Influence of Small-scale Irrigation Schemes on Improving Livelihood of Rural Farm Households; A Case of Perkerra Irrigation Scheme, Baringo County

Ken Nadeiwa[a]*, Julius Koring'ura[b]

[a]Post graduate student University of Nairobi, Box 47,30403 Kenya

[b]Lecturer University of Nairobi, Box 30197, Nairobi, 10100, Kenya

[a]Email: kennadeiwa@yahoo.com, [b]Email: harrietkidombo@yahoo.co.uk

Abstract

Irrigation contributes to livelihood improvement through increased income, food security, employment and poverty reduction. Perkera irrigation Scheme has not fully achieved its objectives as expected. The main purpose of this study was to assess the role of small-scale irrigation schemes on the livelihoods of rural farm household in Perkerra Irrigation Scheme. This study specifically identify the scheme crops and its effect on livelihood of farmers. The study randomly sampled 388 small-scale household farmers living within and around the Perkerra Irrigation Scheme. Well-structured questionnaires for the household data collection and interview guide for the scheme officials were used in the study. This research employed descriptive statistics to assess the relationship between irrigation scheme outcomes and community livelihoods. Field raw data was entered into SPSS and cleaned before analysis. The research established positive effects on the livelihoods of farmers belonging to the scheme. 312(98%) were able to provide food for their families, 308(96%) grow crops for consumption, 291(92%) able to take three meals a day together with their families and 240(75%) said that their families no longer rely on relief food. However, 187 (59%) of farmers in the scheme did not receive nutritional support for their children. Most farmers did not agree to the statement that they received seeds and fertilizer. Most respondents, 192 (60%) strongly agreed they possessed skills in farming compared to that time before the irrigation system. Farm machinery like tractors are made available to farmers in the scheme. The scheme need look into and boost social well-being of farm household as a holistic approach to rural development especially in the area of medical care and facilities.

Keywords: small-scale irrigation; livelihood.

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* Corresponding author.

1. Introduction

Irrigation contributes to livelihood improvement through increased income, food security, employment and poverty reduction. To this end, [1] confirmed a strong direct and indirect linkage between irrigation and poverty. Direct linkages operate through localized and household level effects, whereas indirect linkages operate through aggregate or sub-national and national level impacts. Irrigation benefits the poor through higher production, higher yields, lower risk of crop failure, and higher and year-round farm and non-farm employment. Irrigation enables smallholders to adopt more diversified cropping patterns, and to switch from low- value staple production to high-value market-oriented production. Increased production makes food available [2] and affordable for the poor. Since irrigation investments lead to production and supply shifts, indirect linkages operate through regional and national level and have a strong positive effect on the national economy. Similar study from Gambia revealed that irrigation provided smallholder farmers the chance for increasing income that was reflected on increased expenditure, investment in productive and household assets, saving and trade [3].

In India poverty head count ranges from18 to 53% in irrigated and 21 to 66% in rain fed areas and poverty incidence is 20 to 30% lower in most irrigated areas compared to rain fed areas. Incidence of chronic poverty is 5% lower for irrigated areas in Sri Lanka (Pakistan) than adjoining rain fed areas [1]. Besides its positive effect, irrigation utilization decision comprises different determinant factors. Some of the factors facilitate for utilization decision while others not yet. Hence, a study carried out by [5] on impact of small scale irrigation scheme on farm production efficiency and household income in Oromia National Regional State, Ethiopia found that education of the household head, livestock ownership, access to irrigation technology, amount of credit received, age of household head, distance from market, participation in extension package program, years of irrigation experience, total income of house-holds, access of the household to improved seed and farm size were the significant determinants of household decision on irrigation utilization. This was also confirmed by [6] that in addition to the afore-mentioned factors dependency ratio, active labor force, sex of household head, insect and pest infestation, training received, and ownership of radio are found significant in determining the decision of small-scale irrigation utilization.

Perkerra Irrigation Scheme was started in 1954 and was incorporated into NIB upon its formation in 1966 through an Act of Parliament Cap 347, Laws of Kenya. The Scheme is located 100 Km North of Nakuru town in Marigat District, Baringo County. The main objectives of the irrigation scheme is to improve irrigation and drainage service in the Scheme, enhance efficiency in water utilization in the Scheme, facilitate long-term sustainability of the Scheme and to improve land and agricultural productivity in the Scheme. The Scheme has 750 Farm households with the majority having 3 to 4 acres of farm land and half an acre of village area for settlement.   The Scheme farmers assumed horticultural crops growing from the start. It was a major source of Bulb Onions, Dried Chilies and Watermelons. Other crops introduced as diversification measure in the late 1980s included Pawpaw's for Papaya Wine making by KWAL Ltd and Cotton. Farmers abandoned production of the above crops due to marketing problems.

