Sudan University of science &Technology

College of Post Graduate Studies

Title:

Impact of the Development Net on Rain fed Cultivated Crops In Edd Elfursan and Rehaid Elberdy Localities

اثر شبكة التنمية في المحاصيل المروية مطرياً بمحليتى عدالفرسان و رهيدالبردى

A thesis Submitted for Fulfillment for the Academic Requirement of Ph.D in Rural Development

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Dedication

I dedicate this work to my parent's soul.

To

The memory of my lovely sister Alafia.

To

My family, husband, sons, daughters.

Brothers, sisters, friends.

Colleagues.

Really, who gave me life meaning,

Help and encourage me to progress.

Acknowledgement

First of all, I would like to thank my God Allah, who gave me life, health, power, strength and help me to finish this research. I wish to express my deeply gratitude& sincerely thanks to my Major supervisor Dr Mohammed El Badawai Hussein for his unlimited support, Continuous encouragement, kindness and guidance by intellection stimulation during study. I would like to express my deeply appreciation to co-supervisor Ustaz Abdel Mahamoud Hassen Elshiekh for his unlimited help. Special debt of gratitude is owed to Sudan university staff of Extension and Rural Development Department.

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My deeply thanks to all respondents in Edd Elfursan and Rehaid Elberdy localities, who gave me the correct and necessary information for this study.

Abstract

The study is designed to assess the impact of Rehaid Elfursan Development Net in rural development. It was conducted at Edd Elfursan and Rehid ElBerdy localities in South Darfur state. The study focused on the assessment of impact of the net activities in rural area and benefits gained by rural community from these activities.

The main objectives of this study were to estimate efficiency of Agricultural extension packages (Technical packages),used in the net to improve Agricultural Production of rain fed cultivated crops (Millet ,Sorghum and Ground nut)for the farmers, to know the different facilities and extension services provided by the net, the study also focused on relationship between adoption of Agricultural technical packages and improvement of Agricultural production in rural area, in terms of increasing incomes, improving of the quality of food and raising living standard.

The multi-stage stratified random sampling procedure was used. The field survey used as research method of two areas in Edd Elfursan and Rehaid El berdy localities in South Darfur, to select100household. The data collected during 2010-2011agricultural rainy season; the study site included two administrative units, in Edd Elfursan and Rehaid Elberdiy localities. Four villages were selected. The sample size represented 10% of respondents; numbers of 25 H/H were selected from each village. Primary data collected by direct questionnaires, and observation involving the respondents in their field and home, the secondary data were collected from records, references, reports, internet, previous studies and researches. The total number of the interviewed were 100, 50 from each locality. The collected data were coded and processed

in the computer using the statistical package for social science (SPSS). Data was analyzed by using frequencies, Percentages and chi-square test at the level of significance of 0, 05 to determine the relationship between agricultural technical packages and production.

The study found:

-21% of respondents were illiterate, 74% of them were farmers, 61% of the respondents participated in the net, while 39% non- participant, 60% of the respondents their income less than 500SDG, There was significant difference at 0.05 levels between (participants, non-participant) by average family income. The study found that the respondents (participants and non participant), had only little knowledge's and skills, needed for efficient use of received agricultural inputs.

-Study revealed, that real problems in the study area related to inadequacy of tools and Equipment, lack of credit and loan, which affected production.

-There was no significant association of Rehaid Elfursan net for rural development (CBO), on adoption of recommended technical packages for three rain-fed cultivated crops (Sorghum, Millet and Groundnut).

There was no significant difference between respondents (participant and non-participant) house hold by knowledge of recommended technical packages for improved three rain-fed cultivated crops (Sorghum, Millet and Ground nut).

Based on the finding of study, the researcher proposed the following recommendations:

-The Net should put higher emphasis on the development of production of rain-fed cultivated crops, and to increase the sense of group work, encourage of farmers' individuals and groups to join in social participation programmes.

- Coordination between Net, micro-finance services, related Banks such as Agricultural and Farmer Bank to work with farmer under guarantee of Central Bank of the Sudan.

مستخلص البحث

صممت هذه الدراسة لقياس اثر شبكة منظمات رهيدالفرسان في التنمية الريفية ، اجريت الدراسة في محليتي عدالفرسان ورهيدالبردي بولاية جنوب دارفور.

ركزت الدراسة علي قياس اثر انشطة الشبكه في المناطق الريفيه والفائدة التي جناها المجتمع الريفي .

الاهداف الربيسية من الدراسه هو قياس تاثير حزم الارشاد الزراعي (الحزم التقنية) المستخدمة بواسطة الشبكة في تحسين انتاج محاصيل الري المطري (الدخن، الذره و الفول السوداني) ، ومعرفة التسهيلات و الخدمات المختلفة التي توفرها الشبكة للمزارعين، والتعرف علي المعوقات والمشاكل التي تواجه المجتمع الريفي.كما ركزت الدراسه علي العلاقة بين الحزم التقنية و تحسين الانتاج الزراعي المطري ، وزيادة الدخل و تحسين نوعية الغذاء و

عن طريق المسح كاداه لجمع المعلومات في محليتي عدالفرسان ورهيدالبردي،وهي منطقة الدراسة الريسية و شملت وحده اداريه من كل من محليتي رهيدالبردى وعد الفرسان لاختيار عدد مائة(١٠٠) مزارع. تم جمع المعلومات في الموسم المطري٢٠١١. تم اختيار اربعة قرية، كما تم اختيار ٢٥ مزارع من كل قرية ، مثلت العينه نسبه ١٠% من المبحوثين.

تم جمع المعلومات الاولية عن طريق الاستبيان كاداة اوليةمباشرة لجمع المعلومات من المزارعين والملاحظة كاداة غير مباشرة شملت المزارعين في الحقول و المنازل.كما تم جمع المعلومات الثانوية من المراجع ،الكتب، الدراسات ،البحوث ،الشبكه العنكبوتيه، رسائل الدكتوراه ، الماجستير ،التقاريرالسابقة فى مجال التنمية الريفية والمواضيع ذات الصلة. ١٠٠ مزارع تم اختيارهم عشوائيا، ٥٠ مزارع من كل محلية.

تم جمع و رصد المعلومات وترميزها وتحليلهابواسطة الحاسوب باستخدام التحليل الوصفى، تم عرض نتائج التحليل فى شكل جداول تكرارية ونسب مئوئة وقياس درجة المعنوية عند ٠،٠٥ ، لقياس العلاقة بين الحزم التقنية الزراعية و الانتاج.

خلصت اهم نتائج الدراسة،بان:

- ٢١% نسبة الامية بين المزارعين .٧٤% من المبحوثين يمتهنون الزراعة كمهنة رينئسية

-٦١% من المبحوثين شاركوا في شبكة الجمعيات القاعدية،بينما ٣٩% لم يشاركوا.

٦٠% من المبحوثين يقل دخلهم عن ٥٠٠ جنيه في الشهر .

