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REPOA

THE USE OF LABOUR-INTENSIVE IRRIGATION TECHNOLOGIES IN ALLEVIATING POVERTY IN MAJENGO, MBEYA RURAL DISTRICT

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RESEARCH ON POVERTY ALLEVIATION

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THE USE OF LABOUR-INTENSIVE IRRIGATION TECHNOLOGIES IN ALLEVIATING POVERTY IN MAJENGO, MBEYA RURAL DISTRICT

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LIST OF ABBREVIATIONS AND ACRONYMS

ERB	-	Economic Research Bureau
FAO	-	Food and Agricultural Organization
GOT	-	Government of Tanzania
GDP	-	Gross Domestic Product
GNP	-	Gross National Product
ha		Hectare
HDR	-	Human Development Report
HRD	-	Human Resource Development
IM/L	-	Improved Mechanized Schemes on Large Scale Farms
IT/S	-	Improved Traditional Schemes
IFAD	-	International Fund for Agricultural Development
ILO		International Labour Organization
PPA	-	Poverty Participatory Approach
SSA	-	Sub-Saharan Africa
T/S		Traditional Schemes
UNICEF	-	United Nations Children's Educational Fund
UNDP	-	United Nations Development Programme
URT	-	United Republic of Tanzania
US $	-	United States of America Dollar
UVIP	-	Usangu Village Irrigation Project

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Abstract

This study investigates the role of small scale labour intensive irrigation technologies on poverty alleviation among small scale farmers in Majengo area in Mbeya rural district. The assumption behind the study is that unreliability and inadequacy of rainfall are a source of and constraint to poverty alleviation efforts. The use of small scale irrigation technologies i.e. Improved-Traditional Irrigation schemes, will ensure adequate and timely supply of water to many farms and hence increase productivity and production of rice which is the main crop in the area. The increased rice productivity will in turn be translated into increased output, incomes, employment including non-farm employment and increased ability to build better houses, acquire other assets, buy better clothes, and ability to pay for social services e.g. education, health and water all of which imply poverty reduction. This study confirmed some improvements in the rice productivity but found that very few households i.e. only 470 or 12% of the total (3903) households are involved in the project and only about 530 ha or 15% of the total land area or 24% of the cultivable (2230 ha) land is irrigated. Failure to involve many households or to spread to large farm area has implication in the poverty alleviation i.e. the benefits from such technologies are not spread to the majority of poor or small scale farmers and hence they continue to be poor. This study therefore has found that the irrigation scheme has not succeeded substantially towards poverty alleviation in Majengo area. Problems which are institutional, technical, managerial and policy related are responsible for such a failure. These problems must be solved or reduced so that schemes like this one in Majengo area can effectively play their expected roles of increasing agricultural productivity and production and hence contribute to poverty reduction.

1.0   INTRODUCTION

1.1   Background

Poverty[1] alleviation has been the concern of many developing countries since the 1950s. Various policies, strategies and technologies are being used to alleviate poverty with different results. However, the majority of the people, in developing countries, continue to suffer from low incomes, low life expectancy, illiteracy, malnutrition and poor health services. About 40 percent of people in developing countries, especially in the Sub-Saharan Africa (SSA), are, according to World Bank (1993) still living in conditions of absolute poverty. The poverty dimensions which persisted in the early 1980s are in general still observable in the 1990s. Thus, the need to continue researching on issues pertaining to poverty alleviation are still of crucial importance.

In Tanzania, poverty alleviation has of recent regained momentum as one of the major development goals. For instance, Chungu and Mandara (1994) noted that goals for Tanzanian children by the year 2000 are measured in terms of: infant mortality, maternal mortality, level of malnutrition, access to safe drinking water and sanitary means of excreta disposal, access to school and enrolment rates, adult illiteracy, household income and the extent of protection of children especially in difficult circumstances.

Generally poverty in Tanzania is much more pronounced in the rural areas because the agricultural sector which is dominant has been performing poorly. Thus, attempts to alleviate poverty in rural areas must involve improvement in the performance of the agricultural sector. This study concentrated on the role of 'labour intensive irrigation technologies in poverty alleviation in a rural area which has high potential in agricultural productivity and production improvement.

1.2   Statement and Significance of the Problem
1.2.1   Statement of the Problem

Tanzania is basically an agricultural country with the majority of its people being poor. More than 85% of the Tanzanians are rural dwellers and overwhelmingly dependent on agriculture. According to the World Bank (1995b) study the rural households account for 92% of the poor in Tanzania.

Agriculture, like in most developing countries, is a crucially important sector for the country's overall development.- The World Bank Development Report (1990) notes: "The expansion of agriculture is the driving force behind effective rural development, which in turn lays the foundation for broadly based, poverty - reducing growth in demand for farm labour and for the products of the rural non farm sector. Especially in low-income countries there is a strong association between growth in agricultural purchasing power and rural wages - a key welfare indicator for the rural poor".

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[1]ln its simplest form, poverty should be understood as the inability of an individual to meet the minimal necessities of life such as food, housing, clothing, health, sanitation and education.

The World Bank (1995a) adds further in the case of Tanzania that: "In the foreseeable future, most of Tanzanian population will continue to earn their livelihood in the agricultural sector. Although the agricultural employment is likely to keep pace with rural population growth, the quality and quantity of these opportunities will be dependent upon the level of the rural sector development as a whole.[2] In order to improve agricultural employment, it is essential to pursue overall rural development, which would improve infrastructure, rural education, extension services, land tenure security, efficient input and output markets, and the availability of consumable goods. Such development effort would enable activities beyond subsistence farming, thereby increasing the returns to agricultural labour and creating off-farm opportunities for additional cash income".

Enhancement of employment opportunities in the rural agricultural sector is particularly important in easing the concentration of unemployment in both rural and urban areas. The high urban unemployment is partly due to continuing rural-urban migrations in response to the lack of social and economic infrastructure in rural areas which impinge on employment opportunities in rural areas. Thus, in order to reduce such migrations it is critical to focus on improving the agricultural sector development in addition to creating urban jobs. In this regard solutions to problems of poverty eradication in Tanzania should be targeted to the rural areas and to agriculture in particular.

A large number of the Tanzanians involved in agriculture are small farmers who use mainly primitive or rudimentary technologies such as hand-hoe, ordinary seeds, little or no manure or chemical fertilizers, poor husbandry practices and depend on rains which is in most cases erratic and sometimes inadequate. These have contributed partially to low productivities and production and the subsequent low incomes, low standard of living and other associated characteristics of poverty. Thus, it can be said that since the low agricultural productivities and production have contributed to poverty in Tanzania, the solution to Tanzania's poverty basically lies with improved agricultural productivity or growth which again depends on the application of modern technologies and availability of adequate and timely supply of water to the majority of farmers. Improved small scale irrigation technologies are expected to address the issue of unreliability and inadequacy of water supply which are a source and constrain poverty alleviation efforts in rural Tanzania including the Usangu Plains. Adequate and reliable supply of water is essential for improved agricultural productivity and production which in turn can contribute to poverty alleviation.

This study therefore, concentrates on the labour intensive technologies focusing on small scale irrigation project. The central issue here is that such irrigation technologies normally improves agricultural growth, employment and incomes and food supply all of which have a direct bearing on poverty alleviation.

1.2.2 Significance of the Problem

The significance of the study arises from its intended goal of finding ways of improving the poverty condition of the rural poor who are the majority in Tanzania. As World Bank (1995b) correctly points out " pro-poor" growth policies would involve giving top

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[2] Rural development is a term that refers to all those activities that affect the well being of rural population including the provision of basic needs, such as food and the development of human capital in the country side through education and nutrition program

priority to rural and agricultural development. It further argues that agricultural productivity and growth would require among other policies providing access to improved technology for small farmers through research and extension. It is also important to note that reducing rural poverty may contribute towards reduction of rural-urban migration, and therefore, reduce the urban unemployment problem. Moreover, among the important aspects in poverty alleviation is employment generation. Thus, the use of labour intensive technology is of great significance since it allows for the participation of most farmers or peasants dwelling in the area of the study. As the small scale labour intensive irrigation technologies can be spread to many small farmers, the overall impact will be the subsequent poverty alleviation in the area.