In 1996 the Scheme farmers started planting Seed Maize crop under a Growing Agreement with Kenya Seed Company. Certified Seed Maize production became a turning point for crop production in the Scheme. Assured

market as well as better and prompt payment elated the farmers who improved crop husbandry practices leading to improved production. Due to increased popularity of the seed maize production in the Perkerra Irrigation Scheme, other neighboring Irrigation Schemes - Eldume, Sandai, Kamoskoi and Kapkuikui Irrigation Schemes which are community-based and with their own source of irrigation water from rivers Molo, Waseges and Lorwai springs respectively   have been incorporated into the production of the Seed maize following the farmers' request. The Maize Seed varieties produced are for the medium and low altitudes, and include H513, H515, H516, PH1, PH4, DHO1 and DHO4. Lately in November 2013, Mosuro Scheme in Kiserian area with a potential of 436 acres has requested to be incorporated in the NIB supervised schemes. An Engineer has already visited the scheme for evaluation and submitted her report to NIB management for consideration.

In 2011 the scheme started growing seed sunflower and rice on contract to help diversify crops and reduce over-reliance on maize. Both crops have shown the potential to improve farmers' incomes and improve soils. The first 38.5 acres of rice grown gave 696 (75 kg bags) worth ksh.5.2 million. Currently there are 297 acres harvested out of 347.5 acres of Nerica rice grown which yielded a total of 4,228.5 bags worth ksh.31.07 million. (The buying price was ksh. 100 per kg). In Eldume scheme there were 29.5 acres of rice grown which yielded 467 bags which will fetch ksh.3.45 million. There were 7 acres of basic sunflower seed grown at Perkerra scheme yielded 2,649.5 kg worth ksh207, 657.00. At Kamoskoi Kapnai scheme 6,085kg of sunflower seed worth ksh 476,917.95were realized from 55 acres grown.

1.1 Statement of the problem

Marigat is an irrigation potential area, with an adequate water bodies. However, the living standard of the community is subsistence. Sustainable economic development will be supported by effective agricultural technology intervention. Equal and fair technology distribution within the community is valuable for balanced economic growth [6]. In addition, the fully community development though the Scheme has not been achieved as expected for example most of the farmers are unable to cater for their children schools fees and also provide balanced diet to the family. In fact according to the [7], families around the irrigations are still living in deplorable conditions. Despite previous studies documenting on Perkerra Irrigation Scheme, few of them have established the role of this irrigation on livelihood of rural firms creating a dearth gap on the existing literature.

1.2 Objective of the study

The main purpose of the study was to influence small-scale irrigation schemes on improving livelihood of rural farm household specifically assesses provision of inputs from irrigation scheme on livelihood of rural farmers.

1.3 Secondary information

Smallholder irrigation farmers are provided with farm inputs from the groups that they form. They include draught animal power systems and hand- hoe cultivation. These farm power systems when coupled with the dominant surface irrigation systems are mainly labour intensive, therefore there is a need to make mechanization interventions that will enhance the productivity of smallholder irrigation schemes [8]. Reference [9] argue that farmers groups aim at improving food security and income among small-scale farmers through the promotion of

gardening and low cost irrigation systems using rope and treadle pumps and motorized pumps, and by connecting the farmers to microfinance institutions and possible markets for their agricultural produce. This enhances the living standards of the rural poor households thus improving their standards of living.

Irrigation schemes have been shown to provide agricultural inputs needed for the process of irrigation. The farming inputs include sprinkler equipment that allows for proper irrigation throughout the farms. Adequate irrigation equipment is essential to ensure that the programmes successful. This in the long run improves the livelihoods of the rural farmers and improves their standards of living [10].

Due to the profits that farmers get from sale of their produce, they are able to buy more mechanized equipment that are efficient in cultivating large pieces of land. This ensures that the lands are prepared in time for planting and in order to harvest at the right time. This is essential to enable farmers reap enough benefits from their farms thus improving their standards of living and their livelihoods [9].

