AN ASSESSMENT OF THE SMALL-SCALE IRRIGATION TECHNOLOGY (TREADLE PUMP) IN ENHANCING AGRICULTURAL PRODUCTIVITY IN ZAMBIA

\ Thesis Presented To The Department Of Agricultural Economics And Extension Education of The University Of Zambia,

BY

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In partial fulfilment of the requirement for the degree of bachelor of Agricultural sciences

ABSTRACT

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This study was conducted in Katuba and Chanyanya areas on the outskirts of Lusaka. The sample constituted of 40 small-scale farmers who were interviewed. The study was aimed at evaluating the small-scale irrigation technology as regards its appropriateness to the farmers' conditions. The study had three objective areas. The first was to assess the appropriateness of Treadle pumps to the area's conditions. The second objective was to assess its contribution to the farmer's welfare, and thirdly to asses the IDE's effectiveness of information dissemination.

The survey revealed that over 100% were in favour of the technology and cited lack of electricity and plenty of water in the areas as reasons for its appropriateness. Further, the lack of financial resources for the operation of more advanced technology made the Treadle Pumps attractive.

Sixty percent of the respondents benefited from the loan facility. However, most women did not benefit because of the cultural reasons and therefore felt that it was more adapted to men.

However, generally very few people have benefited from Treadle Pumps because they lack finances to purchase them for cash. This has also been aggravated by IDE's lack of capacity to loan pumps on a large scale.

Further IDE's lack of funding has also affected its marketing strategy as it fails to advertise adequately.

ACKNOWLEDGEMENTS

Firstly, I would like to sincerely thank my supervisor Mr G. Jere for his untiring guidance. I particularly wish to thank him for his advice in the evolution of this research study.

Special thanks also go to Dr T. Kalinda for his valuable suggestions and corrections.

I' am also grateful to Mr Ntambo for the assistance and hospitality he showed me during data collection in Katuba and Chanyanya.

Lastly I would like to show my heartfelt gratitude to Mr J. Mulolo, Hedges and Mutengo for all encouragements and computer services they provided.

I dedicate this report with much love and gratitude to my parents, my brothers and sisters for their love and unfailing support and belief in me. I also dedicate it to my friend Mulenga and the class of 2002.

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LIST OF ACRONYMS

IDE	International Development Enterprises
MAFF	Ministry of Agriculture, Food and Fisheries
ASIP	Agriculture Sector investment Programme
FAO	Food and Agriculture Organisation
CIDA	Canadian International Development Agency
GTZ	German Assistance to Zambia
JICA	Japanese International Co-operating Agency
FICAH	Food Industry Crusade against Hunger

CHAPTER 1

1.0 INTRODUCTION

This is a research paper on the promotion of small-scale irrigation technology in Zambia. The technology's appropriateness to the country's conditions and on how it has influenced small-scale agricultural productivity was looked at. To achieve this, a brief background of the development of small-scale irrigation in Zambia was given.

1.1 Background

The Zambian government shortly after independence made frantic efforts to end the nation's reliance on a relatively small number of European commercial farmers who produced most of the marketed agricultural produce and set out to expand agriculture on the large scale. This initiative was also a means of transforming the Zambian economy from a single propelled sector i.e. mining to a multi-sector economy. To this effect the programme of producer co-operatives was initiated in 1965 that was to be a vehicle aimed at bringing hundreds of thousands of small-scale farmers into the cash economy by producing marketable surpluses. By 1969 this strategy of restructuring the agriculture sector had failed because producer co-operatives could not repay the loans. This failure was partly attributed to co-operatives perceiving loans as incomes and not as investment and therefore could not utilise this capital productively.

In the period between the early 1970s and early 1980s, Zambia's population growth rate increased from 2.7 percent to 3.4 percent per annum while food production grew slowly and actively dropped in the late 1970s. Food self-sufficiency drastically

declined from 97 percent of the total demand in the period 1964-1966 to only 79 percent in the period 1978-80s as a consequence. Furthermore food imports raised to over 10 percent of the country's foreign exchange earnings. In 1980 the demand for food imports rose to 41 percent due to changing consumption habits of the urban population, particularly demand for wheat and maize. One cause of the shortfall in food production has been erratic rainfall, although this may only partially explain the situation of acute food shortage; the government has however identified it as one of the major causes of the nation's food problem. Thus among those concerned with the formulation of agriculture policies there has been a growing concern in the potential role that irrigation could play in improving food productivity, food security and meeting the local food demand thereby reducing the dependence on food imports.

Despite the technical and managerial problems that could be faced by small-scale irrigation and also the costs involved the expansion of small-scale irrigation in meeting the demand for food was inevitable. To mitigate the downward trend in food production and possibly alleviate poverty, the government, through the Ministry of Agriculture, Food and Fisheries (MAFF), in collaboration with co-operating partners through the Agriculture Sector Investment Programme (ASIP) initiated by the World Bank in 1996 formulated action plans to boost small-scale farming. These plans involved the principle of price liberalisation and capital investment in irrigation including the building of vital infrastructure such as feeder roads, communication systems and improvement of research centres in rural Zambia. Furthermore in 1998 there was a tax rebate on all imported agricultural equipment from 17.5 percent to 15 percent (ZPA, 1998).