1.3 Research Objectives

The study investigated the impact of agricultural technologies, particularly the use of labour-intensive small scale irrigation technologies among smallholders in Igurusi-Usangu Village Irrigation Project (UVIP) in Mbeya Rural District. The irrigation scheme which is the focus of this study is known as the MAJENGO IRRIGATION SCHEME. The aim was to find out the extent to which such technologies have contributed towards poverty reduction in rural areas.

The study dealt mainly with the following research questions:-
(i) What has been the impact of irrigation technologies on the size of cultivable land?
(ii) What has been the impact of labour intensive irrigation technologies on employment, output and incomes?

1.4. Why Small Scale Irrigation Technologies

Agriculture is the main-stay of the Tanzanian economy and as noted above, more than 85 per cent of Tanzanian population live in rural areas and mostly are engaged in agriculture. The sector also contributes half of the country's Gross Domestic Product and generates more than three quarters of the country's exports. However, the insufficient and erratic rainfall has negatively affected the performance of the agricultural sector. The droughts and hence two bad harvests in 1974/75 and 1979/80 (due to insufficient rainfall) led to more emphasis on irrigated agriculture. Thus since 1980, the country was divided into six zones, under the Irrigation Division of the Mfnistry of Agriculture, to implement high priority irrigation development policy. The Usangu plains was one of the priority areas and was placed under the Mbeya zonal irrigation unit.

In the Usangu plains, irrigation is the most important input of agricultural production. There are three types of irrigation (URT 1994): (i) Traditional schemes by small holders (T/S) (ii) Improved Traditional schemes also by small holder (IT/S) and (iii) Improved mechanized schemes on large scale mainly by state farms (IM/L). The traditional irrigation schemes are the most prevailing type of irrigation in the Usangu Plains as they cover at least 2/3 of the cultivated land in the area.

Irrigation helps to increase agricultural productivity and production. However in as far as poverty alleviation is concerned those gains from irrigation need to be spread (through

increased participation) among many poor peasants. Large scale mechanized irrigation schemes which are mainly capital intensive do not involve many poor peasants and hence have little effect in poverty alleviation. The small scale irrigation schemes are mainly labour intensive and have a wider chance of involving more poor peasants.

The traditional irrigation scheme in Majengo was facing a number of problems related to drainage, uneven farm plots and agronomy practices. For these reasons only about 50 per cent of the total area was at any particular season under cultivation. Improvement of the traditional scheme in terms of constructing large canals, constructing appropriate side slopes to canals, levelling and terracing of the irrigable area and provision of small machines which can easily be operated and maintained were carried out. Such an improved scheme has a greater possibility for benefiting more peasants thus alleviating poverty. Poverty alleviation depends on increased agricultural productivity and production which can be achieved through improved irrigation practices involving small scale-farmers.

The improvement of the Majengo irrigation scheme from a traditional village irrigation scheme was funded by the United Nations Development Programme (UNDP) and the Government of Tanzania (GOT) under the execution of Food and Agricultural Organization (FAO) and the irrigation department of the Ministry of Agriculture. With the completion of the upgrading more smallholder farmers (from 64 to 470 households) used the scheme for irrigation resulting into more cultivable land and output. The crop yield of rice was expected also to rise by 96 per cent from 1.63 tons/ha to 3.2 tons/ha. Peasants in this scheme can now grow paddy during rainy season and onions, beans and maize etc during dry season.

This study is focusing on the improved small scale irrigation scheme of Majengo area with the hope that it stands a better chance of involving more peasants, better farming practices and increased crop yields and farming seasons, all of which contribute to poverty alleviation more than the traditional small scale or the large scale mechanized irrigation schemes could do.

1.5 Definitions: Poverty and the Poor
1.5.1 The Village (or Area) Perception
In the six villages of Majengo, the local communities perceived poverty in terms of characteristics that distinguished a rich person from a poor one. Generally these characteristics were associated with ownership of assets (housing, land and livestock), money and food security, or availability of preferred food. According to the perception of the local communities a poor person was described as one with no house, one with no decent house, or one with a temporary housing thatched roof and walls made of trees and grass. A poor person also was said to have no land (or small i.e. less than one acre), no livestock, no own food (depends on begging or gets food from relatives), wears ragged clothes and lacked adequate money incomes and couldn't meet the costs of basic social services e.g. health and education. In the general discussion with villagers in Majengo it was observed that the villagers had the idea that most rural Tanzanians are poor in terms of having little or low incomes, poor housing, poor clothing and poor services e.g. water, education and health services.

1.5.2   Standard definitions

In the literature there are various definitions of poverty. Kapunda and Maje (1996) cite a number of sources which give the various definitions of poverty, viz: Greer and Thorbeche (1986), World Bank (1990), Kapunda (1990, 1991, 1992), Ali (1992), Mtatifikolo (1994), Cooksey (1994), Bagachwa (1994a, 1994b), Kigoda (1995) HDR etc. There is no global consensus on what the exact definition of poverty should be. However, most authors seem to include in their definition the notion that poverty is a low level of standard of living below an acceptable minimum level in terms of minimal necessities of nutrition, health, education, housing, water and sanitation, in a given economy. These aspects are also found in the definition of poverty as given by the Government of Tanzania.

The Tanzanian government defines poverty as a state of deprivation prohibitive of a decent human life. Accordingly this is caused by lack of resources and capabilities to meet basic human needs as seen in many but often mutually reinforcing parameters which include malnutrition, illiteracy, the prevalence of diseases, squalid surroundings, high infant and maternal mortality, low life expectancy, low per capita incomes and expenditures, poor quality housing, inadequate clothing, low technological utilization, environmental degradation, unemployment, rural-urban migration and poor communications (See URT, 1996).

The various definitions of poverty have been generally grouped into two main categories the "absolute" and "relative" (Semboja 1994:40). In this study the absolute definition is adopted whereby the poor means households and individuals that cannot earn enough to meet their basic needs. Poverty defined in this way focuses on the absolute economic well-being of the poor and requires some knowledge of the minimum standard of living referred to as the poverty line.

The World Bank report (1993) estimated the poverty line for Tanzania at about Tshs 46,173 per capita per year adjusted for household composition. A more recent World Bank study (1995b) puts the poverty line at Tshs 73,177 per person per year taking into account exchange rates of 1995 and inflation. Thus all people living below this poverty line are considered to be poor.

1.6   Methodology

1.6.1   Study Area

The study focuses on one of the various small scale irrigation schemes of the Usangu Village Irrigation Project.[3],[4]. The particular scheme is located in the Majengo area (530ha) in the southern part of the Usangu Plains. The Usangu plains are situated in the Utengule Ward in Mbeya Rural district and extends approximately between latitude 8°45' and 9°00' south and longitude 33°35' and 33°55' East. The plains are bounded by the Tanzania - Zambia (Tanzam) highway and railway in the north and the Poroto mountains in the south while other boundaries are the Meta river in the east and Mlowo river in the west. Igurusi which is a

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[3]   The other small scale irrigation schemes are Mswiswi scheme (870ha), Matombayo scheme (600ha). Meta/Lunwa schemes (1200ha) and Ipatagwa scheme (SOOha)

[4]   See map of study area

major settlement of the area is situated along the Tanzam highway and railway, about 55 km east of Mbeya Municipality.