- بينت نتائج الدراسة هنالك فروق معنوية بين المشاركين في الشبكة وغير المشاركين في دخل الاسره.

-وجدت الدراسة ان المزارعين تنقصهم الخبرة والمهارة المطلوبه للاستخدام الامثل للمدخلات الزراعية.

كما بينت نتائج الدراسة ان المشكلة الحقيقية تتمثل في عدم توفر المعدات والاليات الزراعية، عدم توفرالقروض و السلفيات مما اثر سلبا علي الانتاج.

كما بينت نتائج الدراسة ايضا ان شبكة جمعيات رهيد الفرسان ليس لها اثر معنوي هام في تبني الحزم التقنية الموصي بها في محاصيل الزراعة المطرية الذرة ، الدخن و الفول السوداني.

كما بينت نتائج الدراسة بان ليس هنالك فروق معنوية بين المشاركين في الشبكة وغير المشاركين في تبني الحزم التقنية الموصي بها في محاصيل الزراعة المطرية الذرة ، الدخن و الفول السوداني.

بناء علي نتائج الدراسة اقترح الباحث توصيات اهمها:

-ينبقي لشبكة رهيد الفرسان ان تجعل تركيزها الاكبر في تطوير انتاج محاصيل الزراعة المطرية الذرة ، الدخن و الفول السوداني (القطاع المطري)، وزيادة الحس والوعي للعمل الجماعي بين المزارعين، وحس المزارعين افراد وجماعات للانضمام و المشاركة في البرامج الاجتماعية في تنظيمات المجتمع القاعدية.

-التنسيق بين الشبكه و مؤسسات التمويل الاصغر والبنوك ذات الصلة ،البنك الزراعى، بنك المزارع، والعمل مع المزارعين تحت ضمان بنك السودان المركزي.

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List Abbreviations.

UN United Nations

ADS Area Development Scheme

WSDC Western Savanna Development Corporation

RDP Rural Development Programme

VEW Village Extension Workers

AEP Agriculture Extension Programme

NGOs None-Governmental Organization

CBOs Community Base Organizations

HAC Humanitarian Aid Commission

WFP World Food Programme

IDPs Internal Displaced People

FSA Food Security Assessment

GN Ground Nut

FAO Food Agriculture Organization.

IFAD International Fund Agricultural Development.

VEW Village Extension worker.

FO Farmer organization.

JMRDP Jabal Mara Rural Development Project.

HTS Hunting Technical services

Chapter One

Introduction

1.1 Background:

The United Nations Organization (UN) representing in the Development Program (UNDP) was established the Area Development Scheme (ADS) in five selected areas in Sudan. Southern Darfur State was one of these areas, which includes two provinces at that time, Edd ElFursan and Rihaid El-Birdiy, covering 21000 square kilometers of area .The overall target of the project was to shift the human being in the particular area from the poverty zone to the satisfaction zone (improvement of life standard, improvement in education, attitude, and general behaviors).This development of human being would be undertaken via society (ADS documents 1994-1995).

1-1-1 Establishment & formation of the Net:-

In order to start moving towards the target, the project administration has formed a number of village centers. These centers were given the following authorities:

1-They are fully authorized to represent farmers.
2-To finance the farmers to run their small scale projects from the revolving funds according to the priorities that mentioned by the producers themselves. (Net-documents 2002).

The project has provided producers with different income generation activities such as oil mill, flour mill, groundnuts threshers and water pumps. Based on rural guarantee fund. Participation aiming to sustainable development. The project has also formed a central body (based in Khartoum) for the beneficiaries (DASCO. Co .L.t) which is latterly directed to a company known as Rihaidy El Fursan. Many studies were made accordingly by this company.

This company was closed down and replaced by a voluntary organization named as the Net of Rural Development Society as non-governmental Community Based organization (CBO). Its mandate to working in the development and humanitarian field. The organization has completed the required procedures ending up with registration at Humanitarian Aid Commission in Khartoum in October 2004 (Net document-report 2004).

Net including 160 Community Based organizations (CBOs). In its membership. The total of population benefited from Net was approximately from the Net was 500,000 from the whole area of Edd ElFursan and Rihaid El Birdy. The administration council of the Net is formed of 24 members including 8 members of ladies. The formation of the council includes the chief, his deputy and secretary. The rest were only members. The duration of this council was 4 years after the rotation, and should be replaced by a new one according to the constitution. (Net document2004).

1.1.2 Objectives of the organizations Net:-

1-Provision of water for all projects (rain-fed area) and drinking water for animal and human being.
2-Provision of agricultural services including such as farm inputs (improved seeds, Extension services, etc).
3-provision of animal race improvement (horses, hybridization)
4-Environment protection programs (training courses on the importance of the green cover in relation to the environment).
5- Provision of first aid, nursing service, midwifery with Ministry of Health.
6-Provision of education services and related to environment for the teachers and pupils as well in the particular area through the maintenance of the school including the furniture

1-2 Statement of research problem:

The socio-economic, political situation, drought situation in Darfur region since 1980s in particular gave the area opportunity of receiving considerable UN agencies, NGOs national &international support initiate it development projects and boosting the capacity building of individual and groups in the region.

In 1980s the Western Savanna Development Corporation (WSDC), as the result of pre-studies were conducted by Hunting-Technical Services (H.T.S), Jubal Mara Rural Development Project (JMRDP), and Western Savanna Project (W.S.D.P) have been initiated to strike development and help in filling his disparity gap, according to the six years plan (1977 to 1983), started the program of rural development in the study area, this program covered whole area, Villages, sub-villages more than 45 villages.

In 1994-1995 Area Development Scheme (ADS) introduced in the area, it is participatory community base-rural development, and it works according the rural animation approach to participation, It is a form of approach interaction which help rural people to investigate critically and analyze their living realities to act autonomously in taking initiatives and to perceive possibilities in changes. The project came as an alternative to the conventional approach to "Top down"approach rural development project. The project aims at increasing the income and improving the standard of living (poverty alleviation), had started program in same area, at that time one locality known as Edd El fursan, but later divided into two localities Edd Elfursan and Rihid El birdiy. ADS have worked in same way of (WSDC) of rural development. Both of them are considered as mechanism to achieve sustainable development in rural area in south Darfur state. There are reliable information's about that development and well known about the outcome of project till the ends of the two projects.(WSDC)1995.

Rhaid Elfursan development Net Organization, is a group of Communities

Based Organization (CBOs) in the study area, to invest in the area through approach based on community participation and involvement. The Net handing over the project 2004, the handover procedure& sustainable component to cause the continuation of development were received by the Net, and started its work in study area (Rehaid Elberdy and Edd Elfursan localities).The Net has been working for more than 8 years; it used different extension methods aiming to increase production by providing agriculture input. However no study was carried out to assess the project impact in enhancing the production, and there is little information about the outcome of the Net till now. So the main aim of study is to asset-To what extent the Rihaid El fursan Development Net organizations in South Darfur state succeeded in enhancing Rain fed agricultural production in study area?