In 1997, the International Development Enterprises (IDE) which is an American, non-profit making development organization, whose headquarters is in Denver, Colorado was established under the technical support of the United Nation Food and Agriculture Organisation (FAO) at the invitation of MAFF. IDE promotes a business approach to solving international development problems.

IDE has been active in promoting appropriate and low cost irrigation equipment in less developed countries. Zambia is IDE's first country of operation in Africa. IDE's mission to Zambia is to improve the social, economic and environmental conditions of the poorest people by identifying and marketing very low cost, sustainable and appropriate technologies that can be sold at a fair market price.

IDE has the following objectives.

- To identify, manufacture and market appropriate irrigation technology suitable for Zambian conditions.
- To provide access and opportunity for low cost irrigation technology as well as to enhance agricultural productivity in rural areas.
- To mobilise communities, educate and train small-scale farmers in operating and maintenance of treadle pumps.
- To train farmers in farm management, agronomy, water conservation and sanitation.
- To link small-scale farmers to various agri-business enterprises for direct export sales. This leads to the establishment of out grower schemes, where farmers grow for particular assumed markets. In this way it breaks the cycle of poverty and foster self-sufficiency among farmers.

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IDE believes that the technology can allow farmers to grow crops throughout the year thus enabling them to generate enough income for themselves. This income can service loans as well as retaining substantial profits. IDE today runs a number of small-scale irrigation projects, one of them being Katuba project which is about 30 Km north of Lusaka and complimentary to ASIP. IDE has contracted and trained local small-scale manufactures to manufacture treadle pumps at a low cost margin to make them affordable to farmers. Such companies include SAMS, SARO Agric. KNIGHT engineering and others.

IDE receives both logistical and financial support from donor agencies. The major funding agency is the Canadian International Development Agency (CIDA). Others are German Technical Assistance to Zambia (GTZ), the Japanese International Co-operating Agency (JICA), the Food Industry Crusade against Hunger (FICAH) and the Rotary International.

1.2 Problem statement

Even though over half of Zambia's land is arable and potentially irrigable (review of commerce and agriculture, 2001), currently the use of irrigation is relatively small countrywide. Although it is purported that the treadle pump has the advantage of reducing the farm labour requirement by 80% and at the same time increasing the irrigated area four fold to an average of 1 Lima/farmer, it's been observed that the majority of small-scale farmer still employ traditional methods of irrigation such as the watering can and buckets which slows productivity. Worse still some farmers do not even produce at all in the dry season because of irrigation problems.

Furthermore, despite the support rendered by the government, donor agencies and NGO's in promoting IDE's irrigation project, not many small-scale farmers have accessed the technology as only about 3000 have bought treadle pumps out of the estimated over 600,000 beneficiaries targeted by 2010. The purpose of this study thus was to:

- Determine the extent to which the technology is accepted.
- Assess the convenience of the technology in as far as operating and repairing are concerned.
- Evaluate the marketing strategy of IDE to determine its efficiency and effectiveness.
- Find out the constraints faced by farmers in adopting and acquiring the technology

1.3 Rationale

The choice of this study was based on the interest to have an insight on the development of small-scale irrigation in Zambia. Accordingly, findings of this study have brought out ways and means of improving the International Development Enterprises' marketing strategy and will have given an insight on future small-scale irrigation projects.

1.4 Study objectives

The general objective of the study was to evaluate the extent to which IDE's treadle pump irrigation project has provided small-scale farmers with appropriate irrigation technology, increased agricultural performance and has led to higher income opportunities among small-scale farmers

The specific objectives were to:

i. To determine the extent to which the treadle pump irrigation technology has been accepted as appropriate to the Zambian conditions as regards convenience and maintenance.

ii. To assess the contribution of treadle pump irrigation technology to the welfare of small-scale farmers.

iii. To assess IDE's effectiveness regarding information dissemination about treadle pumps.

CHAPTER 2

2.0 LITERATURE REVIEW

Africa has by world standards, very little irrigation. There are some physical reasons for this, but they can by no means account for the low levels of irrigation. The irrigation sector is struggling in most cases with; disappointing yield, disappointing rates of new developments, high capital cost and low-grade maintenance.

"The early story of irrigation developments is buried in the oblivion of ancient un recorded history. The first are of irrigation, as an aid to agriculture must have been made about the same time as man adopted himself to the social way of life. Under the climatic conditions prevalent in some parts of the world, it is clear that irrigation must have been a pre-requisite to organised society" (FAO and UNDECO, 1973).