The Usangu catchment is characterized by three physiographic zones namely the strongly dissected mountains (2300-2500 m above see level) in the southern and south-eastern part, the moderately dissected mountain slopes (1200-2300 m above sea level) in the southwestern and western part, and the alluvial plains (1080 - 1200 m above sea level) in the north. The strongly dissected mountains have highly dense dendritic drainage pattern comprising Meta, Lunwa and Italawa rivers whereas the moderately dissected mountain slopes have medium parallel drainage pattern comprising Mambi, Mswiswi, Patagua and Mlowo rivers. In addition the strongly dissected mountains and the moderately dissected mountains slopes have well drained sandy loam soils whereas the footslopes and the alluvial plains have sandy clay loams and poorly drained sandy clays. Climatically the area is characterized by a unimodal rainfall regime, with most rains falling between December and April. The mountains receive more mean annual rainfall (about 1380 mm) whereas Igurusi in the alluvial plains receive around 900 mm.

The temperature in the area varies over the year from the cool June-July where mean monthly temperatures in the mountains and the alluvial plains may approach 10°C and 18°C respectively to the warm October - November where mean monthly temperatures may approach 25° C in the mountains and 30° C in the alluvial plains. The area therefore, has rich drainage pattern and soils which makes it a high potential area for irrigation. According to URT (1994) the Usangu Plains have the highest potential for irrigation in Tanzania a country which in turn has vast potential for development of irrigated agriculture.

The Majengo irrigation scheme was improved between 1984/85 and 1989/90. The scheme was intended to serve small scale farmers. At present, the project encompasses six villages, namely, Chamoto, Makongolo-Mswiswi, Igurusi, Majenje, Mahango-Mswiswi and Uhambule. In 1986 the six villages had a total of 2,246 households with 10,121 people and by 1994 the households had increased to 3,903 with a population rising to 18,259 people. Out of these, Igurusi which is the largest settlement (village) had 2,000 households with 10,000 people. The six villages have a total of 3,500 ha out of which only 530 ha (or 15%) are being irrigated and only about 470 households (or 12%) are currently involved in the project.

Agriculture is the main economic activity of the area and thus the main source of livelihood providing food and cash income for the households. The non-agricultural activities are negligible. There is no reliable statistical data for the total land area under cultivation which is roughly estimated at 2,230 hectares. The area has some problems of land shortage. The irrigation project was expected to ease the land hunger through increasing the cultivable land area. The main food crops grown are rice, maize, beans, onions, banana, tomato, potato and sugar cane. The most important cash crop is rice with some little coffee, onions, serena, groundnut, sunflower and sugar cane serving also as cash crops. Some livestock-keeping including cattle, goats, ducks, pigs, cows and poultry are undertaken in the area.

1.6.2. Sampling

The population of the study area included all farmers in Usangu Plains.[5] Due to the low and unreliable rainfall patterns, irrigation is the most important input of agricultural production in the area. Most of the households have an area under irrigation.

According to URT (1994) Usangu Plains have nine locations with differing numbers of irrigation schemes. From the nine locations, two locations (UVIP and Kimani) were found to be of importance for the purpose of this study. The irrigation schemes had a mixture of both traditional and modern schemes. However, for the purpose of representation, UVIP and specifically Majengo Irrigation Project was selected.

Majengo is occupied by peasants (smallholders). There is no large scale farming in the area. Dwellers in this ward can generally be regarded as poor with some households being poorer. The project occupies an area of 530ha with rice being the major crop. The households are therefore more likely to reflect the impact of use of agricultural technologies on poverty alleviation among the rural poor. Three hundred households or about 8% of the total households in the project area were randomly selected for our sample. Out of these about 200 or two-thirds of the sampled households were participating in the irrigation scheme while the rest (one third) were non-participants. Thus about 43% of the 470 households involved in the irrigation projects were covered in the research.

1.6.3   Data Collection

The study utilized both primary and secondary information. The secondary information was obtained from the various publications in the general literature and from the Planning Commission and the Bureau of Statistics. The results frorrj the various Household budget surveys available were also used. It is quite rare to find rural households keeping records for their past incomes, past expenditures on health, clothing, food and education. Thus the secondary data apart from providing background information, were instrumental as sources of information and data for the pre-project period. Baseline surveys done by other institutions were also examined for the purpose of getting pre-project information.

Secondary information as obtained from the above sources were complemented by primary data obtained from the survey area during July - August 1996, using a questionnaire. The primary data was obtained from the survey area by means of survey questionnaire from a sample of 300 households in Igurusi-Usangu (Mbeya) out of which 270 responded positively. Following Durning (1990:149) who notes that, "On poverty, the only true experts are the poor," a Poverty Participatory Approach (PPA) was incorporated in the survey questionnaire. Households were asked on how they perceived poverty to be. Additionally, the data collected aimed at providing information on, among others the households characteristics, landholding and irrigation information, production costs, support and extension services, marketing information, ownership of assets, sources of incomes and expenditure patterns.

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1.6.4   Data Analysis

This study employs qualitative analysis which involves mainly tabulations, ratios, among others.

1.7   Hypotheses

The study was guided by the following inter-related hypotheses:

1. The use of improved labour intensive irrigation technologies will tend to increase the size of cultivated area and lead to higher agricultural output.
2. Labour intensive technologies will lead to increased agricultural employment.
3. Increased agricultural output and employment will lead to improved incomes withn direct impact on poverty alleviation.

2.0   POVERTY PROFILE IN TANZANIA
2.1   Overview

Tanzania is regarded as one of the poorest countries in the world, ranked by the World Bank Development Report (1993) as having a per capita GNP of US $ 100 in 1991 which according to the World Bank Development Report (1995) seems to have fallen to US $ 90 in 1993, being the lowest in the World. Some studies have revealed underestimation in the per capita figures (e.g. World Bank 1993; Sarris and Van den Brink (1993) and Tinios et al (1993) and the most recent information (URT 1997) shows an improved situation of per capita income which now stands at US $ 200. Nevertheless even with improvement in per capita income the majority of Tanzanians are poor or live in conditions of poverty.

It is important to note that the per capita figures for Tanzania have to be interpreted with caution since one needs to consider a large devaluation in the mid 1980s, underestimation of GDP to the tune of 30 to 70 per cent (Bagachwa and Naho, 1994) and variations in per capita estimates for same years put the per capita at US $ 280 (World Bank 1993). All these make the per capita estimates quite unreliable in ranking Tanzania as the poorest country in the world. This argument however does not remove Tanzania from being a poor country.

The per capita income for Tanzania and the SSA as a whole are, thus, far below the US $370 (in 1985 purchasing power parity dollars) per capita, which is, according to the World Bank, a cut-off for absolute poverty. In fact Tanzania is a very poor country because her people's consumption levels fall below a lower poverty line of US $275 which is also used by the World Bank[6]. Thus, studies on poverty alleviation are crucially important for Tanzania.

2.2   Incidence and Extent of Poverty

The Tanzanian population which stood at 23.17 million in 1988, is estimated, with an annual growth rate of 2.8 per cent, to have reached 28.11 million people in 1996. Out of this population, about 80 per cent live in rural areas, 5 per cent in Dar es Salaam city and 15 per cent in other urban areas.

Various efforts in analyzing poverty in Tanzania have shown that poverty in Tanzania is almost entirely rural. Initial efforts in analyzing poverty in Tanzania were done by van Ginneken (1976), who used 1969 data and found that 65% of the rural households were living in poverty. Later on, the ILO in 1982 calculated poverty line by costing three different subsistence diets for 1980. The results indicated that 15% of the urban households and 25%-30% of rural households were below the poverty line which was calculated to be TShs 600 per month for a family of five. According to IFAD, in 1988 nearly 12 million rural Tanzanians or 60% of the rural population were living below the poverty line. About 10% of the population lived in absolute poverty (Jazairy *et al* 1992). The 1991 Cornell-ERB project revealed that over 50% of the population or 44% of the households were still living in poverty and that about 12% of the households were severely undernourished (Bagachwa, 1994).