1-3 Objectives of Study:

The main objective of study**.**

1-To evaluate the impact of Rehaid ELfursan development net, on agricultural activities mainly rain fed cultivated crops.

The specific objectives to**.**

1- To assess the impact of technical packages on production

2- To identify the development constrain to rural development in area.

3- To recommend applicable packages that will enhance production.

1-4 Variable of the study:

No	**Independent**	**Dependent**
1	Farmer age	1-Adoption of technical package.
2	Family size	**-** Verities of crop grown.
3	Farmer gender	**-**Adoption of seed rate, sowing date,

		spacing, Thinning, weeding, pest and disease control
4	Farmer marital status	2- Access to asset
5	Education level	**3** Technology used
6	Occupation	**4** Information sources.
7	Types of land ownership	**5** Access to Credit & loan
8	Total cultivated area(Farm size).	**6** Participation in the Net
9	Social participation	
10	Participation in the Net	

1-5 Justification of Study:

1. There is little information about the outcome of the Net in area.

2. The study area is unique feature including climatic factors, socio-culture, economically and politically is important to the whole Sudan.

3. The researcher will hopefully provide useful information about sustainability of rural for future researches.

1-6 Limitations of the study:

- The conflict in the Darfur region since 2003 is the big challenge for the researcher till now.
- The data was collected in the rainy season and was very difficult for researcher to reach the big number of farmers in the study area, because of tough and rough conditions.

1-7 Organization of study.

The research is organized into five chapters.

Chapter one, introduction, research problem, objectives, research hypotheses and justification for the research.

Chapter two, literature review.

Chapter three, Research design and methodology.

Chapter four**,** Data Analysis and discussion.

Chapter five, Summary of results, conclusions, Recommendations,

References and Appendences.

Chapter Two
Literature Review

2-1 Introduction.

Greater Darfur is one of Sudanese state which has been shares an international frontier with Egypt, lybia, Chad and Central African Republic, borders the Sudanese states of North, West Kordofan and South Sudan/Bahr EL-Ghazal. It lies in Western Sudan, covering an area of 511, 412Km-just about equal the size of France. It was one region according regional Government act 1982, which later changed to two states North& South of the 1998 constitution(decentralization constitution document 1998), which divided into three states North, South and West Darfur, later became five states by adding East and central Darfur. These states have similar socio-economic characteristic & traditional structure, despite their separate geographic boundaries, still one region. South Darfur state is one of the five states that compose Darfur region (Greater Darfur), which is located in western part of the Sudan, between longitude 22 to 30, and 28to00 south, latitudes $8^{o} – 30^{o}$ and 13 to 30 North covering an area 137,842 thousand km2, equal about 32, 8 million Fadden, cultivatable area is about 24 million Fadden (10080000 Hectare) useful for agricultural activities, only 7,2million Fadden (30%) of this area is used for growing agricultural crops. Cultivatable area for fruits, vegetables crops is about 750000 feddan (315000 Hectare), the area used of it is about 13%. The total population of about 2.876875 (3million), number of female is 1,504,604, male 1,372,271, according to 2008 population census, 73% of which in Rural areas, (Population census 2008**).** Soil types in the state comprises of Sandy soil: 33, 85%, basement soil 25, 95% Sandy-clay soil: 18, 45%, silty-clay soil: 11, 31%, clay soil 9, 15% volcanic soil: 1, 29%. The state comprises of 21 localities. Each of which has many cities, villages, sub villages. These localities are very rich in natural resources**. (Ministry of Agriculture Natural Resources Report, 2002).**

The main activities of the population was agriculture as dominant activity, as more than 80 percent of the population works and depends mainly on field crops, and about 15 percent depend exclusive on livestock depending on grazing area. The southern part normally is one of the highest cereal-producing areas of the country. The state is characterized by its diversified climate and ecosystems. In the northern part the semi-desert ecosystem in dominating with average annual rainfall vary between 200-300mm. in the central the poor and rich savanna ecosystem are prevailing, with average annual rainfall between 400-800mm.southern parts is 1000mm, while the heights of Jebel Mara 1200mm exist with its distinguished Mediterranean climate. The agricultural system in the state completely depends upon the rainfall conditions, which made it vulnerable especially in the northern parts. The productivity of this traditional rain fed agriculture system has been declining and hence the production reached levels that are below the food security of state. The agricultural statistics of the 2000/2001 till 2006 season in south Darfur showed that 360 thousand hectares were planted by sorghum production where only 265 thousand were harvested (about 73% of planted area) with very low productivity of about 0.6 ton/hectare. The same statistics, also showed that about 760 thousand hectares of millet were harvested out of 1015 thousand hectares originally planned. (About74% of the planted area) with 0.23 ton/hectare productivity. The deterioration in productivity and unsuitability of current farming system are due to: Variability in climatic condition. b) Land degradation and climatic change. **(Ministry of Agriculture- South Darfur, Agri-assessment report -2006)**

The problem of climatic condition is mainly attributed to the high variability of rainfall in time and space, where land degradation is manifested in degreased soil fertility low nitrogen and organic matter) and enhanced topsoil erosion by water runoff and wind.

Sorghum:

Sorghum bicolor is a genus of grass with about 30 species, one of which is raised for grain and many of which are used as fodder plants, either cultivated or as part of pasture. The plants are cultivated in warm climates worldwide. They are native to the tropics and subtropics, one species, sorghum bicolor native to Africa with many cultivated forms now, is an important crop, used for food (as grain) Most varieties are resistant to drought- and heat-tolerant, and are especially important in arid regions, where the grain is one of the staple for poor and rural people. These varieties form important components of pastures in many tropical regions. *S. bicolor* is an important food crop in Africa is the "fifth-most important cereal crop grown in the world .http:/en.wikipedia.org/wiki//file- sorghum

Millets:

Millet ***Pennisetum glaucum*** are a group of highly variable small-seeded widely grown around the world as cereal crop or grains for both human food and fodder. Millets are important crops in the semi-arid tropic of Asia and Africa with 97% of millet production in developing countries. The crop is favored due to its productivity and short growing season under dry high temperature conditions. The height of the millet plant may range from 0.5 to 4 meters. The millet grain has great variation, and can be nearly white, pale yellow, brown, grey, slate blue or purple. The Grains of millet are about 3 to 4 mm long, much larger than those of other millets. The seeds usually weigh between 2.5 and 14 mg, with a typical mean of 8 mg. The size of the millet is about one-third that of Sorghum. The relative proportion of germ to endosperm is higher in millet than in sorghum. Millet grows rapidly and can be grazed 5–7 weeks after sowing, when it is 20–30 cm high. The highest feed value is from the young

green leaf and shoots. The plant can quickly come to head, so it must be managed accordingly the plant matures the value and palatability of feed.

