hampering population growth in Lower Gweru irrigators marginally had a better head than dryland farmers as they had higher purchasing potential even after serious loses to livestock theft. There is a correlation between purchasing power and cattle ownership. Cattle are the most priced livestock in Zimbabwe. Those with cattle are considered rich as cattle are seen as a means of production. The owners have the capacity to generate wealth either through direct use or to hire out the cattle as the draught power to those who do not have them accumulating, even more, income in the process. Cows also provide milk for household use and for selling to community members at a competitive price.

Of note is the high number of goats. Goats can survive in harsh conditions the study found that irrigators purchase and rear goats as they were easy to sell in cases where a farmer requires urgent cash. Some farmers indicated that they relied on goat milk as it was delicious and nutritious. Goats provide much-needed protein to irrigators and were less vulnerable to theft, unlike cattle.

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There was a distinct a higher poultry population amongst irrigators as compared to dryland farmers. The variation can be attributed to the availability of stock feed amongst irrigators that led to increased poultry production. It is acknowledged that irrigators do not solely depend on poultry for feeding as they have the purchasing power to alternative sources of protein. Poultry can also act as an important source of revenue for both dryland and irrigators of Insukamini.

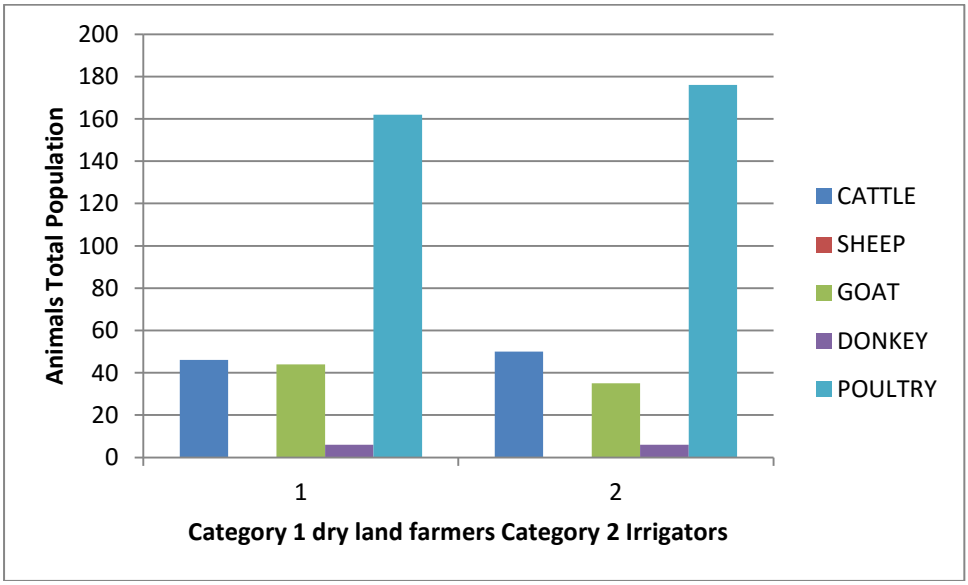

FIGURE 3. LIVESTOCK TOTAL POPULATION

Tables 1 and 2 present the average population of animal and poultry distribution per household for both irrigators and dryland farmers.

Table 2 Average Population of Livestock for irrigators

Livestock	Average Population/Family before Irrigation	Average Population After irrigation involvement
Cattle	3.1	3.3
Sheep	0	0
Goats	2.9	2.3
Donkeys	0.4	0.4
Poultry	10.7	11.7

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Table 3 Average livestock population Dryland Farmers

Livestock	Average Population Per Family
Cattle	1.13
Sheep	0
Goats	1.13
Donkeys	0.63
Poultry	5.4

Table 1 and 2 highlights the significance of Insukamini irrigation scheme as it has led to an increase in the average animal population per family. Amongst irrigators, the average population of livestock increased when farmers joined the project for all livestock types except for goats although the average population remains higher than that of non-irrigators. This highlights the central role played by irrigation system in boosting livestock population. Livestock act as a form of wealth and a buffer for hunger and unforeseen disasters.