The Cornell-ERB project (1991) also established that poverty was mainly a rural phenomenon where 59% of the people were poor with around 85% of the national incidence of poverty being accounted for by rural residents. The World Bank (1993) poverty profile of Tanzania indicates that rural Tanzanians are poorer than their urban counterparts probably

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[6] See UN1CEF (1994) and World Bank Report (1993).

reflected through having bigger families and lower incomes. Average rural per capita income is found to be 63% of urban areas income. IFAD (1993) also indicate that whereas the percentage of rural population in Tanzania below the poverty line decreased marginally from 65 percent in 1965 to 60 percent in 1988, the number of absolute poor in rural areas increased from 7.1 million to 12.0 million during the same period. Furthermore, Bagachwa et al (1995) adds that rural poverty is on the increase because income redistribution mechanisms have not yet been adequately addressed.

From the World Bank poverty profile in Tanzania, 85 per cent of the rural people are considered poor spending and consuming less than an absolute poverty level of US $ 1.00 per day per capita. Further, 90 per cent of those spending or consuming less than US $ 0.75 per day per capita also live in rural areas. The expenditure measures which were drawn from a National household survey (The Tanzanian Human Resource Development Survey (1993/94)) estimated household incomes at levels about 30 per cent higher than those of GDP per capita drawn from National Accounts. In 1993, GDP per capita for rural people was estimated to be about US $ 90 per capita whereas consumption per capita (i.e. cash plus non-cash expenditure) was about US $ 180. This compares to a national average of US $ 110 GDP per capita for the same year. What is important however, is that even the US $ 180 per capita is still far below the World Bank's poverty line of US $ 275 and hence even by these measures Tanzania rural people are quite poor. In addition, looking at national household expenditure, rural households spend about 76 per cent of their cash and the imputed value of family consumed production on food which signifies that the rural poor are extremely poor.

Nevertheless, recent evidence indicate that overall poverty situation in the 1990s is better than it was in the 1980s. Kigoda and Mwisomba (1995) estimate poverty in Tanzania Mainland to be 42.7% in 1994. World Bank (1995b) point out that in 1983, 65% of rural Tanzanians lived below the poverty line. The percentage declined to 50.5% by 1991. The same report presents estimates of the incidence of poverty for different locations and poverty lines as of 1993. Three poverty lines of Tshs 114,187, Tshs 73,877 and Tshs 83,111 are used in each of the locations. The results are summarized in Table 1.

The general observation from Table 1, is that whichever poverty line is used among the three, the incidence of poverty is more prevalent in rural areas. Even the depth of poverty is widest in rural areas compared to urban areas. The Table reveals for example, that the poor who live in Dar es Salaam have, on average, incomes closer to the poverty line than those who live in the rural area. This partly implies that rural people have incomes that fall far below the poverty line compared to those in the urban areas. -

Table 1: Poverty Measures by Location in Tanzania, 1993

Location	Poverty Line (Tshs)	Poverty Line as % of Average Adult Expenditure	Head Count (PO)	Depth* (PI)
Rural Tanzania	114,187	78	49.7	15.7
	73,877	57	27.8	6.9
	83,111	51	21.2	4.7
Urban Tanzania	114,187	50	24.4	6.1
	73,877	36	9.9	2.2
	83,111	32	6.9	1.5
Dar es Salaam	114,187	27	2.9	0.38
	73.877	20	0.21	0.06
	83.111	IS	0.21	0.04
Mainland Tanzania	114,187	62	41.6	12.7
	73.877	45	22.3	5.5
	83.111	40	16.9	3.8

Source: World Bank (1995b), Table 3.4 p. 66

*Notes: * Depth of poverty is a measure of how far the average income of the poor is from the poverty line.*

2.3   Poverty at Regional Level

Since Tanzania is basically an agricultural economy, poverty in regions is attributed to low agricultural productivity. In that respect, regions with low rainfall, poor soils, poor road infrastructure and long distance to markets have higher poverty incidence than better off regions (Amani 1996). It is further pointed out that according to World Bank Report (1994) Mbeya region occupies the 11th position out of 20 regions of Mainland Tanzania in the poverty ladder. The region was reported to have per capita income adjusted to adult equivalent in 1991 of Tshs. 68,368 compared to the country's average of Tshs. 91,509. More recent estimates however put the region's per capita at Tshs. 73,000 which compares well with the recently estimated country's poverty line of Tshs. 73,177 (World Bank 1995b). Thus using these figures Mbeya is not a very poor region. However, estimates for Majengo area, show

that on average the area's per capita is US $84 or Tshs. 50,400. Thus, the area of our study is poor since its per capita is below both the region's per capita income and the country's poverty line.

3.0   LINKAGE BETWEEN SMALL SCALE IRRIGATION AND POVERTY ALLEVIATION

3.1   A Theoretical Framework

There are three main types of agricultural technologies, viz: One, biological package of technologies which are essentially yield-increasing technologies and involve mainly improved or high yielding plant or seed varieties, fertilizers and pesticides. Two, mechanical package of technologies or labour-saving technologies which refer to the large scale irrigation, use of tractors, combines and other forms of machines primarily as substitutes for labour. Three, the labour-intensive technologies such as the use of small scale machines and small scale irrigation.

In principle all the three types of technologies lead to increased agricultural productivity and production. However, it should be noted that adequate and timely supply of water whether from rains or from small or large scale irrigation is a precondition for realisation of agricultural productivity and production. This is true even in a situation where modern technologies are not applied. Water is an essential component of agricultural activities. The importance of water can be illustrated if one considers two production functions. In one of the production functions the inputs are labour and machinery and in the other water supply and chemical fertilizer. In the first case, an increase of machinery can lead to a rise in agricultural output from a lower isoquant to a higher one since labour is a good substitute for machinery. However, in the second case, an increase in fertilizer can not lead to an increase in agricultural output since the required increase in water supply to make fertilizer effective has not occurred as the two cannot easily be substituted. Thus adequate and timely water supply is a key component of the agricultural production with or without the application of modern technologies.

In some parts of the developing world, Tanzania included, rainfall is often inadequate and unreliable. The rain is also erratic, resulting in the loss of water without being used effectively in agricultural activities. Generally the difference between a good crop and a harvest failure still depend primarily on the timing and the adequacy of the rainfall. As a result efforts to increase agricultural productivity and production in developing world have often focused on technologies that would utilize most of the available water including rain water thus accepting the fact that technology is an appropriate means of inducing agricultural growth. The crucial role of irrigation technologies is to ensure effective water utilization for agricultural purposes (adequate and timely supply of water to farmers).

Sam path (1992) among others observed that irrigation technology is one of the most important factors of improving agricultural productivity and production in developing countries. The question however is to what extent does the adoption of such irrigation technologies and its subsequent economic growth lead to poverty alleviation. It is argued that a full judgement as to the appropriateness of a particular change in technology must, however, have regard to all of the factors limiting agricultural modernization and determining the generation and distribution of income. This is because there are other forces, such as institutional factors, pricing policies and the cost of technology, among others, which can make a poor loose or gain from the introduction or use of various agricultural technologies. In other words, the effects of agricultural technologies, including irrigation, on poverty alleviation is in this case an empirical question (Bagachwa, 1994). Thus, although it is a

necessary condition, raising agricultural output (by such technologies) is not by itself sufficient to reduce poverty or to achieve an improvement in rural welfare.