History is replete with references to the practice of irrigation from wells, tanks, and canals. Even today, there are some striking examples of irrigation works built hundreds, and in some cases thousands of years ago in continental China, Egypt, India, Israel, Italy and in some other countries. Li ping built a multi-purpose scheme for flood control and irrigation on the Mukiange river and around 2200, year ago Egypt claims to have had the worlds oldest dam more than 100 metres long and 12 meters high, built 5000 years ago to store water for drinking and irrigation. Basin irrigation introduced at the Nile about 3300 BC still has until very recently played an important role in Egyptian agriculture. Irrigation works in the valley of the Euphrates and Tigris must have supported several ancient civilisations in Mesopotamia. Well-

tanks and inundation canals from rivers are well known sources of irrigation water in India (Ibid, 1973)

Africa requires the benefit of irrigation technology more than any other continent because of its geomorphologic and climatic circumstances that makes it the driest continent, apart from Australia. Even where annual rainfall is adequate, it often occurs in concentrated wet seasons whose duration is rather shorter than crops require. Irrigated agriculture has a small place in sub-Saharan African economies, except for Sudan and Madagascar. For instance, in Madagascar irrigated land occupies 50% of cultivated area and Sudan 75%. In all other sub-Saharan countries the figure is below 10% and in most cases below 3%. In short, irrigation is a special unusual way of life, for all but a handful of African countries. Considering the light of Africa's total resources, the picture is gloomy since the 2% of land that would benefit is in fact not irrigated. Africa irrigates about 0.3% of its total land area; however, these macro-statistics show inequalities within Africa (Washington, 1978).

From the foreign literature it can be observed that the greater existing irrigation activity is carried out in the Northern and Southern extremes of Africa, 55% of all irrigated land in Africa is in the main Nile valley states Egypt and Sudan, 15% in Mediterranean countries like Morocco, Algeria, Tunisia and Libya, and only 14% in South African and Zimbabwe. If we add to this 5% of Madagascar, only 10% will remain of all Africa's irrigation in the vast area between the Sahara and the Zambezi. Most of this is either in Somalia or along the major rivers of West Africa, the Niger, Senegal and Gambia (The World Bank report, 1981).

The introduction and development of irrigation in Zambia will involve a decision to develop and use a non-renewable water resource. The innovations of irrigation will offer numerous rainfall results in Zambia. However, it is physically possible to produce almost all grains and grasses for livestock by applying irrigation. Acceptability of irrigation may involve conditions, which influence resource use because of people's culture or social attitude. In many places in Zambia, this may not be a constraint apart from the predominant fishing region. To be economically attractive irrigation must increase the overall efficiency and increase the present worth of the investment. It must prove more desirable, irrigation will lower the degree of risk or hazard from weather in the drier southern parts of the country and it would also increase the yields per hectare and the diversity of the overall cropping system. The irrigation farmer will be assured of a reasonable annual income and therefore can do more long term planning. A farmer can shift operating costs to a fixed capital asset thus acquiring potential collateral for obtaining long-term loans, stability and the appearance of the permanent enterprise (NORAD, 1995).

The basis for development of irrigation agriculture has been laid by the research conducted at the national irrigation research station, at Nanga on Kafue flats. This research has developed cropping patterns for different systems of irrigation agriculture including Soya bean, wheat and cotton rotating for large and medium scale farming on the plateau and the Zambezi/Gwembe valley respectively. Foster (1953) gives the first description of successful irrigation when an area of 16 hectares on the Kafue river near Mazabuka was used to grow potatoes and onions by furrow irrigation in 1951, enclosing 285 hectares, it was divided into two large farms on 60 hectares each managed by Europeans with seven (7) small-scale farmers.

The major irrigation development in Zambia is Nakambala sugar estate, which is mainly on land at the edge of the flats near Mazabuka. Tate and Lyle established it in 1964, which at the same time, between 1964 and 1969; sugarcane trials were being conducted at a pilot polder. The first commercial crops were planted and a refinery built in 1966 – 67. The irrigation system consists of canals and night storage reservoirs. Most of the area is then irrigated by gravity flow, about 800 hectares of the largest irrigation enterprise in Zambia.

In 1980, an area of the 1900 hectares adjacent to Nakambala sugar estate was ear marked for irrigation development of out grower sugarcane production, involving smallholder units of 4 hectares with joint financing by CDC. The Kaleye Small Holder Company Ltd. a non-profit making enterprise managed the project, ensuring good husbandry practices and monitoring the effective distribution of water supplied by Nakambala Sugar Estate (Wood, 1984).

Another area of early irrigation in Zambia was Mpongwe development Project (M D P) located in the south of Copper belt Province. Zambia covers large expanse of arable land with fertile red soils highly suitable for irrigated agriculture, practically wheat production. Hydrological survey revealed the existence of an extensive aquifer that could provide good quality water for irrigation of about 12000 hectares of wheat. However this project, started with 450 hectares under wheat. The company also plants over 200 hectares of coffee using irrigation. (Mills et al 1979).

There are a number of other governmental mission sponsored irrigation schemes that were established in Zambia. These are all less than 100 hectares: Munushi Banana Development Project, Luapula Province, with 87 hectares of banana for sale in the Copper belt. Chunga Irrigation Scheme in Lusaka Province, producing vegetables for Lusaka. Buleye, Melina and Siatwind Scheme near Sinazongwe at Lake Kariba. Chirundu Irrigation Scheme growing banana and papaw with mission support for sale in Lusaka.