5.7 Asset Ownership and Irrigation

The study found that most households had agricultural implements. The most populous were gardening tools such as watering cans, cattle ploughs and hoes. These were critical assets for daily use within irrigation and home gardens. Important to note is the fact that these assets are more amongst irrigators than non-irrigators.

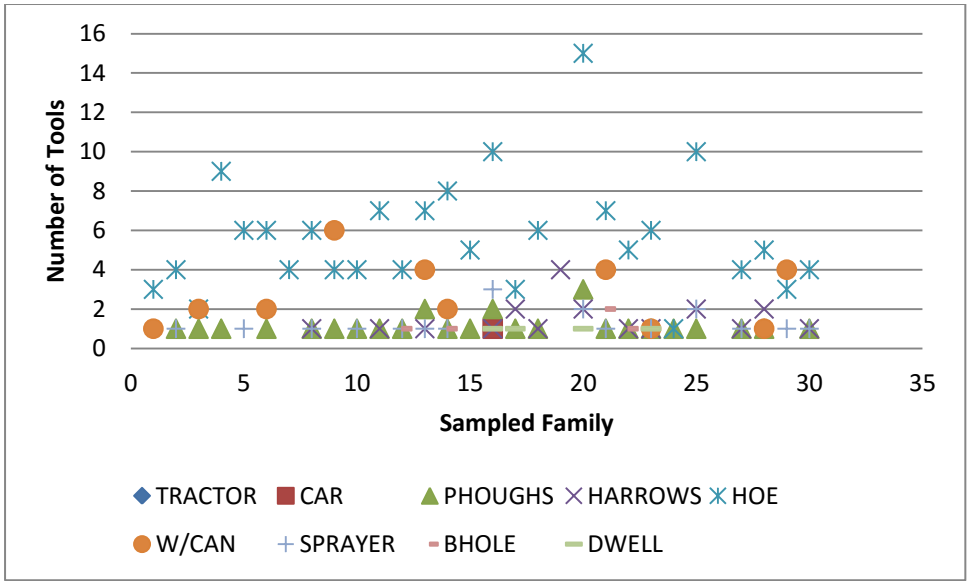

Figure 4 Asset Ownership Irrigators

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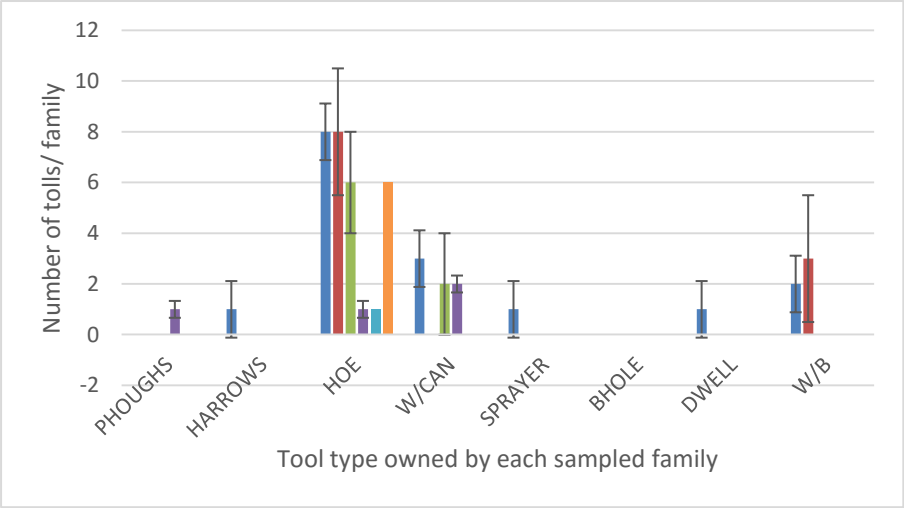

Figure 5 Asset Ownership Dryland Farmers

Figures 4 and 5 highlight the significance of irrigation schemes in the acquisition of household assets, tools and equipment. Due to better income generated from irrigation schemes irrigators can afford the purchase of property leading to improved infrastructure at home and better quality of life as opposed to dry land farmers.