Although there are conflicting views on how technical change affect the poor, the economists' optimistic perspective is to view technical change as the ultimate source of growth. Mellor (1986) for instance notes that "one of the most important theoretical and empirical findings in the analysis of western economic growth is the identification of technological change as a major source of growth (as quoted in Binswanger and van Braun 1993). This increased agricultural output is said to contribute towards increased equity in many developing countries (Stevens and Jabara 1988:158). The Neo-classical theory advocate that the long run effect of economic growth is reduction in the levels of income inequality and poverty. Fields (1980) provide evidence on reduced absolute poverty as a result of economic growth. Further, Chungu (1993), found that the real income gains from the technologies which were adopted in Iringa rural, were translated into increased food consumption for the poor and improved nutritional welfare for the children. Agricultural technologies have thus been accredited for the role they play in assisting towards poverty alleviation despite the fact that there are counter arguments of increased income disparities and disastrous environmental impacts[7] Hayami and Kikuchi (1982) for example, emphasize that technological change affects the share of incomes received by the different factors of production (including labour). Moreover, if the technology is labour-intensive, it would increase the proportion of labour to other resources. Thus, generally it has been demonstrated theoretically and to some extent empirically that adoption of technologies can contribute to poverty alleviation in terms of increased output leading to increased incomes, improved nutrition status and enhanced employment opportunities.

Adoption of small scale irrigation technologies may have a direct or indirect link with poverty alleviation. Increased agricultural output can directly increase food consumption and raise the income levels of the concerned farmers. The spread of these benefits depends, however, on the extent to which the involved households can adopt and utilize the technologies. The small scale irrigation technologies are simple, less costly and easy to handle and have wider chances of spreading or being adopted and utilized by many small farmers. Thus, poverty can be alleviated through increased incomes and consumption indicators.

Indirectly increased agricultural employment and non-farm activities can occur as a result of increased acreage due to irrigation. The extra incomes from increased agricultural production raises the demand for output from, and participation in non-farm activities. The increased incomes can subsequently lead to improvement in nutritional status, and increased accessibility to education, health and other poverty related aspects because farmers have the ability to pay for such services. The theoretical potential of small-scale labour intensive technologies to alleviate poverty underscores the importance of this study.

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[7] Environmental impacts e.g. diseases such as Malaria of irrigation are out of scope of this study.

3.2. Literature Review

From the theoretical framework, it has been observed that technology and technological change is a major form or source of growth. However, there are different views on the likely impact of technology or technological change on poverty alleviation.

Binswanger and Von Braun (1991) note that there are two different views. First, that technology and technological change contributes to economic growth- and that there is a good chance (though admittedly no guarantee) that such a general growth will bring corresponding growth in the income of the poor or the reduction of poverty. Second, that technology, may have adverse consequences for the poor, especially the poorest. This second view was also adopted by Griffin (1979), Ghose (1979) and Justman and Teubal (1991). In general, it is argued that there are certain institutional factors and price policies which make the poor loose in this regard. The two views indicate that the effects of technology and technical change in poverty alleviation is an empirical one. In this study, however, as argued in the theoretical review we concentrate on studies which have confirmed that agricultural technologies, and in this case irrigation, contribute to poverty alleviation.

Studies done purely on agricultural technologies have revealed that the poor have been positively affected [among others Binswanger and Ruttan (1978), Berry and Cline (1979) Pinstrup-Andersen and Peter Hazell (.1985), Lipton with Longhurst (1989)]. In particular, it has been found that if the technologies are cost effective, the use of the technologies by the poor are as efficient as those of the non-poor. The real income gains from the technologies translate into increased food consumption for the poor and improved nutritional welfare. Chungu (1993), for instance, studied the relationship between the income brought into a household from a technology driven project and poverty alleviation and concluded that since the technology used is appropriate and properly transferred, the income brought in from the project benefit the children and family members, thus improving their nutritional status.

It has been noted that by improving the productivity of land, irrigation can be an important tool for a country's development and poverty alleviation. Stevens and Jabara (1988:240) for instance argue that increased irrigation continues to offer large potentials for doubling and tripling yields during the main crop season and often makes possible a second or even a third crop in tropical climates, and thfese subsequently contribute to poverty alleviation through increased output and incomes. For the case of Tanzania, Kagubila (1991) got similar findings. Further, Abbie and others (1982), indicate that irrigated land in India is more productive than the non-irrigated land. They calculated that value added per hectare of net irrigated land was more than five times that on rainfed land. The difference being a result of higher cropping intensity on irrigated land. Moreover, evidence from Northern Nigeria, revealed that returns per unit area on irrigated area were over three times greater than the non-irrigated land (Turner 1983)[8].

Biggs, S. and Griffith, J. (1987) on irrigation in Bangladesh report that the rural poor benefit more if policies favouring labour-intensive small scale irrigation are given higher priority. It is further pointed out that since most of the small-scale irrigation schemes are labour intensive and accessible to many small farmers, they generate more productive employment. Ranis and Stewart (1987:153), emphasize the importance of labour intensive small scale irrigation schemes in employment generation as follows: "Within each irrigation

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8 As quoted in Turner (1994:259)

system, the least mechanized combinations tend to create more direct employment, while substantially less direct employment .is associated with the most mechanized combinations". The least mechanized irrigation schemes have been found to be appropriate both from the growth point of view and from the standpoint of contributing to equitable income distribution. Thus for the purpose of poverty alleviation more people are covered under small scale irrigation than in large schemes.

Increased employment opportunities resulting from technical change have a direct bearing on poverty alleviation. Rudra, A. (1987:33) emphasizes this aspect as follows "There are not many differences of opinion about the employment effect of the seed-fertilizer-water part of technology packet. It is widely agreed that these inputs augment employment. More irrigation obviously calls for more labour for digging, budding and so forth". Martens (1989) further adds that irrigation projects in Tanzania had a direct impact on area of land, cropping pattern and productivity. With the particular project of Mto wa Mbu (Arusha) employment generation increased from 77,494 days in 1980 to 114,457 days in 1984. Overall 557,419 employment opportunities (in days) were created due to the labour-intensive irrigation project in Mto wa Mbu. Incomes (Revenue less costs) increased from Tshs 37.2 million in 1980 to Tshs 56.5 million in 1985. Per hectre incomes increased from Tshs 33,382 to 38,008 during the same period.

Paul (1990), on new agricultural technologies in Haryana Region (India), found poverty to be inversely related to the level of irrigation. These results indicate the importance of irrigation in poverty alleviation. Further evidence on this is provided by Okidi (1988) who found that irrigation in Lake Victoria basin of Kenya provided an opportunity for poverty alleviation through increased employment opportunities, food production and income generation. Moreover, the involvement of beneficiaries in the design and implementation of irrigation schemes has been found to have an added advantage in poverty alleviation. It is argued that impact of irrigation in alleviating poverty will increase once the farmers, for example, are involved in the implementation stage as that will motivate them to adopt the technologies (Karim (1990), D'Silva (1992).

Thus there is a lot of evidence in many parts of the developing world which confirm the positive role which the small scale labour intensive irrigation technologies play in increasing agricultural productivity and production. This in turn is shown to be a necessary factor if we are to have positive impact in raising incomes of the poor, improving their nutritional status and increasing employment opportunities all of which are poverty related aspects. -

4.0   FINDINGS AND DISCUSSION

4.1 Preamble

The purpose of the study was to examine to what extent small scale irrigation projects can assist in poverty alleviation in rural Tanzania. In the study area, 270 households or 90% of the sampled households were interviewed of which 66.9% were participants in the irrigation project, and 33.1% non-participants. There are various reasons and expected benefits that attracted different households to enter this irrigation project. Table 2 provides some of those reasons.

Table 2: Participation in the Majengo Irrigation Scheme: Reasons and Expected benefits (% of Surveyed Households)
n = 270

REASON	PERCENT	BENEFIT	PERCENT
Access to land	34.6	Water supply	52.2
Irrigation facilities	13.7	Extension services	9.3
Extension services	13.7	More output/incomes	4.9
Expectation for loans	13.2		
More output/incomes	11.0		-
Other reasons	13.8	Other benefits	33.6
TOTAL	**100.0**	**TOTAL**	**100.0**

Source: Survey Data, 1996.