There is provision of external inputs such as water supplies, and outputs such as water destinations crop evapotranspiration, surface runoff, etc. It provides a systematic examination of the hardware and processes used to convey and distribute water internally to all levels within the project from the source to the fields thus improving irrigation performance. External indicators and internal indicators are developed to provide a baseline of information for comparison against future performance after modernization, benchmarking for comparison against other irrigation projects, and a basis for making specific recommendations for modernization and improvement of water delivery service [11].

1.4 Methodology

Research design is a sketch and the procedures for research that cover the decisions from broad assumptions to detailed methods of data collection and analysis [12]. The study used a combination of descriptive survey and explanatory research design. A descriptive research gives a thorough and accurate description survey by determining the "how" or "why" the phenomena came into being, and also what is involved in the situation. This is achieved by portraying an accurate profile of the events and situations [13], which [14] considered as an extension of, or forerunner to an explanatory research. On the other hand, an explanatory study goes beyond description and attempts to explain the reasons for the phenomena that the descriptive study only observed [15] by seeking to establish a causal relationship between variables [14]. Therefore, a descriptive study would look at what is going on, while an explanatory study seeks to explain why it is going on [16].

According to [17], population is the entire group of individuals, events or objects that have a common observable characteristics. It is an aggregate that all conforms to a given specification. The population of study will comprise approximate 13000 people settled around Perkera Irrigation Scheme. The population around Perkera Irrigation Scheme was estimated to be 13,000 people. The sample size obtained by calculating the number using the formula Mugenda and Mugenda (2003) was n = 388 respondents (See below formulae). However, only 335 (86%) surveys were filled, returned and subjected to analysis. 11 interviews were conducted for management staff.

The research utilized both primary and secondary data. The secondary data was obtained from book related to the study, magazines, and journals, presented conferences, previous reports as well as the Internet. The primary data on the other hand was obtained through questionnaires and interview guides developed for the study. Questionnaires were used to obtain the primary data required for the project that were self-administered by the researcher and research assistants in the field. Questionnaires are best suited for surveys [14]. This research employed a 5 likert scale in rating the various responses. The respondents were required to read, understand and tick an appropriate choice. The respondents comprised of the community in and around the Perkerra Irrigation Scheme and their various beneficiaries. An interview guide was preferred as a tool for data collection because it provides flexibility and the ability to probe and clarify responses. It notes verbal as well as non-verbal behaviors, and provides high responses rates [18]. An interview guide was used in the study to gather additional information from the scheme staff. This allowed direct interaction with the scheme manager and other staff respondents to give in-depth information that the questionnaires may not have gathered.

Before the actual data collection exercise took place, the researcher undertook preliminary survey within the scheme in order to familiarize with the study area and also make appointments with the identified scheme officials for interviews. During the appointment day, the researcher used the interview guides to get answers to the questions. He distributed the questionnaires to the research assistants to collect data from the farmers after which they brought back the filled up questionnaires. According to [19] say that once the data is collected, editing should be done to identify and eliminate errors. Data analysis is the breaking down of large components of research data or information into simpler, easily synthesized and understood parts. Before processing the responses, the filled questionnaires were checked for completeness and consistency. The data was then coded to enable the responses to be grouped into various categories. This research employed quantitative methods of analyzing data. In analysis ratio scale is used in data measurement and both inferential and descriptive statistics was used to analyze the raw data. In descriptive statistics the research employed descriptive statistical tools such as SPSS which helped to describe the data and determine causal factors presenting them in tables for clarity.

1.5 Results

2. Age of respondents

The study found it necessary to identify the age representation of respondents, this was important in showing relationship between age and farming practices. The findings from the question of age were as table 4.2.

Table 4.1: Respondents' representation by age

Age level	Frequency	%
Less than 20 years	32	10
21 -35 years	154	46
Above 35 years	146	44
No response	3	0
Total	**335**	**100**

Table 4.2 shows that most respondents falling in 21 – 35 years of age bracket recording 46% of the total 332 respondents who answered this question. This was followed by those above 35 years of age who recorded a 146 (44%). The study found only 32 farmers (10%) falling below 20 years of age. These finding can be attributed to the fact that most people involved in farming are grown-ups who probably have access to land. The contracting arrangement with Perkerra irrigation scheme also favors mostly individuals with national identity cards.

2.1 Education levels of respondents

It was necessary to establish the level of education for all respondents this was important in assessing the knowledge levels on farming practices. The findings for the question on education levels were as table 4.3.