5.8 Irrigation Produce Marketing

Major constraints that undermine the expansion of rural irrigation production has been an important focus of attention, as inadequate and unreliable agricultural production, becomes a constraint for efficient agricultural marketing system (Zenda, 2002). While weak marketing system become a cause for reduced agricultural production, efficient and effective marketing systems can act as catalysts for high production (Zenda, 2002). Most farmers cited market accesses as a major challenge due to transport limitations. Farmers indicated that there was no organised marketing system in place to assist farmers. Transportation availability was reported as the primary challenge to get produce to the market in Gweru, Bulawayo or Beitbridge where produce can fetch better prices. The indication was that sometimes crops such as tomatoes perish due to transportation challenges leading to financial losses for farmers. About 37% of irrigators indicated that due to transport inadequacies they often sell farm produce to hawkers. However in as much as that drastically cut off transport costs it lowered producer price and reduced profit margins. Some of these hawkers then carry these produce to sell afore at much higher prices. Respondents indicated that at times they sell crops to GMB if there is a surplus of production on both irrigation and dryland plots.

Table 4 Output market Channels

Category	Respondents out of 30
Hawkers	30
Local Sales	30
GMB	5
Shops	20
Urban Deliveries	30
Didn't Sell	3

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6 CONCLUSION AND RECOMMENDATIONS

Self-administered questionnaires, direct observation and analysis of secondary data was used to examine the role of rural irrigation schemes in ensuring rural household income, poverty reduction and fostering rural development. To that extent, the following conclusions and recommendations were made. The study identified some social and economic significance of irrigation schemes at national and international level. Irrigation projects in Zimbabwe present a mixed picture of success and failure. They provide opportunities for rural community development, assist in poverty reduction and afford marginalised communities an opportunity to participate in the mainstream economy. It enables the irrigators and the surrounding communities an opportunity to produce enough food for their families and extra food that can be sold to neighbouring communities ensuring both community and household food security and income.

There is a need to vouch for more funding for irrigation schemes as they create rural employment. Employment is both direct and indirect through the employment of people to work on the farms and indirectly through the provision of raw materials for other economic sectors. Well, managed irrigation schemes result in community economic development. Receipts from crops sales by farmers were channelled towards developmental activities. Funds were in the construction of better houses. The houses were fitted with corrugated iron roofs and cemented floors. The other money was used to drill home boreholes, purchase farming tools and equipment. The remainder was used to acquire livestock such as cattle, goats and chickens. Most importantly irrigation profits were used for the acquisition of medicine and sending children to school. This led to an improved standard of living for irrigators and, an improved Human Development Index for the irrigators.

On a broader scale, the scheme resulted in the development of better infrastructure for the community. As a consequent of the project construction of tarred roads, setting up of base stations for cellular networks resulting in an improved standard of living for transport, communication and information technology was facilitated. There is a ripple effect of the scheme on other sectors of the economy due to demand for goods and services by irrigators. Entrepreneurship opportunities were created as a consequent of irrigation establishment in the form of welders, grinders, builders, establishment of small businesses. The irrigation employs local unskilled and semi-skilled labour reducing unemployment in the neighbouring communities. Benefits of irrigation scheme are also extended to the employees of the irrigation project who work as general hands and security guards at the irrigation.

It is concluded that the construction of dams under the new economic blueprint ZimAsset will translate into real economic benefits for rural livelihoods and mitigate against the challenges that are posed by climate change and climate variability. The vulnerability to weather extremes can be significantly reduced in both arid and wet regions in Zimbabwe. Rural irrigation schemes can also ensure household food security and can assist the food import bill that has been rising in Zimbabwe and improved the balance of payment. The recommendation is that the donor community remodel their relief aid to developmental assistance through the establishment of community assets such as deep wells and small dams so as to establish more irrigation schemes. This will go a long way in providing a lasting solution to rural poverty and underdevelopment. Irrigations will help reduce the dependence syndrome that is not sustainable.