.http:/en.wikipedia.org/wiki//file: Grain millet –earlyfill-tifton/7-3-02jpg

Ground nut. .

Ground nut ***Arachis hypogeal***, today is an important oilseed is being cultivated in both the seasons covering an area of over 4500ha. The area under (rain fed) kharif *i*s relatively less (550ha) as compared to irrigated (4200ha).Although the productivity of kharif groundnut during Sharif is about 1300kg/ha, the productivity under typical fallow residual moisture conditions is quite high **(**1800kg/ha). Field should be ploughed and cross ploughed to bring to a fine tilth up to a depth of 25-30cm.Generally two ploughing followed by two harrowing in criss- cross direction will bring the soil to a fine tilth. Deep ploughing is advantageous in rain fed areas because of better retention of moisture and improvement in soil porosity. It leads to better management of soil borne pathogens and enhanced nutrient availability in sandy and sandy loam soils, the best practice is to undertake soil planking as soon as ploughing of soil is undertaken after collecting and removing rice stubbles**.** Groundnut is sown in between second fortnight of June and first fortnight of July in kharif depending upon the onset of monsoon.

2-2 Agriculture production

This concern to improve a country's agricultural base, and thus the livelihood of the majority of its inhabitants, is usually expressed in terms of programme and projects of rural development. However, while agriculture is rightly the most important objective in the development of rural areas, rural development should also embrace the non-agricultural aspects of rural life. There are many definitions and statements on rural development that attempt to describe

succinctly what it is trying to achieve. Perhaps the one used in conjunction with the UN-sponsored Second Development Decade in the 1970s best illustrates the broad nature of rural development:- The Second Development Decade equates rural development with the far-reaching transformation of the social and economic structures, institutions, relationships and processes in any rural area. It conceives the goals of rural development not simply as agricultural and economic growth in the narrow sense as balanced social& economic development. Rural development is a process integrated with economic and social objectives, which must seek to transform rural society and provide a better and more secure livelihood for rural people. Rural development, therefore, is a process of analysis, problem identification and the proposal of relevant solutions. This process is usually encompassed within a program or a project which seeks to tackle the problem identified. However, as can be seen from the above statement, the problems those rural developments program attempt to solve are not only agricultural; such program must also tackle the social or institutional problems found in rural areas. Indeed, if the kinds of problems which rural development program confront are considered in very broad terms, they may perhaps be divided into Physical. These are problems which relate to the physical environment of a particular rural area, e.g., lack of water, poor infrastructure, lack of health facilities, or soil erosion. Rural development program can study the nature, extent of the problems and propose a course of action.

Non-physical. Not all the problems which farmers face are physical in nature. Some problems are more related to the social, political conditions of the region in which the farmers live; e.g. limited access to land, no contact with government services, or dependence upon a bigger farmer. These problems are also very real even though they exist below the surface

2-3 Development:

Definition 1**:** Development is the organized efforts undertaken in accordance to planning ordinance to coordinate between the human potential and material resources in the middle of a certain society, in order to achieve the highest levels of national income, per capita incomes and higher standards of living, social life in its different aspects, to achieve a higher level of social welfare.

Definition **2**: it is the political and intellectual process; it is process of changing and modification of man for the sake of others. So they are need of intellectual leadership and social elites that have clear vision issues of degeneration and prosperity. From definitions above, it is clear that the development is not just

the process of economic planning or growth in certain sector but comprehensive series with concerted and synaptic action that discusses & addresses all the elements of human life and responds to the demands of the population in general. (Http:/ Tanami.Ma/article.Php, 2010).

There is considerable body of empirical evidence that shows the need to work collaboratively with local institutions to achieve sustainable improvement in rural poverty reduction and management of natural resources.

2-4 Concept of development

All rural extension work takes place within a process of development, and cannot be considered as an isolated activity. Extension program and projects and extension agents are part of the development of rural societies. It is, therefore, important to understand the term *development*, and to see how its interpretation can affect the course of rural extension work. The term development does not refer to one single phenomenon or activity nor does it mean a general process of social change. All societies, rural and urban, are changing all the time. This change affects, for example, the society's norms and values, its institutions, its methods of production, the attitudes of its people and

the way in which it distributes its resources. A rural society's people, customs and practices are never static but are continually evolving into new different forms. There are different theories which seek to explain this process of social change (as evolution, as cultural adaptation or even as the resolution of conflicting interests) examples of each explanation can be found in different parts of the world. Development is more closely associated with some form of action or intervention to influence the entire process of social change. It is a dynamic concept which suggests a change in, or a movement away from, a previous situation. All societies are changing, and rural extension attempts to develop certain aspects of society in order to influence the nature and speed of the change. In the past few decades, different nations have been studied and their level of development has been determined; this has given rise to the use of terms such as developed as opposed to *developing* nations. In other words, it is assumed that some nations have advanced or changed more than others, and indeed these nations are often used as the model for other, *developing*, nations to follow.

This process of development can take different forms and have a variety of objectives. The following statements illustrate this:- Development involves the introduction of new ideas into a social system in order to produce higher per caput incomes and levels of living through modern production methods and improved social organization.

- Development implies a total transformation of a traditional or pre-modern society into types of technology and associated social organization that characterize the advanced stable nations of the Western world.

- Development is building up the people so that they can build a future for themselves. Development is an experience of freedom in deciding what people choose to do. To decide to do something brings dignity and self-respect.

Development efforts therefore start with the people's potential; proceed to their enhancement and growth. Much has been written about the process of development, and the approaches which developing nations should adopt in order to develop. Reviewing this literature it cans be concluded that a process of development should contain three main elements.

1-Economic. The development of economic or productive base of any society, which will produce the goods, materials required for life.
2-Social.The provision of a range of social amenities and services (i.e., health, education, welfare) which care for the non-productive needs of a society.
3-Human. The development of the people themselves, both individually and communally, to realize their full potential, to use their skills and talents, and to play a constructive part in shaping their own society. Development has to do with the above three elements. It should not concentrate upon one to the exclusion of the others. The economic base of any society is critical, for it must produce the resources required for livelihood. But we must also think of people, ensure their active participation in the process of development.

2-5 Types of developments.

Diversity of concept about the perception of development has resulted to diversities in categories of development some of which.

2-5-1 Participatory Development:

Participatory development seeks to engage local populations in development projects. Participatory development (PD) has taken a variety of forms since it emerged in the 1970s, when it was introduced as an important part of the "basic needs approach" to development. Most manifestations of PD seek “to give the poor a part in initiatives designed for their benefit” in the hopes that development projects will be more sustainable and successful if local populations are engaged in the development process. PD has become an

increasingly accepted method of development practice and is employed by a variety of organizations. It is often presented as an alternative to mainstream “top-down” development. There is some question about the proper definition of PD as it varies depending on the perspective applied. Two perspectives that can define PD are the "Social Movement Perspective" and the "Institutional Perspective".