Table 4.2: Education levels of respondents

Education levels	Frequency	%
Primary school	117	35
Secondary school	90	27
Certificate	34	10
Diploma	33	10
Degree/master	15	5
No response	46	14
Totals	**335**	**100**

Considering education levels from table 4.3., a majority of farmers interviewed 117 (35%) had primary school education. 90 (27%) statistics was registered for those with secondary education while those with certificate education were 34 (10%). Only 15 (10%) of total farmers interviewed were university graduates. 46 people (14%) did not respond to this question.

2.2 Gender of respondents

The study did find it necessary to establish how farmers are structured age wise, this was important in establishing among the sexes are contributing more to farming practices. The findings to the question were as table 4.4.

Table 4.3: Gender of respondents

Gender	Frequency	%
Male	181	54
Female	150	45
No response	4	1
Totals	**335**	**100**

Table 4.4 shows Gender representation among the total 335 farmers, for those sampled the gender was almost balanced with male being 181 (54%) compared to their female counterparts 150 (45%). These findings indicate fairly equal representation of both genders in agricultural practices.

2.3 Provision of inputs by irrigation scheme and effects on livelihood of rural farmers

This research established that different inputs are provided by the scheme to smallholder farmers who are members of the scheme. However, the researcher was more strategic to measure the reach out to farmers with specific inputs that included seeds and fertilizer.

Provision of inputs can help to improve production process, and have a direct effect on livelihood of rural farmers in schemes.

2.3.1 Level of confidence with each type of input received

The study did want to establish the level of confidence on inputs received, it was important so as to establish if any provision of inputs as direct effect on production and livelihood of the farmers.

The findings from the question were as table 4.10.

Table 4.4: Level of confidence with each type of input received

Rating levels

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	No response
Provision of inputs	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Received free seeds	36 (11)	63 (20)	5(2)	24(8)	191 (60)	0 (0)
Received free fertilizer	13 (4)	52 (16)	20(6)	28(9)	206(65)	0 (0)

As table 4.10 presents, most farmers did not agree to the statement that they received seeds and fertilizer. 215 (68%) disagreed or strongly disagreed receiving seeds, while 234 (74%) disagreed or strongly disagreed receiving fertilizer. This indicated that most farmers in irrigation scheme do not receive inputs in their farms.

2.3.2 Scheme members and non-members existence of draining systems

The question of whether there existed a drainage system facilitated by the scheme was asked to the respondent farmers.

It was important to ask the question as drainage system is one of the key component of a irrigation system thus affecting production process and eventually farmers livelihood. The findings on whether there is existence of drainage system were as in table 4.11.

Table 4.5: Scheme members and non-members existence of draining systems

	Response of existence of draining systems	
Level of confidence	**Scheme members**	**Non-scheme members**
Strongly agree	108 (34%)	3 (19%)
Agree	159 (50%)	10 (63%)
Undecided	14 (4%)	1 (6%)
Disagree	24 (8%)	2 (13%)
Strongly disagree	11 (3%)	0 (0%)
No response	3 (1%)	0 (0%)
Totals	**319 (100%)**	**16 (100%)**

From table 4.11 shows that 108 (34%) of scheme members strongly agree that there are existence of draining systems, and 11 (3%) strongly disagree that there is no existence of drainage systems. 3 (19%) and none strongly agree and disagree respectively on existence of draining systems. The findings established similarities in both members and non-scheme member respondent's ratings. This may be attributed to the fact that those that did not belong to the scheme still could adopt drainage methods used by their neighboring scheme members.

3. Conclusion

The study showed that inputs that included seeds and fertilizers were provided to farmers in the scheme. However, most farmers did not agree to the statement that they received seeds and fertilizer. 215 (68%) disagreed or strongly disagreed receiving seeds, while 234 (74%) disagreed or strongly disagreed receiving fertilizer. Farming has become modern today due to technological advancement. For government managed schemes like Perkerra, technology adoption has been embraced to a good extend as much as resources allocated remain limited. For example, farm machinery like tractors are made available to farmers in the scheme as proved by 147 (46%) of farmer respondents who strongly agreed to the question seeking to establish if tractors for digging of farms and drainage are made available. Coming second to this were 90 (28%) of total 319 scheme members interviewed who agreed to the question.