According to Table 2, most farmers (34.6%), joined the scheme in anticipation of being given more land, and especially from the increased land area that could be used for rice cultivation. The traditional scheme covered only a small area but the technologies used in the improved scheme increased the area of farming land. The other reasons included opportunities to use irrigation facilities, extension services and expectation to get loans and produce more output and therefore earn higher incomes. Overall, about 66.4% have benefitted from increased water supply, extension services and higher output/incomes.

4.2   Main Activities in Majengo Area

The activities undertaken by the people of Majengo are summarized in Table 3 where it is shown that the main economic activity for the households in Majengo is farming on own farm (55.5%). This indicates the importance of agriculture as a source of income. The results also corroborate those of the Human Resource Development (HRD) survey of 1993 which found that agriculture was the source of income for 72.5% of all Tanzanians, and more important for the rural households and the poor (World Bank 1995b). The other occupations and activities are quite insignificant in the area. Thus any attempt aimed at poverty reduction in the area should be directed towards improving agricultural productivity, and therefore raising the returns to labour that is involved in agricultural production. As argued elsewhere in this study, irrigation is expected to contribute in the achievement of that objective, especially for the case of rice which is a high water consuming crop.

Table 3: Main Activities for Households in Majengo

$n = 270$

ACTIVITY	Percent
A. Economic Activities 1. Working on own farm	55.5
2. Fishing	0.4
3. Paid employee - government	0.7
4. Paid employee - parastatal	0.2
5. Paid employee - other	0.5
6. Unpaid family helper	1.8
B. Non-Economic Activities: 1. Non economic Activities	14.4
C. Others: 1. House maker	0.1
2. Schooling	25.4
3. Inactive for being too old	1.0
D. TOTAL	**100.0**

Source: Survey Data, 1996.

4.3   Impact of Irrigation on Employment, Output and Incomes

The majority of households interviewed acknowledged that the irrigation programme had a positive impact on employment, output and incomes. Due to lack of record keeping inherent in most of the studies done in rural areas like this one, it was not possible to obtain adequate and reliable information on actual figures on employment, output and incomes during pre-and after-project periods for comparative purposes. There was greater use of perceptions from the interviewees who were asked to respond whether an increase or decrease was recorded. In that regard about 154 households or 57.1% of the households interviewed pointed out that employment (in terms of number of people) increased as a result of irrigation. This employment was more conspicuous with regard to casual employment where the youth were the main beneficiaries. Only a small percentage (1.6%) of the respondents indicated a decline in employment. Additionally, 128 households or 47.2% of the interviewed indicated that output recorded an increase. The results on the impact of irrigation on employment and output are summarized in Table 4.

Table 4: Irrigation and Changes in output and Employment in Majengo.

n = 270

Type of Impact	On Employment (Number of households %)	On Output (%)
Increase	57.1	47.2
No change	31.3	26.4
Decline	1.6	15.4
No idea	10.0	11.0
TOTAL	**100.0**	**100.0**

Source: Survey Data, 1996.

While output increased, the composition of that output indicates that rice benefitted more from irrigation. A comparison of the output composition before and after irrigation in Majengo indicate .that the share of rice in total output increased front 40.2% to 61.3%, that of beans from 8.3% to 10.5%, that of onion from 2.2% to 2.4% and that of tomato increased marginally from 0 to 0.3%. Maize on the other hand recorded a decline of its share in the total output from 49.3% to 25.4%. The increase in the share of rice was due to increased availability

of water. This indicates the importance of irrigation for rice cultivation. The decline in the share of maize on the contrary signify probably that more labour was used mainly in the production of rice and other crops which are more water dependent and which could find a market more easily than maize.

With regard to incomes, it was difficult (as prior assumed) to get meaningful data on households incomes. However, reliable data on expenditures were obtained. Expenditure data was thus used as proxies for incomes. On the basis of expenditure data, the households had a total annual income of Tshs 42.1 million during year 1995. Conspicuous observation from the expenditure data was the high proportion of expenditures on food. Food alone as a group accounted for 41.2% of total households' expenditures and also had a household with the maximum expenditure in the study area of Tshs 480.000. Other significant expenditure proportions were observed in health (17.8%), clothing (12.8%), housing (7.2%) and education (6.5%).

Additionally, on the basis of households' perception, researchers were able to obtain information of their being better off or otherwise from the earned incomes. The households were asked whether they thought they were better off or worse off when comparing the situation in the pre-project era or after the start of the project. A summary of their response is shown in Table 5. In particular the households were specifically asked to link their being better off as resulting from having better incomes originating from irrigation activities.

In Table 5, it is shown that 42% of the respondents did not remember exactly or could not tell whether they were better off or worse off in 1985 before the project was improved. About 35.5% of them thought they were better off in 1990. However five years later, in 1995, after the completion of the improvement of the project, the proportion declined to 20.4% (a proportion also lower than that of 1985 of 23.6%). This shows that the project has not helped many people to be better off. If anything, it is observed from the same Table that a majority (57.7%) reported of only average improvement in 1995.

With regard to the use of extra earnings, it is revealed in the same Table that there have been only slight changes in terms of their allocation. Most of extra earnings have on average continued to be used mainly on medical services, clothes, consumable and other household durables. This is true for all the years before and after the start of the project. However, savings have declined when comparing 1985 and 1995 and also use of agricultural inputs have declined substantially.

Table 5: Proportions of Better-Off Households and Their Expenditure of Extra earnings (% of Surveyed Households)
n = 270

RANK	1985	1990	1995
1 Better off	23.6	35.5	20.4
2 Average improvement	7.7	25.0	57.7
3 Worse	26.7	31.0	18.9
4 Cannot remember	42.0	8.5	3.0
TOTAL	**100.0**	**100.0**	**100.0**
Use of extra earnings			
Pay debts	6.3	0.5	3.6
Give credits to others	0.0	0.5	0.0
Save	11.5	5.2	6.7
Educate children	8.4	4.6	9.7
Agricultural inputs	14.7	8.2	'2.6
Medical services	16.8	18.6	14.4
Clothes	12.6	13.9	15.9
Other consumables	16.2	20.6	29.7
Household durables	13.1	27.8	16.9
Others	0.5	0.0	0.5
TOTAL	**100.0**	**100.0**	**100.0**

Source: Survey Data, 1996.

Note: *The year 1985 is for period when the project had not been improved; 1990 is when the improvement had just been completed and 1995 represents five years later since the project was improved.*

4.4 Acquisition of Wealth Assets

The survey showed that there have been no significant improvements in agricultural related assets unlike the case of some of the other assets. Specifically Table 6 shows an initial increase in the number of acquired agricultural related assets when comparing the pre-1985 and the period up to 1988. These include number of fields, poultry, livestock, hoes, plough and spraying machines. The numbers of all these, however, declined in the subsequent period of the 1990s.

Table 6: Wealth Assets Acquisition by the Surveyed Majengo Households

Agricultural Related Assets*	REFERENCE PERIOD		
	Before 1985	1986-1988	After 1991
Fields	61	23	16
Poultry	323	488	454
Livestock	195	274	122
Hoes	169	290	242
Plough	17	23	12
Spraying machines	2	23	1
Harrow	0	0	1
Other Assets			
Houses	59	53	39
Radio/Cassettes	49	46	67
Watches	13	21	83
Bicycle	35	46	46
Motor vehicle	0	1	2

Source: Survey Data, 1996
*Notes: * Number acquired on a cumulative basis for each period*

On the other hand in the same period the acquisition of radio/cassettes, watches, bicycles and motor vehicle increased. However, the number of new houses declined for the period and only about 32.8% reported to have made some improvement (in terms of wealth acquisition) in their housing with a mean value of improvement per house being Tshs. 24,795. A larger percentage of respondents 67.2%, said they did not improve their housing mainly for lack of money.