You cannot "buy" development; beneficiary communities must own the projects - B. Hoeper. The "Social Movement Perspective" defines participation as the mobilization of people to eliminate unjust hierarchies of knowledge, power, and economic distribution. This perspective identifies the goal of participation as an empowering process for people to handle challenges and influence the direction of their own lives Empowerment participation is when primary stakeholders are capable and willing to initiate the process and take part in the analysis. This leads to joint decision making about what should be achieved and how. While outsiders are equal partners in the development effort, the primary stakeholders are primus inter pares, i.e., they are equal partners with a significant say in decisions concerning their lives. Dialogue identifies and analyzes critical issues, and an exchange of knowledge and experiences leads to solutions. Ownership and control of the process rest in the hands of the primary stakeholders.

The "Institutional Perspective" defines participation as the reach and inclusion of inputs by relevant groups in the design and implementation of a development project. The “Institutional Perspective” uses the inputs and opinions of relevant groups, or stakeholders in a community, as a tool to achieve a pre-established goal defined by someone external to the community involved. The development project, initiated by an activist external to the community involved, is a process by which problem issues

in a community can be divided into stages, and this division facilitates assessment of when and to what degree a participatory approach is relevant From an institutional perspective, there are four key stages of a development project: Research Stage, Design Stage, Implementation Stage, Evaluation Stage that are defined in later sections of this article.

The institutional perspective can also be referred to as a "Project-Based Perspective".

Advocates of PD emphasize a difference between participation as “an end in itself”, and participatory development as a “process of empowerment” for marginalized populations This has also been described as the contrast between valuing participation for intrinsic rather than purely instrumental reasons. In the former manifestation, participants may be asked to give opinions without any assurance that these opinions will have an effect or may be informed of decisions after they have been made. In the latter form, proponents assert that PD tries to “foster and enhance people’s capability to have a role in their society’s development” Participatory development employed in particular initiatives often involves the process of content creation. For example, UNESCO’s Finding a Voice Project employs ICT for development initiatives. Local content creation and distribution contributes to the formation of local information networks. This is a bottom-up approach that involves extensive discussions, conversations, and decision-making with the target community. Community group members create content according to their capacities and interests. This process facilitates engagement with information and communication technology (ICT) with the goal of strengthening individual and social development. This participatory content creation is an important tool for poverty reduction strategies and creating a digitally inclusive knowledge society.

The goal of economic and social development in developing countries is

to set in motion a process of self-reliant and sustainable development through which social justice will be realized. "Self-reliant development" means building the endogenous mechanisms of society that will enable developing nations ultimately to achieve growth without aid. "Sustainable" development means continuing a stable growth pattern in such a way as economic development is in harmony with the environment. The realization of "social justice" means equalizing and ensuring opportunities for people to participate in order to rectify disparities between regions, income levels, and gender. Toward this end, the focus in development should be not only on increasing the material production but also on fostering and improving the social capabilities of people involved in development. For this to be done, people involved in development should take an active part in the process of planning and implementing development activities as well as enjoy their benefits. This is what "participation" means. Participation in every aspect of politics, economy, and society is important as both the goal and means of development.

This study committee would like to regard participatory development as a form of development that heightens sustainability and self-reliance and aims for the realization of social justice by improving the quality of people's participation. The areas in which participatory development takes place exist on a diversity of levels, ranging from the most microcosmic level of individual organizations' aid projects, to the communities and local societies that surround them, up to and including the national level. It is at the levels of rural communities, local societies, and the state that all of the aspects of participation in the economy, society, and politics overlap. We would like to highlight local societies and groups of rural communities that can serve as administrative and developmental

units, and direct our focus regarding participatory development on increasing the quality of participation in these local societies. The quality of this participation will be enhanced as basic human needs of regional inhabitants are met, as people's awareness and the organization of people's groups in local societies are promoted, and as organizations' capability to manage resources, to govern themselves autonomously, and to negotiate with representatives from outside the community are progressively fostered. The series of processes through which peoples' awareness, organization, and capabilities are continuously developed is collectively termed "the process of participation in local society," but many forms of participation in this process actually exist. The following three elements are involved; they interact while influencing the form as well as the quality of participation.

1. People and local organizations (including the subgroups that form part of the organization when an organization is involved), the agents of participation;

2. The formal and informal institutions such as laws, administrative systems, or behavioral norms that determine the participating entity's opportunities for participation and behavioral models.

3. The national structures of state and government that are guarantors of the effectiveness of these institutions and can improve or strengthen them through policy support. The quality of participation varies depending on the following: (i) what kind of participating entities exist, and what kind of institutions offer what kind of opportunities for participation, (ii) the extent to which the state and government channels guarantee the effectiveness of existing institutions and carry out appropriate policy support, (iii) the degree to which participating entities are able to respond appropriately to opportunities to participate, and finally (iv) how the state, government structures, and other

third parties are able to improve and strengthen institutions or to find a mutually complementary and strengthening relationship with informal and formal institutions when necessary in order to increase opportunities to participate. Because these three elements are themselves determined by the initial cultural and historical conditions and status of development of the society in which participation takes place, the quality of participation is also influenced by these conditions and their developmental status.

Through participatory development, we seek not only to construct or restructure such formal institutions as legal and administrative systems, administrative processes, and markets, but also to introduce mechanisms from informal institutions such as the existing traditional resource management systems of local societies to enhance the effectiveness of existing formal institutions. For example, it is conceivable that by actively mobilizing the know-how of local societies and such informal customs as mutual aid, one can compensate for the limitations of existing formal systems and by enhancing the capabilities of community members and their organizations, one can create norms for new and better organizational arrangements, improving and developing informal institutions. Furthermore, efforts to promote a change in the perceptions and enhance the capabilities of public officials and to improve or streamline the government agencies and channels will facilitate the above-mentioned improvements and the degree of effective and sustainable participation in local societies.

Stages of a participatory development from an institutional perspective.

Each project issue in participatory development can be divided into stages, and this division facilitates assessment of when and to what degree a participatory approach is relevant. From an institutional perspective, there are **four key stages** of a development project:

1. **Research Stage** is where the development problem is accurately defined. All relevant stakeholders can be involved in this process. The research around the development problem can include studying previous experiences, individual and community knowledge and attitudes, existing policies and other relevant contextual information related to socio-economic conditions, culture, spirituality, gender, etc.

2. **Design Stage** defines the actual activities. A participatory approach helps to secure the ownership and commitment of the communities involved. Active participation by local citizens and other stakeholders aims to enhance both the quality and relevance of the suggested interventions.

3. **Implementation Stage** is when the planned intervention is implemented. Participation at this stage increases commitment, relevance and sustainability.

4. **Evaluation Stage** participation ensures that the most significant changes are voiced, brought to common attention and assessed. For a meaningful evaluation, indicators and measurements should be defined in a participatory process at the very beginning of the initiative involving all relevant stakeholders.