It is however sad to note that most of these concerted efforts have actually died off. This has been a deterrent in the development of irrigation at national or formal sector level.

There are, however, other constraints in the development of irrigation in Zambia. The first one has to do with the capital-intensive nature of irrigation. Capital is scarce in Zambia and interest rates are high. Consequently, the economic returns from capital-intensive enterprises, which may include irrigation, have to be high to cover costs. Thus unless crop yields are high and other production costs are low, irrigation may not be economically viable.

The major constraints of irrigation are institutional weaknesses within the MAFF with almost no specific section for small-scale irrigation. Staff with such expertise is readily available in rural areas and a number of irrigation projects have been studied but little consistent and practical analysis has been undertaken that could be used to extrapolate results to other projects concerning small-scale irrigation (NORAD, 1995).

CHAPTER 3

3.0 METHODOLOGY OF THE STUDY

3.1 Target population

The target population for the study comprised small-scale farmers from Katuba, chanyanya/chikupi, chongwe and other surrounding areas within Lusaka. These areas are located north, south and east of Lusaka respectively.

3.2 Sample

Because of the un-orderly manner in the set up of village habitats coupled with the distance between farms, a project sample of only 40 respondents was purposively picked and interviewed.

3.3 Method Of Data Collection

The data collected consisted of both primary and secondary data. Secondary data was obtained from IDE literature such as brochures, newsletters and reports while primary data was collected by the use of structured questionnaires. The questionnaires contained both close-ended and open-ended questions. Personal interviews were also employed. The advantage with personal interviews was that any ambiguous questions were clarified on the spot. Observations were also made.

3.4 Method Of Data Analysis

The data collected was analysed by the use of a computer statistical package for social sciences (SPSS) software. Descriptive statistics were generated and comparisons made between and among selected variables. Frequencies thus were run and Cross-tabulations were also done to compare relationships between the variables.

CHAPTER 4

4.0 STUDY RESULTS AND INTERPRETATION

TABLE ONE: Demographic characteristics of farmers

CHARACTERISTIC	NUMBER	PERCENTAGE
Gender		
Male	33	82.5
Female	7	17.5
Total	**40**	**100**
Age		
20-29	9	22.5
30-39	13	32.5
40-49	13	32.5
Above 50	5	12.5
Total	**40**	**100**
Marital status		
Single	1	2.5
Married	38	95
Widowed	1	2.5
Total	**40**	**100**
Education		
Primary	17	42.5
Secondary	17	42.5
Tertiary	6	15.0
Total	**40**	**100**
Occupation		
Farmers	27	67.5
Teachers	5	12.5
Businessmen	8	20.0
Total	**40**	**100**

Source; Survey Data.

4.1 Demographic Characteristics of Farmers

Out of the 40 small-scale farmers who had answered the questionnaires 33 (82.5%) were males and 7 (17.5%) were females. Of this 9 (22.5%) were aged between 20 and 29 years, 13 (32.5%) were aged between 30 and 39 years, 13 (32.5%) were between 40 and 49 years of age while the remaining 5 (12.5%) were above 50 years. Of the 40 respondents, 38 (95%) were married, one (2.5%) was single and one (2.5%) was widowed. The educational levels were as follows, 17 (42.5%) had attained primary education, 17 (42.5%) had attained secondary and only 6 (15%) had attained tertiary education. Occupations were divided into three major groups of which 27 (67.5%) were farmers, 8 (20.0%) were in business and 5 (12.5%) were teachers. 35 (87.5%) of these had only one Treadle pump and the remaining 5 (12.5%) had two pumps each.

4.2 Appropriateness of Treadle Pumps

The first objective was assessed by evaluating the five characteristics of an innovation as perceived by farmers (M. Rodgers). These are Relative advantage, Compatibility, Complexity, Trialability and observability. Relative advantage refers to the degree to which an innovation is recognised as better than the object it intends to replace. The pump therefore was compared to the buckets and all the respondents favoured the pump because of the following reasons; 20% said that it is less tiresome as it doesn't require much movements, 14% said that it irrigates faster and the remaining 18% attributed its advantage to increased hecterage. Most farmers could therefore now grow up to one Lima while others reached three Limas as compared to when they could only manage to irrigate less than a Lima. The table below shows the percentages of the responses.

TABLE TWO; the advantage of Treadle pumps over buckets.

	Frequency	Percent
Less tiresome	8	20.0
Increased hecterage	18	45.0
Irrigates faster	14	35.0
Total	**40**	**100.0**

SOURCE; Survey data

Farmers perceived the innovation as compatible in that it was less demanding in the manner in which it was operated. It is portable and very easy to operate and manage. It irrigates faster because the flow rate is high such as 1.5-2 litres per second. The pump does not require sophisticated mechanical knowledge for its operation. It is simple equipment that can be fixed by the farmers themselves when it broke down. Servicing is cheap as spare parts are available in local areas i.e. pieces of wood. The pumps also do not need fuels or oils for lubrication but are foot powered, thus only energy is required. This therefore, also fits in with trialability as the innovation could be tried on a larger scale without incurring many costs. This is shown by the following responses from the respondents.