Acknowledgement

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4. Appendices

Appendix I: Questionnaire

Table 5

SECTION A: BACKGROUND INFORMATION				
1	Gender	Male	[ ]	Select one
		Female	[ ]	
2	Age bracket	≤ 20 years	[ ]	Select one
		21-35 years	[ ]	
		above 35 years	[ ]	
3	What is your highest level of education	Primary School	[ ]	
		Secondary school	[ ]	
		Certificate	[ ]	Select one
		Diploma	[ ]	
		Degree	[ ]	
		Master		
5	Which is the single main activity that your household engages in to secure livelihood?	Crop Farming	[ ]	Select one
		Agro-pastoralism	[ ]	
		Pastoralism	[ ]	
		Small business	[ ]	
		Wage earning (employment	[ ]	
6	Are you a member of the irrigation Scheme?	Yes	[ ]	Select one
		No	[ ]	
7	How long have you been member of the irrigation scheme	1 – 5 years	[ ]	Select one
		6 – 10 years	[ ]	
		11– 20 years	[ ]	
		Above 21 years	[ ]	

Please mark the number that best reflects your level of agreement in the following statements.

KEY: SA- Strongly Agree, A: Agree, UD-Undecided, D: Disagree, SD: Strongly Disagree

Table 6

SECTION B: TYPE OF CROPS AND FARMERS LIVELIHOODS				
1	I can provide food for my family	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate
2	I grow crops for consumptions	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate
3	I growing crops for income generating activity	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate
4	I and my family members we are able to take three meals a day	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate
5	My family no longer rely on relief food aid	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate
6	My children receive nutrition support	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate
4	Men are now busy working in the farms instead playing old chase	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate

5	Men are busy working farmers rather than going for raids	SA- Strongly Agree	[ ]	Select the most appropriate
		A-Agree	[ ]	
		UD- Undecided	[ ]	
		D- Disagree	[ ]	
		SD- Strongly Disagree	[ ]	
SECTION F: ECONOMIC EMPOWERMENT AND DEVELOPMENT				
1	Am able to spend and save through microfinance institutions	SA- Strongly Agree	[ ]	Select the most appropriate
		A-Agree	[ ]	
		UD- Undecided	[ ]	
		D- Disagree	[ ]	
		SD- Strongly Disagree	[ ]	
2	Am able to pay schools fees for children	SA- Strongly Agree	[ ]	Select the most appropriate
		A-Agree	[ ]	
		UD- Undecided	[ ]	
		D- Disagree	[ ]	
		SD- Strongly Disagree	[ ]	
3	We are able to make contributions for several helping each other when in need	SA- Strongly Agree	[ ]	Select the most appropriate
		A-Agree	[ ]	
		UD- Undecided	[ ]	
		D- Disagree	[ ]	
		SD- Strongly Disagree	[ ]	
4		SA- Strongly Agree	[ ]	
		A-Agree	[ ]	Select the most appropriate
		UD- Undecided	[ ]	
		D- Disagree	[ ]	
		SD- Strongly Disagree	[ ]	
SECTION G: IRRIGATIONS				
	A member of the irrigations scheme	SA- Strongly Agree	[ ]	Select the most appropriate
		A-Agree	[ ]	
		UD- Undecided	[ ]	
		D- Disagree	[ ]	
		SD- Strongly Disagree	[ ]	
	I have been a member for the last five years			

I use irrigation system water to grow my crops	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate
I use irrigation system water for domestic use	SA- Strongly Agree A-Agree UD- Undecided D- Disagree SD- Strongly Disagree	[ ] [ ] [ ] [ ] [ ]	Select the most appropriate

APPENDIX II: INTERVIEW SCHEDULE: THE MANAGEMENT

How are you Sir/ Madam. I am a student from University of Nairobi pursuing a Master's Degree in Project Management. Welcome to this interview session. I am going to ask you some questions about irrigation activities in your area.

Please feel free and respond appropriately. To begin with:

Section A: Biographical information

1. What is your highest Educational level?........................

2. What is your position in project?……………………….

3. What is your gender? …………………………

SECTION B

3). State the various activities irrigation is involved in community.

……………………………………………………………….……………

……………………………………………………………………….…

4) What measures have you put in place to ensure the project is sustainable?

………………………………………………………………..………..

…………………………………………………………………………

5) Kindly, provide your views on how community has developed as results of the projects.

……………………………………………………………….……………….……………

…………………………………………………………………………………….…

6) Kindly, indicate various challenges faced during the implementations of the project.

………………………………………………………………………………..

6) In your opinion what would like to be done to enhance the capability of the project in developing the community

………………………………………………………………………………..

We have come to the end of the interview session.