Forms of participatory development:

1. **Passive participation** is the least participatory of the four approaches. Primary stakeholders of a project participate by being informed about what is going to happen or has already happened. People's feedback is minimal or non-existent, and their participation is assessed through methods like head counting and contribution to the discussion (sometimes referred to as participation by information).

2. **Participation:** By consultation is an extractive process, whereby stakeholders provide answers to questions posed by outside researchers or experts. Input is not limited to meetings but can be provided at different points

in time. In the final analysis, however, this consultative process keeps all the decision- making power in the hands of external professionals who are under no obligation to incorporate stakeholders' input.

3. **Participation by collaboration.**

forms groups of primary stakeholders to participate in the discussion and analysis of predetermined objectives set by the project. This level of participation does not usually result in dramatic changes in what should be accomplished, which is often already determined. It does, however, require an active involvement in the decision-making process about how to achieve it. This incorporates a component of horizontal communication and capacity building among all stakeholders—a joint collaborative effort. Even if initially dependent on outside facilitators and experts, with time collaborative participation has the potential to evolve into an independent form of participation.

4. **Empowerment participation.**

Is where primary stakeholders are capable and willing to initiate the process and take part in the analysis. This leads to joint decision making about what should be achieved and how. While outsiders are equal partners in the development effort, the primary stakeholders are primus inter pares, i.e., they are equal partners with a significant say in decisions concerning their lives. Dialogue identifies and analyzes critical issues and an exchange of knowledge and experiences leads to solutions. Ownership and control of the process rest in the hands of the primary stakeholders.

Variations of participatory development:

Manifestations

There are many different manifestations of Participatory Development. PD has been promoted as a way to improve the "efficiency and effectiveness" of "formal" development programs. This method usually involves external and

local actors working together on a particular project. GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit), a German development agency, describes participation as “co-determination and power sharing throughout the program cycle". By involving those who will benefit from the programs in their development and having local and international groups work together, it is hoped that development projects will be made more sustainable and successful. Enabling "mutual learning" is another way that PD is conceptualized. The goal is to enhance “communication, respect, listening and learning between development workers and those they serve” in order to achieve more applicable, “useful outcomes”. Participatory Rural Appraisal (PRA) is one example of mutual learning, a form of research which acknowledges that “illiterate, poor, marginalized people [can] represent their own lives and livelihoods... do their own analysis and come up with their own solutions”. Some hope that PD will be able to cause a shift in power relations by “valorizing...voices” that usually go unheard by political and development groups. This speaks to the idea that PD has the potential to increase a population’s ability to be self-determining. Those who promote this view of PD would like to see local communities making, rather than only contributing to, important decisions. These activists hope that PD will lead to better civil engagement, whereby people are able determine the ways their own communities function.[1] In these cases, international organizations can support and draw attention to the efforts of groups working for self-determination.

Implementation:

Some theorists have highlighted a difference between “invited” and “claimed” spaces for PD. Invited spaces are usually formal events where local communities are asked by development agencies to share their thoughts. There is often a goal of coming to an agreement. Conversely, claimed spaces are created when marginalized individuals step in and “[take] control of political

processes" The Zapatista Army of National Liberation movement can be viewed as an example of local people "claiming" space to advocate for political change.

Benefits:

Research conducted by several development agencies (World Bank, CIDA, USAID, IRDP) suggests that there are many benefits to be gained through the use of PD These studies suggest that while PD projects may have high start up costs, they will be less expensive and more sustainable in the long run.These studies also found that PD projects are better at addressing local needs and are generally more relevant to local populations than traditional development. Community participation is also thought to increase the efficiency of development projects. Participation can also contribute towards more equitable outcomes so long as elite capture of participatory mechanisms is avoided

Criticisms:

When compared with traditional forms of development, PD is sometimes criticized for being costly and slow. A project may take longer if one has to engage, work and come to a consensus with local communities, than if one did not have to do these things. PD may also have higher start up costs than traditional development. In addition, PD is criticized for reaching a smaller population than traditional development. Community dialogue and augmentation may initially involve only a few individuals, whereas dropped food aid reaches hundreds of people.
More radical development thinkers have put several criticisms forward. PD projects have been accused of treating communities as if everyone in them is the same. This issue.
Until recently strategies of development from above" have dominated spatial planning theory and practices. Development from below is a more recent strategy is a reflection of changing idea and a nature and purpose of

development it's self. Its strategies are basic needs oriented, labor intensive small scale, often rural-central and argue for the use of appropriate technology rather than highest technology, there are three patterns of participation in Sudan which can be identified:

A- Participation stem from the local composition e.g. Naffer, El fazza and fire line opening, which are dominant among rural people.

B- Participation in all project life. The study focused the relationship between participation, self-reliance and sustainability of long run project. The local participation may secure the cooperative group.

C- Local organization, which shows the solidarity of the group and their integral role to economic, social matters and coordination with local Government. Traditional form of participation morally prevails in the rural area. Other forms, which need outside intervention either Government or by Agencies need institutionalization and administrative arrangements also. Participation; Always try to consult the local people; seek out their ideas involved them as much as possible in the program activities.

2-5-2. Sustainability and Sustainable Development (SD)

As a working definition, sustainability can be defined as the practice of maintaining processes of productivity indefinitely—natural or human made—by replacing resources used with resources of equal or greater value without degrading or endangering natural biotic systems. According to M. Hasna, sustainability is a function of social, economic, technological and ecological themes Sustainable development ties together concern for the carrying capacity of natural systems with the social, political, and economic challenges faced by humanity. As early as the 1970s, the concept of "sustainability" was employed to describe an economy "in equilibrium with basic ecological support systems."

Scientists in many fields have highlighted *The Limits to Growth* and economists have presented alternatives, for example a 'steady state economy' to address concerns over the impacts of expanding human development on the planet.

The term sustainable development rose to significance after it was used by the Brundtland_Commission in its 1987 report Our Common Future. In the report, the commission coined what has become the most often-quoted definition of sustainable development: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The United Nations Millennium Declaration identified principles and treaties on sustainable development, including economic development, social development and environmental protection.

The United Nations World Commission on Environment and Development (WCED) in its 1987 report Our Common Future defines sustainable development: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Under the principles of the United Nations Charter the Millennium Declaration identified principles and treaties on sustainable development, including economic development, social development and environmental protection. Broadly defined, sustainable development is a systems approach to growth and development and to manage natural, produced, and social capital for the welfare of their own and future generations. The term sustainable development as used by the United Nations incorporates both issues associated with land development and broader issues of human development such as education, public health, and standard of living.

The concepts of sustainable development and sustainability derive from the older forestry term "sustained yield", which, in turn, is a translation of the German term "nachhaltiger. Ertrag" dating from 1713. Sustainability science is

the study of the concepts of sustainable development and environmental science. There is an additional focus on the present generations' responsibility to regenerate, maintain and improve planetary resources for use by future generations.