TABLE THREE; Cost of operating and maintaining the Treadle pumps

	Frequencies	Percent
Cheap	38	95.5
Reasonable	2	5.0
Total	**40**	**100.0**

SOURCE; Survey data

TABLE FOUR; ***Respondent's Assessment of the Appropriateness of the Treadle pumps technology By Occupation.***

Occupation	Plenty of water	No electricity	Plenty of water and no electricity	Row total
Farmers	18	4	5	**27**
Businessmen	4	1	3	**8**
Teachers	2	0	3	**5**
Column total	**24**	**5**	**11**	**40**

SOURCE; Survey data

In the next section, the study assessed the beneficiaries' views about the appropriateness of the Treadle pumps in relation to their conditions; all the 40 respondents agreed that the technology was suitable for the areas conditions. Twenty-four (60%) attributed the suitability to the abundance of water in the area, of these 18 were farmers, 4 were in business and 2 were in the teaching profession. Of the 5 respondents who said that the pumps were suitable because of lack of electricity in the area, 4 were farmers and only one was in business. Out of the 11 respondents who said that the technology was suitable for the area because there is plenty of water and no electricity, 5 were farmers, 3 were businessmen and the other 3 were teachers.

This implies that most beneficiaries have welcomed the Treadle pumps simply because the areas have a very high water table which makes it easy to sink wells and the other reason is that the areas are sufficiently endowed with a good number of streams which run almost all year. The lack of electricity for electric pumps, money for running fuel pumps also makes the treadle pumps attractive to poor farmers.

The study then tried to assess what kind of water source the beneficiaries of the Treadle pump technology used for irrigation purposes. Most of the respondents in

Katuba and chanyanya had said that they made use of both the stream and water wells and the water sources were able to sustain them for a period between eight (8) months and one (1) year hence making the Treadle pumps technology appropriate for the areas conditions.

4.3 Accessibility to Treadle Pumps

TABLE FIVE; ***Access to Treadle Pumps as a factor of Sex.***

	Cash	Hire purchase	Loan	Row Total
Male	14	4	15	**33 (82.5%)**
Female	2	2	3	**7 (17.5%)**
Column Total	**16**	**6**	**18**	**40**

SOUCE; Survey data

In terms of the mode of purchase, 16 respondents had bought the pumps on cash basis of these 14 were males and 2 were females. Out of the six respondents who bought the pumps on hire purchase, 4 were males and 2 were females. And of the 18 respondents, who had acquired pumps through loans, 15 were males and 3 were females. In total 82.5% of the respondents who had Pumps were males and only 17.5% were females.

The study found out that one's sex had no influence on accessing the Treadle pump technology therefore; both men and women had equal access to Treadle pumps through the loan facility. The implication of this is that the IDE's project on providing access and opportunity for low cost irrigation technology took into account gender equality in its effort to break the cycle of poverty and foster self-sufficiency among small-scale farmers. However, despite IDE considering gender in its effort to enhance irrigation development among small-scale farmers, many females never benefited from the project because of the following reasons; most females were in

male-headed households, which under customary law property belong to man. The other vital reason is that of culture and values. The manual aspect involved in operating the foot operated and the nature of the pump made women feel that the pumps were biased toward men.

TABLE SIX; ***Mode of purchase as a factor of one's occupation.***

	Cash	Hire Purchase	Loan	Row Total
Farmers	7	4	16	**27**
Businessmen	4	2	2	**8**
Teachers	5	0	0	**5**
Column Total	**16**	**6**	**18**	**40**

SOURCE; Survey data

From the above table, out of the twenty- seven (27) respondents involved in farming seven (7) said they had bought the pumps on cash, four (4) on hire purchase, and sixteen (16) through loans. Out of the eight (8) businessmen, four (4) had paid cash for the Treadle pumps; two (2) had bought through hire purchase and two (2) on loan. As for the teachers, all the five (5) had paid in cash and no one acquired the treadle pump on either hire purchase or loan.

From the above statistics, it can therefore be inferred that the IDE afforded most farmers an opportunity to buy Treadle pumps through loans since many farmers did not have sufficient income due to the seasonality of earnings. The implication of this is that most farmers could have had no access to the Treadle pump technology had it not been for the loan facility simply because they had limited incomes.

In this section, the study set out to evaluate how the respondents perceived the price of the Treadle pumps. This was imperative in that unless the beneficiaries could

afford the Treadle pumps they are not likely to have access to small-scale irrigation technology. Out of the thirty three (33) male respondents, twelve (12) had the view that the price for Treadle pumps were cheap, nineteen (19) perceived the price as reasonable and only two (2) had said that the price was costly. Out of the seven female respondents, two (2) perceived the price as cheap and five (5) felt that the price was reasonable.

The implication of this is that most farmers afforded the Treadle pumps due to the fact that IDE had developed a mass marketing strategy that was aimed at affording most small-scale farmers an opportunity to have access to small-scale irrigation technology through a loan facility and at no profit.