4.5 Human Development Indicators

In principle poverty reduction is associated with improvement in social indicators resulting mainly from growth in incomes, and observable through better living standards. Various indicators were examined in terms of characteristics, accessibility, and distance. These are explained below.

4.5.1 Housing Characteristics and Accessibility to Social Services

Households in Majengo were reported to have ownership of more than one house (building). Information on the particulars of those buildings was solicited for a period of as far back as 1985. However, for the purpose of this study, only the particulars of the main building are reported below for 1985, 1990 and 1996.

Overall, it is seen from Table 7 that there was no significant change in terms of the characteristcs and type of housing in the study area. Most of the houses can be said to be still typically the poor man's housing.

Further information was sought on the accessibility to some social services which contribute to reduction of poverty. These included source of drinking water, source of cooking fuel, lighting fuel and type of toilet. The results are summarized in Table 8.

Table 7: Characteristics for the Main Buildings of the Surveyed Households in Majengo

n = 270

Particulars	1985		1990		1995	
	Number or Type	% of House holds	Number or Type	% of House holds	Number of Type	% of Households
Number of rooms	3	42.4	3	41.1	3	40.2
Number of Windows	3	32.7	3	32.5	3	32.3
Sleeping rooms	2	44.4	2	42.4	2	41.9
Persons per room	4	25.1	4	24.9	4	22.8
Foundation	none	48.5	none	48.7	none	49.0
Floor	earth	73.1	earth	74.3	earth	73.7
Walls	mud bricks	63.2	mud bricks	63.9	mud bricks	62.1
Roof frame*	poles	49.7	poles	50.3	poles	51.0
Roof	grass	70.8	grass	72.3	grass	69.7

Source: Survey Data 1996

*Notes: * In moxl cases roof frames are either of poles or sawn timber.*

According to Table 8, it is clear that little, if any, changes have occurred in terms of accessibility to some social services. For instance about 37 percent of the surveyed households have continued to rely on rivers as their main source of water for domestic use. The percentage of households which were using piped water on community supply have remained at around 54% for both the pre and after project period. Likewise, the majority of the surveyed households (about 75%) have continued to use firewood as the main source of their fuel for cooking. The small percentage of the households which use electricity, paraffin and charcoal for cooking have continued to be stagnant.

In the case of fuel for lighting, the majority of the surveyed households (about 94%) have continued to rely on paraffin and quite a small number use electricity, gas and coal. Finally, in the case of toilet facilities most of the covered households (about 94%) continue to use pit latrines and very few use flash and improved (ventilated) pit latrine facilities. There are also few others which have no toilet facilities.

Additionally, information was sought with regard to accessibility/acquisition of some social services by ranking for two periods, 1990 and 1995.

Table 8: Accessibility to Some Social Services in Majengo (% of Surveyed
    Households)

n = 270

FACILITY	1985	1990	1995
Drinking water source			
1. Piped water on housing unit	3.5	3.5	3.5
2. Piped water outside housing unit	2.2	2.2	2.6
3. Piped water on community supply	54.0	53.9	53.7
4. Catchment tank	0.0	0.0	0.0
5. Public well (protected)	0.0	0.0	0.0
6. Public well (un-protected)	2.7	2.6	2.6
7. Private well (protected)	0.0	0.0	0.0
8. Private well (un-protected)	0.4	0.4	0.4
9. Spring (covered)	0.0	0.0	0.0
10. Spring (not-covered)	0.0	0.0	0.0
11. River	37.2	37.3	37.1
Fuel for cooking			
1. Electricity	3.3	3.3	3.3
2. Gas	0.0	0.0	0.0
3. Paraffin	11.4	11.2	11.2
4. Coal	0.0	0.0	0.0
5. Charcoal	10.2	9.9	9.9
6. Firewood	74.7	75.6	75.6
Fuel for lighting			
1. Electricity	5.4	5.5	5.4
2. Gas	0.5	0.5	0.5
3. Paraffin	93.6	93.5	93.6
4. Coal	0.5	0.5	0.5
5. Charcoal	0.0	0.0	0.0
Toilet Facilities			
1. No toilet	0.5	0.5	0.5
2. Flash	3.1	3.1	3.1
3. Pit latrine	93.3	93.7	93.8
4. Improved (ventilated) pit latrines	2.6	2.6	2.6

Source: Survey Data, 1996.

Table 9:   The Ranking of Acquisition/Accessibility to Some Social Services by the Surveyed Households in Majengo

n= 270

ACCESSIBILITY TO	1990			1995		
	(1)	(2)	(3)	(1)	(2)	(3)
Cash incomes	2.1	2.6	3.2	1.8	3.2	2.8
Food security	1.7	3.2	2.6	1.8	3.4	2.4
Nutrition	1.9	4.7	1.1	1.8	5.2	0.8
Health services	0.8	4.8	2.1	0.8	4.2	2.8
Education	0.8	5.0	2.0	0.7	4.5	2.6
Housing	1.3	1.7	4.8	1.3	1.8	4.6
Housing facilities	1.2	4.4	2.2	1.5	4.6	1.7
Clothing	2.0	3.0	2.8	1.6	3.7	2.5
Agricultural productivity	1.8	4.1	1.8	1.4	3.8	2.4
Land (size)	3.2	3.1	1.4	3.2	2.9	1.6
Labour utilization	0.8	4.4	2.5	0.8	4.4	2.6
Socio-economic facilities	0.7	5.3	1.7	0.6	4.7	2.4
Others (unspecified)	1.0	4.1	2.1	0.6	4.5	2.0
TOTAL	**19.3**	**50.4**	**30.3**	**18.0**	**50.9**	**31.2**

Source: Survey Data, 1996

Notes: Ranking (I) poor
(2) average
(3) good

On average, the majority of surveyed households, (51%) reported in both periods i.e. pre- and after project that their acquisition/accessibility to social services could be summarized as average. Only about a third of them thought the situation was good.

4.5.2 Distance to basic amenities

Distance to basic amenities provide an indicator of the level of standard of living. Reduction in the distance or proximity to basic amenities imply higher living standards. In Majengo, a comparison was done for three periods, i. e. 1985, 1990 and 1995 (Table 10) Unfortunately, the results did not provide any conclusive trend. Actually, for a period of about fifteen years the distance to basic socio-economic facilities remained almost the same.

Table 10: Average Distance to Social Services and Economic Facilities (km)

Facility	1985	1990	1995
Water supply	1.0	1.0	1.0
Collect firewood	4.0	5.0	5.0
Market place	4.0	4.0	4.0
Shop (nearest)	2.0	2.0	2.0
Dispensary/	4.0	4.0	4.0
Hospital	16.0	16.0	16.0
Primary school	1.0	1.0	1.0
Church/mosque	1.0	1.0	1.0
Primary court	8.0	8.0	8.0
Urban centre	51	50	50
Main farm	5.0	5.0	5.0
Public transport	4	4	4
Milling machine	2	2	2
Primary cooperative society	5	5	5

Source: Survey Data, 1996

5.0   CONSTRAINTS TO POVERTY ALLEVIATION
5.1   Preamble

The depth of poverty i.e. how far incomes fall below the poverty line is quite great in rural Tanzania. In the area of the study it has been shown that besides low income, the availability, acquisition and accessibility to social services is   still low and the project doesn't seem to have helped much in this. This is despite the noted increase, though small in productivity and production.

In principle economic growth can help in poverty alleviation either directly through increased employment and incomes or indirectly through improved social services. This doesn't seem to have occurred significantly in Majengo area. Substantial contribution of the project towards poverty reduction has been constrained by institutional and managerial; technical and policy factors as well as other problems such as lack of adequate money.