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Agricultural and rural extension forms the core of this research paper. The research noted four critical areas that need extension services support and attention namely: food storage development, processing, and marketing so as to increase the scope, meaning and profitability of rural irrigation schemes. Research indicated that there are marginal profits that are realised through direct sales at the farm level. Lack of storage and processing facilities at farm level makes it difficult for farmers to realise maximum profits from their produce. However, there is a window of opportunity for farmers to organise themselves so as to meet their mutual agricultural interest in selling and marketing their products in areas where they can get better profits instead of relying on the middle man whose prices are not reflective of the market rates. Farmer fortunes can also be met through the cooperative development of small processing home industry so as to add value to agricultural outputs. This will go a long way in addressing storage challenges. There are some areas for cooperation that can go a long way in assisting farmers in becoming more commercial focused in their operations. Livestock security and crop security are areas where farmers can cut costs through adoption of Information Communication Technology (ICT) and investment in security fences. Although the startup capital costs are high, the returns are worth it in the long run. Livestock security will lead to an increase in the herd size of most farmers increasing the current assets available to farmers during cash demanding situations. Farmer extension services through knowledge and technical expertise in the areas mentioned above will lead to the realisation of a much better and much more rewarding irrigation projects in the countryside and rural poverty reduction. It is, therefore, fundamental to provide extension services to farmers about well-researched information on post-harvest treatment of crops produced at the scheme. Farmers also require such information on the variation of in commodity price and knowledge on where and how to package their produce in a manner that maintains food safety and allows them to realise better returns on their crops.

While the irrigation technology is one way of ameliorating rural poverty, there is a need to research further into water use efficiency so that the project can benefit more people. This paper provides the basis for crucial debate on how irrigation schemes can be used to improve the quality of life. As noted above extension officers and rural planners can draw valuable lessons from Lower Gweru irrigation scheme to (or “intending to”) improving other projects in similar environmental conditions to (or “intending to”) strengthening capacity in the fight against rural poverty and inequality. While this research provides insights on possible solutions to rural poverty, there is a need for further research into other interventions such as household gardens in areas where it is not feasible to construct dams. The quest for solutions must top the global agenda given the increased vulnerability of rural populace due to increased incidents of climate extreme weather events. The paper highlights areas of further research about developing better environmental and economic efficient irrigation systems in developing countries where poverty levels remain high.

REFERENCES

AGRITEX . 1999. Irrigation Annual Report. Harare: Department of Agriculture.

ALENE, D., & MANYONG, V. 2007. The effects of education on agricultural productivity under traditional and improved technology in northern Nigeria: an endogenous switching regression analysis. *Empirical Economics (2007) 32:141–159, 32*, 141-159.

ALKIRE, S., & ELI, K. 2010. Multidimensional poverty in developing countries: a measure using existing international data’, mimeo, Oxford Poverty and Human Development Initiative, Oxford Department of International Development. Oxford: Oxford.

BARRETT, J. 1992. *ODI*. Retrieved May 23, 2015, from http://www.odi.org/publications/4454-cattle-communal-farming-systems-zimbabwe

BROOKS, N., ADGER, W., & KELLY, P. 2005. The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global Environmental Change, 15*, 151-163.

CHAMBERS, K. 2009. Zimbabwe's battle against cholera. *The Lancet, 373*(9668), 993-994.

DHAWAN, B., & DATTA, H. 1992. Impact of irrigation on multiple cropping. *Economic and Political Weekly, March 28:*(A15–A18), A15–A18.

DUBE, K. 2015. Rural Irrigation Schemes, A socio-economic perspective, Zimbabwe. Saarbrücken, Germany: LAP Lambert Academic Publishing.

DUBE, K., & SIGAUKE, E. 2015. Irrigation Technology for smallholder farmers: A strategy for achieving household food security in Lower Gweru Zimbabwe. *South African Journal of Agricultural Extension*, 1-11.

EUROPE AID. 2011. Agriculture, Irrigation and Development Programme in Zimbabwe. Harare: European Aid.

HOSSAIN, S., & BYERLEE, D. 1995. Education and farm productivity in post-green revolution agriculture in Asia. In: Peters GH, Hedley D (eds) Agricultural Competitiveness: market forces and policy choice. Proceedings of the 22nd international conference of agricultural economists, Harare, Harare: Dartmouth Publishing Company, Aldershot.

HUFFMAN, W. E. 1973. Decision Making: The Role of Education. *American Journal Of Agricultural Economics, 56*(1), 85-97.

HUSSAIN, I., & HANJRA, M. 2004. REVIEW Irrigation and Poverty Alleviation: Review of the empirical evidence. *Wiley InterScience, 53*, 1-15.