4.4 Benefits from Treadle Pumps

TABLE SEVEN; ***Respondents Attributed Benefits from Treadle pumps by occupation***

	Improved financial status	Improved standards of living	Increased crop yield	Row total
Farmers	9	6	12	**27**
Traders	4	1	3	**8**
Teachers	0	5	0	**5**
Column total	**13**	**12**	**15**	**40**

SOURCE; Survey data

In this section, the study set out to assess the beneficiaries attributed benefits or gains from using the Treadle pumps. All the forty (40) respondents agreed that they had benefited in some way, of the thirteen (13) who had benefited financially (profits) nine (9) were farmers, four (4) were businessmen and no teachers, out of the twelve

(12) who had benefited in terms of food security, six (6) were farmers, one (1) was a businessman and 5 were teachers and out of the fifteen (15) who had benefited in terms of increased crop yield 12 were involved solely in farming, three (3) in business and none (0) in teaching.

The implication of this is that most Treadle pump users were now able to grow crops throughout the year, unlike previously when they had solely depended on rains. Businessmen were able to incur financial benefits simply because they invested a lot in agriculture inputs to produce surpluses as opposed to most farmers with meagre resources.

The study further tried to find out what the small-scale farmers in these areas were using Treadle pumps for. Out of the forty- (40) farmers, three (7.5%) had used the Treadle pumps for growing crops only for consumption; thirty-six (90.0%) for both home consumption and for sale and only one (2.5%) grew crops strictly for sale. From the foregone statistics, the study accordingly established that the introduction of Treadle pumps improved nutrition and income levels for most beneficiaries in the areas. Most farmers in Katuba, chanyanya and chongwe grew Rape, Tomatoes, and cash crops such as Baby corn, paprika and Coffee.

4.5 Information Dissemination

TABLE EIGHT; ***Appreciation of IDE's Information Services as a Factor of Ones Level of Education.***

Level of education	Very Helpful	Quiet Helpful	Row Total
Primary	11	6	**17**
Secondary	14	3	**17**
College	5	1	**6**
Column Total	**30**	**10**	**40**

SOURCE; Survey data

The study then evaluated the extent to which the Treadle pump users appreciated the IDE's information services. This was necessary in that unless the beneficiaries appreciated the technical information they were unlikely to make full benefit of the pumps. Accordingly the following question was asked; how helpful had been, the technical information rendered by the IDE on Treadle pumps? From the above table, of the 17 respondents who had primary education eleven (11), said that they highly appreciated the information in that it was very helpful as regards to the use and maintenance of Treadle pumps while six (6) said it was quite helpful. Fourteen (14) of the seventeen (17) who had attained secondary education had also highly appreciated the technical information while only three said it was quite helpful. Finally, of the six (6) who had attained college education five (5) felt that the information services were very helpful and only one (1) did not appreciate much.

The study went on to assess how the beneficiaries came to know about the Treadle pumps. This was important since without an effective information system on Treadle

pumps very few farmers were likely to benefit from the project. Out of the forty (40) beneficiaries, twenty (50%) had known about Treadle pumps through the friends, seventeen (42.5%) through the IDE and three (7.5%) through the electronic media. From the statistics, therefore, it can be inferred that social interaction played a major role in the dissemination of information on small-scale irrigation technology complimenting the official method. However, this led to most farmers receiving inadequate information on the technical aspects of the irrigation technology.

4.6 IDE Officials

The total number of IDE officials to which questionnaires were administered was eight (8); of these three (3) were single and five (5) were married. Their ages ranged from 26 to 34 and they were all males. Amongst the respondents one (1) was in management another respondent was in mid-management and six (6) were field officers, only two (2) had university degrees, the remaining six (6) were college graduates.

The study wanted to establish the degree to which the officials felt that the introduction of Treadle pumps received favourable responses. Five (5) of the eight (8) respondents said that the responses were extremely good, while three (3) said it was quiet good.

It then tried to solicit what measures the staff felt could be put in place in order to meet the targeted 600,000 beneficiaries of small-scale irrigation, of the total eight (8) respondents one (1) management official felt that there was need to embark on recruiting more extension officers, lobby for more funds from co-operating partners and the need to involve other organisations in promoting small-scale irrigation, the coordinator had the same view. Out of the six (6) field staff three (3) had the view that

there was need to recruit more extension officers, one (1) said there was need to lobby for more funding and the other two (2) suggested that there was need to work in conjunction with other organisations in the promotion of small-scale irrigation. The implication of this is that the field staff favoured the need for more funding and collaboration with other organisations because they had more insight of the problems they face in reaching farmers than those in management.

Further the study went on to try to establish the official's views on whether the high inflation rates currently being experienced in the country had affected the operations of the organisation. Out of the eight (8) respondents, six (6) who included the management official, the coordinator and four (4) field officials said that high inflation rates had an effect on the operations of the organisation while the remaining two (2) field workers felt that the organisation was not so much affected by the high inflation rates.