5.2   Constraints to the Project
5.2.1   Institutional and Managerial Constraints

These are constraints that relate to the good functioning of the project and managerial issues as they evolve from the project administrators. Noticeable ones include the following:

(a)   Poor distribution of farm land i.e. inefficient land rights. The land at scheme and surrounding villages is said to be owned by native land owners who own quite large areas. The newcomers and young people have to rent the land from the land owners at very high costs (e.g Tshs. 8000-10,000 per acre).

   In certain areas the village authorities (particularly in registered villages) allocate farm plots to households. The problem is that these allocations are made without much legal backing which can help in dealing with the disputes between villages as well as households which arise from time to time.

(b)   Lack of commitment on the part of leaders at ward, district and regional level to support the irrigation scheme.

(c)   Livestock keepers have invaded'the area and their cattle are causing soil erosion and destroying many small canals.

(d)   Little involvement in management and contribution from farmers in terms of labour and finance to maintain the canals.

5.2.2   Technical Constraints
(a)   Generally, farmers have poor understanding of the nature of irrigation in terms of operations, inadequate equipment and financial resources.

(b)   Lack of proper maintenance programmes do affect the water supply and distribution to farmers.

(c)   Poorly constructed canals result into loss of water, water not reaching most farm plots i.e. limits the area which can be irrigated and hence magnifying the problem of land shortage in the area.

5.2.3 Policy Constraints (a)

(a)   Difficulties and delays in obtaining title deeds for the land area of Majengo have further magnified the problem of shortage of farm land.

(b)   The small or negligible saving by the project or scheme farmers make them unable to invest adequately in agricultural activities. Non-availability of credit is also a problem.

(c)   Inefficient marketing system and the poor performance of the cooperative society.

(d)   Transport bottlenecks. There are inefficient transport facilities for both the inputs (especially fertilizers) and output to the marketing centres.

A summary of the problems and solutions as pointed out by the respondents are summarized in Table 11.

Table 11: The Majengo Irrigation Project: Problems and solutions by the Surveyed Households

n = 270

Problem	Percent of Households	Suggested Solution	Percent of Households
Water distribution	58.2	Canal Improvement	42.3
Extension/Inputs	10.4	More extension services and input supply	10.4
Poor Leadership	10.0	Strengthen leadership	20.9
Transport	6.6	Agricultural infrastructure	14.8
Others	14.8	Others	11.6
TOTAL	**100.0**		**100.0**

Source: Survey Data, 1996

As noted above major problems of the project include poor water distribution due to lack of sufficient water, lack of adequate extension services and input supply and poor leadership. Obvious solutions to these problems are improvement of the canals, more extension services and input supply and strengthening of the leadership.
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5.3   Other Problems

Despite the fact that the scheme has had some positive effects, there are still some problems among the people in Majengo. Perceptions from the interviews revealed that people in Majengo have problems in acquiring even basic necessities. *56%* of the surveyed households reported that money was still their main problem. Thus even with the project, the incomes have not been raised substantially. Implicitly this means that the growth achieved in the study area has not significantly contributed towards poverty reduction. In order for the people of Majengo to attain growth that can lead to poverty reduction, the constraints noted above should be addressed effectively. Apart from the low level of incomes achieved, the other main problems facing the households are summarized in Table 12.

Table 12: Ranking of the Main Problems in Majengo (% of the surveyed
**   Households)**

n = 270

PROBLEM	RANKING			AVERAG E
	(1)	**(2)**	**(3)**	
Food	4.5	3.5	4.6	4.2
Clothing	1.5	2.5	2.5	2.2
Poor housing	12.5 '	14.5	19.3	15.4
Water	2.5	3.5	1.5	2.5
Children's education	6.5	9.5	9.6	8.5
Labour tor Agriculture	2.0	4.0	3.0	3.0
Health care	11.5	40.0	22.8	24.8
Money /poverty	55.5	14.5	15.2	28.4
Credit/Loans	3.5	8.0	21.3	10.9
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

Source: Survey Data, 1996

The other two main problems according to Table 12 are inability to pay for the health care services and poor housing. The .costs of educating children, loans or credit repayment are also serious problems.

5.4   Assistance Required

In view of the problems, the farmers in the area suggested a list of assistance which they thought the government can give them in an attempt to improve agriculture and therefore achieve the overall growth objective of poverty reduction. These are summarized in Table 13.

Table 13:   **Ranking of the Various Government Assistance to Improve Agriculture (% of Surveyed Households)**

N= 270

ASSISTANCE REQUIRED	RANKING			AVERAGE
	(1)	**(2)**	**(3)**	
More irrigation services	29.9	18.7	29.4	26.0
Land improvement facilities	13.4	20.9	10.2	14.8
Advice on new crops animal husbandry	0.5	I.I	0.0	0.5
Reliable market	19.8	18.2	21.4	19.8
Improve roads	0.0	2.7	4.3	2.3
Improve input supply	19.8	15.5	12.8	16.0
Provide input subsidies	13.4	19.8	11.8	15.0
Help improve environment	I.I	2.7	10.2	4.7
Others (unspecified)	2.2	0.5	0.0	0.9
TOTAL	**100**	**100**	**100**	**100**

Source: Survey Data, 1996

The farmers cited major assistance as more irrigation services, reliable marketing services, improvement in input supply, land improvement facilities and provision of some input subsidies. According to the interviewed farmers such assistance would help them increase their agricultural productivity and production, get higher incomes and hence reduce poverty in their areas.

6.0   CONCLUSIONS

The study investigated the role of small scale labour intensive irrigation technologies on poverty alleviation among small scale farmers in Majengo area. The main economic activity of the people is agricultural production with rice being the main crop. Rice is a high water consumer and therefore requires adequate and timely supply of water which in principle should ensure increased crop output. Given that the main economic activity of the people in Majengo is rice production, efforts aimed at poverty alleviation need to involve issues that will lead to **increased rice productivity.**

In Majengo area productivity per acre increased but not many farmers benefitted since water flow from the project did not adequately reach most of the plots. Only 470 or 12% of the total (3903) households are involved in the project and only 530 ha (15%) of the area's total land (3500 ha) or 24% of the cultivable (2230 ha) land is irrigated. Thus many people and a large part of arable land is out of the project with the implication of a continued low production. The problems summarized in chapter five partly contribute to the problem.

The study findings revealed that overall in Majengo area, poverty has not been significantly alleviated. There have been only little improvement in poverty related indicators (e.g increase in productivity, incomes, acquisition of assets and accessibility to social services). The housing conditions have almost remained the same when one compares before and after the adoption of the project with very little improvements being undertaken. The distance to the main social services and economic facilities have also not been reduced. In terms of expenditure patterns, 41% of the surveyed households said food still accounts for a larger, proportion. This is another indication that the people in the area are still poor.

The main reason for the current state of affair is the failure of the irrigation scheme to solve the problem of water distribution amongst the households' farm plots. Most farm plots are not adequately and timely supplied with water.

The following can thus be concluded:

(a) That at least from the theory and literature review it can be argued that the small scale irrigation schemes have a high potential of alleviating poverty since they lead to increased productivity and production which although not sufficient is essential for poverty alleviation. In Majengo area however this (poverty alleviation) has not been large due to several constraints (institutional, technical, managerial and policy related ones).

(b) Success on such project schemes are therefore dependent on solving the constraints. It is therefore recommended that the Ministry of Agriculture Livestock Development and Cooperatives should assist the people of Majengo to solve the noted problems so that the scheme could play its role of increasing agricultural production, in this case rice, and hence contribute to poverty reduction in the area..

Future research work in this area could among other things examine critically the adequacy and inadequacy of the irrigation policy of the Ministry of Agriculture, Livestock Development and Cooperatives particularly with regard to the solving of the problems facing such small scale irrigation schemes so that such schemes could contribute effectively to poverty alleviation.

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