History of sustainability

-The concept of "sustainable development" has its roots in forest management as early as the 12th to 16th centuries However, over the last five decades the concept has significantly broadened. The first use of the term sustainable in the contemporary sense was by the Club of Rome in 1972 in its classic report on the "Limits to Growth", written by a group of scientists led by Dennis and Donella Meadows of the Massachusetts Institute of Technology. Describing the desirable "state of global equilibrium", the authors used the word "sustainable": "We are searching for a model output that represents a world system that is:

(1)- sustainable without sudden and uncontrolled collapse and (2) capable of satisfying the basic material requirements of all of its people. In 1980, the International Union for the Conservation of Nature published a world conservation strategy that included one of the first references to sustainable development as a global priority.

-In 1982, the United Nations World Charter for Nature raised five principles of conservation by which human conduct affecting nature is to be guided / judged.

-In 1987, the United Nations World Commission on Environment and Development released the report Our Common Future, now commonly named the 'Brundtland Report' after the commission's chairperson, the then Prime Minister of Norway Gro Harlem Brundtland. The report included what is now one of the most widely recognised definitions: "Sustainable development is development that meets the needs of the present without compromising the

ability of future generations to meet their own needs." The Brundtland Report goes on to say that sustainable development also contains within it two key concepts:

1-The concept of "needs," in particular, the essential needs of the world's poor, to which overriding priority should be given; and

2-The idea of limitations imposed by state of technology and social

Organization on the environment's ability to meet present and future.

In 1992, the UN Conference on Environment and Development published in 1992 the Earth_Charter, which outlines the building of a just, sustainable, and peaceful global society in the 21st century. The action plan Agenda 21 for sustainable development identified information, integration, and participation as key building blocks to help. Countries achieve development that recognizes these interdependent pillars. It emphasizes that in sustainable development everyone is a user and provider of information. It stresses the need to change from old sector-centered ways of doing business to new approaches that involve cross-sectoral co-ordination and the integration of environmental and social concerns into all development processes. Furthermore, Agenda 21 emphasizes that broad public participation in decision making is a fundamental prerequisite for achieving sustainable development.

The UN Commission on Sustainable Development integrated sustainable development into the UN System. Indigenous peoples have argued, through various international forums such as the United Nations Permanent Forum on Indigenous Issues and the Convention on Biological Diversity, that there are *four* pillars of sustainable development, the fourth being cultural. The Universal Declaration on Cultural Diversity from 2001 states: "... cultural diversity is as necessary for humankind as biodiversity is for nature*"; it becomes "*one of the roots of development understood not simply in terms of economic growth, but

also as a means to achieve a more satisfactory intellectual, emotional, moral and spiritual existence. The proposed changes were supported by a study in 2013, which concluded that sustainability reporting should be reframed through the lens of four interconnected domains: ecology, economics, politics and culture.

Definition:

Though – scholars differ in defining the term sustainability but them share similar and common grounds:(Meeting the needs of present population, wise use of resources in development process conservation of continuous development to satisfy the need of the younger and future generation).The priorities of sustainable rural development (SRD).Fundamental strategies in (SRD) we live in a world with limited available resources. The resources including water soil. Sustainable development is the management and conservation of natural resources base, and the orientation of the technological and institutional change in such a manner as to insure the attainment continued satisfaction of human needs for present and future generation such as such sustainable development in Agriculture forestry and fisheries sector. Conserve land, plant and animal genetics resources, is environmentally none – degrading technically appropriate economically viable and socially acceptable. It is kind of development means to respond to respond to the need s of current generation without exposing the potency of the subsequent generation to danger, so that their needs can be responded to as well. Sustainable development is a road-map, an action plan, for achieving sustainability in any activity that uses resources and where immediate and intergenerational replication is demanded. As such, sustainable development is the organizing principle for sustaining finite resources necessary to provide for the needs of future generations of life on the planet. It is a process that envisions a desirable future state for human societies in which living conditions and resource-use continue to meet human needs

without undermining the "integrity, stability and beauty" of natural biotic systems. The sustainable development has got three dimensions:

A-Environmental dimension: The question of sustainable development put forward needs that take care of economic system by satisfying them, by nature seta limits that must be respected in the field of manufacturing.

B-The economic dimension: Means current, future repercussions of economy on the environment.

C-The social dimension: It is the human dimension that makes growth of social engaging.

Sustainable agriculture:

Sustainable agriculture may be defined as consisting of environmentally-friendly methods of farming that allow the production of crops or livestock without damage to human or natural systems. More specifically, it might be said to include preventing adverse effects to soil, water, biodiversity, surrounding or downstream resources—as well as to those working or living on the farm or in neighboring areas. Furthermore, the concept of sustainable agriculture extends intergenerationally, relating to passing on a conserved or improved natural resource, biotic, and economic base instead of one which has been depleted or polluted.[1] Some important elements of sustainable agriculture are permaculture, agro forestry, mixed farming, multiple cropping, and crop rotation.
Numerous sustainability standards and certification systems have been established in recent years to meet development goals, thus offering consumer choices for sustainable agriculture practices. Well-known food standards include organic, Rainforest Alliance, Fair Trade, UTZ Certified, Bird Friendly, and the Common Code for the Coffee Community(4C).

2-5-3. Social development:

This kind of the development has to do with the concept of community development in terms of achieving social balance. So social development can be considered "the context in which lead to higher standard of living of the population in food, health, &work (Http://Tanmia.ma/article.php.2010). Social development theory attempts to explain qualitative changes in the structure and framework of society that help the society to better realize its aims and objectives. Development can be broadly defined in a manner applicable to all societies' at all historical periods as an upward ascending movement featuring greater levels of energy, efficiency, quality, productivity, complexity, comprehension, creativity, mastery, enjoyment and accomplishment. Development is a process of social change, not merely a set of policies and programs instituted for some specific results. During the last five centuries this process has picked up in speed and intensity, and during the last five decades has witnessed a marked surge in acceleration. The basic mechanism driving social change is increasing awareness leading to better organization. When society senses new and better opportunities for progress it develops new forms of organization to exploit these new openings successfully. The new forms of organization are better able to harness the available social energies and skills and resources to use the opportunities to get the intended results. Development is governed by many factors that influence the results of developmental efforts. There must be a motive that drives the social change and essential preconditions for that change to occur. The motive must be powerful enough to overcome obstructions that impede that change from occurring. Development also requires resources such as capital, technology, and supporting infrastructure.

Development is the result of society's capacity to organize resources to meet challenges and opportunities. Society passes through well-defined stages in the

course of its development. They are nomadic hunting and gathering, rural agrarian, urban, commercial, industrial, and post-industrial societies. Pioneers introduce new ideas, practices, and habits that conservative elements initially resist. At a later stage, innovations are accepted, imitated, organized, and used by other members of the community. Organizational improvements introduced to support the innovations can take place simultaneously at four different levels—physical, social, mental, and psychological. Moreover four different types of resources are involved in promoting development. Of these four, physical resources are most visible, but least capable of expansion. Productivity of resources increases enormously as the quality of organization and level of knowledge inputs rise.