The study then tried to find out what measures the staff felt could be embarked on in order to cushion the effects of inflation on the promotion of Treadle pumps. Out of the six (6) officials all who had said that high inflation rates had an effect on the operations of the organisation, the management official and the coordinator suggested that for the effects of inflation to be cushioned there was need to lobby for more funding from cooperating partners and to request for tax concessions especially the exemption from Value Added Tax (VAT). The remaining four (4) field officials had the view that there was need for more funding while the other two (2) remained neutral on the matter. In conclusion, it is most evident that for the organisation to over come the effects of inflation it needed more funding

In this section, it was desired to find out whether the organisation received adequate funding for promoting small-scale irrigation in Zambia. Out of the 8 officials, the management official and the coordinator had said that the organisation did not receive enough funding, 3 of the field officials had the same view and the remaining 3 had said that they were not sure as to whether the organisation received adequate funding or not. The study further tried to establish the official's views on measures to be taken in order to cushion inadequate funding. Out of the 5, who had said that the organisation did not receive adequate funding, the 3 officials' views on measures that were to be taken were that there was need to encourage farmers to come up with cooperatives were local people could be empowered with knowledge about Treadle pumps and use them to reach out to others hence, reducing the dependence on the IDE extension officials. As for the management official and the coordinator they said that there was need to engage local industries in the production of Treadle pumps instead of importing them from Indonesia and Bangladesh. However, 3 officials had taken a neutral stand because they had no knowledge of the organisations financial system.

Finally, the study assessed the extent to which the officials felt that information dissemination on Treadle pumps was effective. Out of the eight (8) respondents three (3), of which included the management officials and one (1) field official said that the IDE information dissemination method was very effective and the remaining five (5) field officials said that the method was quiet effective. From these results, it can be deduced that those who work in the field had said that the method was quiet effective because they had more knowledge of what transpired in the project area as opposed to those in the management team.

CHAPTER 5

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The promotion of small-scale irrigation technology in Zambia was initiated in 1997, upon the establishment of the International Development Enterprise (IDE), a non-profit non-governmental organisation (NGO) with the technical support of the Food and Agriculture Organisation (FAO). The main objective of the IDE was to boost agriculture productivity through the mass marketing of low cost and appropriate irrigation technology. The project was to benefit more than 600,000 small-scale farmers in Zambia by the year 2010. So far, at least 3000 Treadle pumps have been sold to small-scale farmers by the IDE in areas such as Katuba, Chanyanya, and many other rural communities.

Treadle pumps have proved to be a worthwhile investment amongst small-scale farmers since the technology allows a farmer to produce crops through out the year and the income generated could be used to pay back loans and make enough profits. However, out of the targeted 600,000 farmers in Zambia, only about 3000 have benefited from the project, this is so because of economic instability especially fluctuations in the exchange rates have grossly affected the organisations marketing and planning strategies thus making the organisation operate under difficult conditions.

The other problem behind the failure of the IDE to reach out to most small-scale farmers was its lack of capacity to effectively disseminate information on Treadle pumps to most farmers hence making very few farmers have access to small-scale irrigation technology. In the research findings, it was noted that many of the small-scale irrigation beneficiaries came to know about the Treadle pumps through the IDE and the people themselves. The question however, that remains is on how effective and accurate these media of channelling information are.

Despite the various modes of purchase, out of the 40 Treadle pump users the majority of those who had benefited from the introduction of the Treadle pumps were males.

This could be attributed to the fact that most females were under male-headed households of which under their customary laws property belongs to males.

In the research findings, it was noted that many of the small-scale irrigation beneficiaries came to know about the Treadle pumps through the IDE and the people themselves. The question however, that remains is on how effective and accurate these media of channelling information are.

Amongst the Treadle pump users, occupation had an effect on the mode of purchase in that most Businessmen and Teachers had purchased Treadle pumps on cash as compared to the majority of those solely involved in farming who largely depended on loans. This could be attributed to the fact that Businessmen and Teachers tend to have reliable sources of income than the farmers who largely depend on their produce as the source of income.

Amongst the Treadle pump users those who were in Business had benefited financially (made profits) while most full-time farmers had benefited in terms of improved standards of living. Therefore, occupation had an impact on the kind of benefit for reasons that Businessmen invested a lot of resources in crop production that enabled them to produce surpluses as opposed to full-time farmers who mostly had meagre resources.

According to the findings, the education level had an impact on the beneficiary's appreciation and understanding of the IDE information services in that those who had primary education had a lower appreciation of the information being provided by the IDE unlike those with secondary and college education. This was so simply because most of the IDE field officials were not all that conversant with the local language thus they tended to use English terminologies when addressing the farmers.

On the part of IDE officials, the majority of the official's felt that there was need to increase the number of extension officers to enable the organisation reach out to more beneficiaries. This was so because field officials played a cardinal role in the implementation of the organisations marketing strategy. Amongst the IDE officials, position had an impact on their views on the effectiveness of the organisations

information dissemination strategy in that most field officials felt that the strategy was not all that effective. This was so because the field officials were the actual people who reached out to the farmers and had an insight of what takes place in the project areas.

Finally the IDE's project on Treadle pump irrigation technology has been fairly accepted as appropriate to Zambian conditions. It has benefited a good number of small-scale farmers who use the technology to grow crops through out the year both for sale and consumption. However, the project has faced a number of notable problems such as poor funding, ineffective information dissemination, high inflation rates and lack of logistical support from government.