IFPRI. 2001. Sustainable Food Security for all by 2020. International Food Security Policy Research Institute. Retrieved July 1, 2011, from http://www.ifpri.org/pubs/books/2020/conpro/2020/conpro.pdf

JAPAN BANK FOR INTERNATIONAL COOPERATION. 2007. Impact of Irrigation Infrastructure Development on Dynamics of Incomes and Poverty: Econometric Evidence Using Panel Data from Sri- Lanka. Tokyo: The Bank of Japan.

KLUGMAN, J. F., & CHOI., H.-J. 2011a. The HDI 2010: new controversies, old critiques. *Journal of Economic Inequality, 9*, 249-288.

LIAO, L., ZHANG, L., & BENGTSSON, L. 2008. Soil moisture variation and water consumption of spring wheat and their effects on crop yield under drip irrigation. *Irrigation Drainage System, 22*, 253-270.

MASON, S., & JURY, M. 1997. Climatic variability and change over Southern Africa: a reflection on understanding processes. *Progress in Physical Geography, 21*, 23-50.

MELVYN, K. 2003. FAO/IPTRID Consultant, Knowledge Synthesis Report No3 - March 2003, Small holder Irrigation Technology: Prospects of Sub Saharan Africa.

MOCK, P. 1981. Education and technical efficiency in small farm production. *Economic Development Cultural Change, 29*, 723–739.

MUGANDANI, R., WUTA, M., & MAKARAU, A. C. 2012. Re- Classification of Agro-ecological Regions of Zimbabwe In Conformity with Climate variability and change. *African Crop Science Journal, 20*(Supplement S2), 361-369.

MUPAWOSE, R. 1984. Irrigation in Zimbabwe abroad view in Blackie, M, J (editor). African Regional Symposium on small holder irrigation. Harare: University of Zimbabwe.

MWABA, K. 2013. Traditional Irrigation Practices, High Crop Diversification and Multiple Agricultural Cycles in Wastewater Irrigation Farming in Peru Urban Areas, Zambia. *Journal of Geography and Geology, 5*(4), 106-130.

PATT, A., SUAREZ, P., & GWATA, C. 2005. Effects of seasonal climate forecasts and participatory workshops among subsistence farmers in Zimbabwe. *PNAS, 102*(35), 12623-12628.

RODRÍGUEZ-POSE, A., & HARDY, D. 2015. Addressing poverty and inequality in the rural economy from a global perspective. *Applied Geography*.

RUKUNI, M., & EICKER, C. 1994. Zimbabwe Agricultural Revolution. Harare: Jongwe Printing and Publishing.

SANCHEZ, A. 2000. Linking climate change research with food security and poverty reduction in the tropics. *Agriculture, Ecosystems & Environment, 82*(1-3), 371–383.

SEN, A. 1998. Poverty and Famine: An Essay on Entitlement and Deprivation. Oxford: Oxford University Press.

SIKWELA, M. 2008. A Dissertation Submitted In Fulfilment of Requirement for the Degree of Master of Science in Agriculture (Agricultural Economics). Grahamstown: University of Fort Hare.

SOLESBURG. 2003. Education and Poverty Reduction Strategies. Issues of Policy Coherence. Capetown.

SUDHIR, W., & YASSIR, I. 1997. Rural Infrastructure and Agricultural Development in Southern Africa: A centre periphery perspective. *The Geographical Journal, 63*(3), 259-269.

TAN, Y., LAI, J., ADIKARI, J., SHAKYA, S., SHUKLA, A., & SHARMA, K. 2009. Efficacy of mulching, irrigation and nitrogen on bottle gourd and okra for yield improvement and crop diversification. *Irrigation Drainage System, 23*, 25-41.

WORLD BANK. 2001. World Bank Development Report 2001. Attacking Poverty. Washington DC: The World Bank.

ZENDA, S. M. 2002. A systems approach to agricultural marketing on the Bululwane Irrigation Scheme. Unpublished M Agric dissertation. University of Fort Hare: University of Fort Hare.

ZIMSTATS. 2012. Zimbabwe Census 2012 Preliminary Report. Harare: Zimbabwe Statistical Office.