5.2.0 Recommendations

5.2.1 COOPERATION WITH OTHER ORGANISATIONS

There is need for the IDE to collaborate fully with other NGOs and the government through the Ministry of Agriculture and Cooperatives and get involved in the noble cause of reaching out to as many small-scale farmers as possible by rendering both technical information and logistical support. This is cardinal because the IDE alone does not have the capacity to achieve this.

5.2.2 CREDIT FACILITIES

Loan facilities should not only be restricted to the provision of Treadle pumps but should also be provided in form of sinking boreholes for the small-scale farmers. This would enable farmers especially those upland to use the Treadle pumps even in the dry season.

5.2.3 INFORMATION DISSEMINATION

The IDE should take up the responsibility of ensuring that people are enlightened on the importance of Treadle pumps through the use of appropriate local languages on both the media and by IDE field officials so that the beneficiaries are provided with the right and most accurate information of which most farmers despite disparities in education levels can fully appreciate.

5.2.4 APPROPRIATE LANGUAGES

IDE should make use of appropriate local languages in the marketing materials they use in order to reach many people besides English, which is often used.

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APPENDIX ONE

QUESTIONNAIRE

SECTION A:

Background information:

1. AGE (last birthday) _____
2. Sex
   a. Male ( )
   b. Female ( )

3. Marital status
   a. Single ( )
   b. Married ( )
   c. Divorced ( )
   d. Separated ( )
   e. widowed ( )

4. Education attainment
   a. Primary ( )
   b. Secondary ( )
   c. College ( )
   d. University ( )

e. None ( )

5. Occupation _____

SECTION B:

TREADLE PUMP USERS (Small-scale farmers only)

6. How many treadle pumps do you have?

_____

7. How did you acquire the Treadle pump?

Cash ( ) Hire purchase ( ) Loan ( )

8. In your view, is the price of a Treadle pump affordable?

Yes ( ) No ( )

9 what are you using the Treadle pumps for?

Home consumption ( ) home consumption and for sale ( ) for sale ( )

10. In your view, have Treadle pumps been suitable for your area's conditions?

_____

_____

11. What kind of water source do you use for irrigation?

Well ( ) Stream ( ) Well and Stream ( )

12. For how long does your water source sustain you?

_____

13. What do you grow that is irrigated with the Treadle pump?

Rape ( ) Baby corn ( ) Coffee ( ) Any other ( )

14. Do you feel that the treadle pump irrigation system is better than the traditional systems?

Give reasons

_____

_____

15. Has the use of Treadle pumps improved your agricultural yield?

Yes ( ) No ( )

If yes to question 15 how have you benefited?

_____

_

16 How do you find operating a Treadle pump?

Convenient ( ) Tiresome ( )

17. Is a Treadle pump portable?

Yes ( ) No ( )

18. In your own view, how is the cost of maintaining a Treadle pump?

Cheap ( ) Reasonable ( ) Costly ( )

19. How did you come to know about the Treadle pump?

a. Through friends

b. Through IDE extension officers

c. Through the media

d. Through the IDE extension officers and the media

e. Through the government

20. Have the IDE extension officers been rendering you with information regarding Treadle pumps?

Yes ( ) No ( )

21. If yes to question 21 what kind of information

_____

_____

22. Are you happy with IDE's services?

Very happy ( ) Quiet happy ( ) Not happy ( )

23. How helpful has this information been to you?

Very helpful ( ) Quiet Helpful ( ) Not helpful

24. Apart from the IDE, which other organisation has been promoting small-scale irrigation in your area?

Agriflora ( ) Crusa ( ) None ( )

IDE STAFF ONLY

SECTION A

Background information

1. Age (last birthday) _____
2. Sex
   a. Male ( )
   b. Female ( )

3. Marital status
   a. Single ( )
   b. Married ( )
   c. Divorced ( )
   d. Separated ( )
   e. Widowed ( )

4. Education attainment
   a. Primary ( )
   b. Secondary ( )
   c. College ( )
   d. University ( )
   e. None ( )

5. Occupation _____

SECTION B

6. How has been the response towards the introduction of Treadle pumps?
   Very good ( ) Good ( ) Poor ( )

7. If poor what has been the main constraint?
   _____
   _____
   _____

8. What measures as an organisation are you putting in order to attain you target of 600,000 farmers?
   _____

9. Have the current high inflation rates affected the organisations operations?

   Yes ( ) No ( )

10. If yes, what measures have you put in place in order to cushion the costs involved in the distribution of Treadle pumps?

_____

_____

11. Does your organisation receive adequate funding that may enable it sustain its marketing strategy?

Yes ( ) No ( )

12. If not what measures have you put in place as an organisation?

_____

13. What is your mode of information dissemination to small-scale farmers?

IDE extension officers ( ) IDE extension officers and the media ( )
Other organisations ( ) All ( )

14. How has the mode of information dissemination been?
Very effective ( ) Quiet effective ( ) Not effective ( )

15. Then how has it impacted on your marketing strategy?

_____

_____

_____