Development pace and scope varies according to the stage society is in. The three main stages are physical, vital (*vital* refers to the dynamic and nervous social energies of humanity that propel individuals to accomplish), and mental. Though the term *development* usually refers to economic progress, it can apply to political, social, and technological progress as well. These various sectors of society are so intertwined that it is difficult to neatly separate them. Development in all these sectors is governed by the same principles and laws, and therefore the term applies uniformly. Economic development and human development need not mean the same thing. Strategies and policies aimed at greater growth may produce greater income in a country without improving the average living standard. This happened in oil-producing Middle Eastern countries—a surge in oil prices boosted their national income without much benefit to poorer citizens. Conversely, people-oriented programs and policies can improve health, education, living standards, and other quality-of-life measures with no special emphasis on monetary growth. This occurred in the 30 years of socialist and communist rule in Kerala in India. Four related but distinct terms and phenomena form successive steps in a graded series: survival, growth, development, and evolution. Survival refers to a subsistence lifestyle

with no marked qualitative changes in living standards. Growth refers to horizontal expansion in the existing plane characterized by quantitative expansion—such as a farmer increasing the area under cultivation, or a retailer opening more stores. Development refers to a vertical shift in the level of operations that causes qualitative changes, such as a retailer turning into a manufacturer or an elementary school turning into a high school.

2-5-4 Economic development:

Economic development as the foremost or before anything is the development of strong productivity that is the work of human and his power of productivity. This development requires a growing re-production for the means of production and consumer needs. It also needs or requires an accumulation in the capital. (Http: //Tanami/article.php.2010). Economic development is the sustained, concerted actions of policy makers and communities that promote the standard of living and economic health of a specific area. Economic development can also be referred to as the quantitative and qualitative changes in the economy. Such actions can involve multiple areas including development of human capital, critical infrastructure, regional competitiveness, social inclusion, health, safety, literacy, and other initiatives. Economic development differs from economic growth. Whereas economic development is a policy intervention endeavor with aims of economic and social well-being of people, economic growth is a phenomenon of market productivity and rise in GDP. Consequently, as economist Amartya Sen points out, "economic growth is one aspect of the process of economic development.

The scope of economic development:

The scope of economic development includes the process and policies by which a nation improves the economic, political, and social well-being of its people

The University of Iowa's Center for International Finance / Development states ‘Economic development' is a term that economists, politicians, and others have used frequently in the 20th century. The concept, however, has been in existence in the West for centuries. Modernization, Westernizations, and especially Industrializations are other terms people have used while discussing economic development. Economic development has a direct relationship with the environment. Although nobody is certain when the concept originated, most people agree that development is closely bound up with the evolution of capitalism and the demise of feudalism”

Mansell and When also state that economic development has been understood since the World War II to involve economic growth, namely the increases in per capita income, and (if currently absent) the attainment of a standard of living equivalent to that of industrialized countries. Economic development can also be considered as a static theory that documents the state of an economy at a certain time. According to Schumpeter (2003), the changes in this equilibrium state to document in economic theory can only be caused by intervening factors coming from the outside.

History: Economic development originated in the post war period of reconstruction initiated by the US. In 1949, during his inaugural speech, President Harry Truman identified the development of undeveloped areas as a priority for the west: “More than half the people of the world are living in conditions approaching misery. Their food is inadequate, they are victims of disease. Their economic life is primitive and stagnant. Their poverty is a handicap and a threat both to them and to more prosperous areas. For the first time in history humanity possesses the knowledge and the skill to relieve the suffering of these people ... I believe that we should make available to peace-loving peoples the benefits of our store of technical knowledge in order to help them realize their aspirations for a better life… What we envisage is a program

of development based on the concepts of democratic fair dealing ... Greater production is the key to prosperity and peace. And the key to greater production is a wider and more vigorous application of modem scientific and technical knowledge. There have been several major phases of development theory since 1945. From the 1940s to the 1960s the state played a large role in promoting industrialization in developing countries, following the idea of modernization theory. This period was followed by a brief period of basic needs development focusing on human capital development and redistribution in the 1970s. Neo-liberalism emerged in the 1980s pushing an agenda of free trade and removal of Import Substitution Industrialization policies. In economics, the study of economic development was borne out of an extension to traditional economics that focused entirely on national product, or the aggregate output of goods and services. Economic development was concerned in the expansion of people's entitlements and their corresponding capabilities, morbidity, nourishment, literacy, education, and other socio-economic indicators.[1] Borne out of the backdrop of Keynesian, advocating government intervention, and neoclassical economics, stressing reduced intervention, with rise of high-growth countries (Singapore, South Korea, Hong Kong) and planned governments (Argentina, Chile, Sudan, Uganda), economic development, more generally development economics, emerged amidst these mid-20th century theoretical interpretations of how economies prosper Also, economist Albert O. Hirschman, a major contributor to development economics, asserted that economic development grew to concentrate on the poor regions of the world, primarily in Africa, Asia and Latin America yet on the outpouring of fundamental ideas and models. It has also been argued, notably by Asian and European proponents of infrastructure-based development, that systematic, long-term government investments in transportation, housing, education, and healthcare are necessary to ensure sustainable economic growth in emerging countries.

Growth & development

Dependency theorists argue that poor countries have sometimes experienced economic growth with little or no economic development initiatives; for instance, in cases where they have functioned mainly as resource-providers to wealthy industrialized countries. There is an opposing argument, however, that growth causes development because some of the increase in income gets spent on human development such as education and health. According to Ranis et al., economic growth and development is a two-way relationship. According to them, the first chain consists of economic growth benefiting human development, since economic growth is likely to lead families and individuals to use their heightened incomes to increase expenditures, which in turn furthers human development. At the same time, with the increased consumption and spending, health, education, and infrastructure systems grow and contribute to economic growth. In addition to increasing private incomes, economic growth also generate additional resources that can be used to improve social services (such as healthcare, safe drinking water, etc.). By generating additional resources for social services, unequal income distribution will be mitigated as such social services are distributed equally across each community, thereby benefiting each individual. Concisely, the relationship between human development and economic development can be explained in three ways. First, increase in average income leads to improvement in health and nutrition (known as Capability Expansion through Economic Growth). Second, it is believed that social outcomes can only be improved by reducing income poverty (known as Capability Expansion through Poverty Reduction). Lastly, social outcomes can also be improved with essential services such as education, healthcare, and clean drinking water (known as Capability Expansion through Social Services). John Joseph Puthenkalam's research aims at the process of economic growth theories that lead to economic development. After analyzing the existing

capitalistic growth-development theoretical apparatus, he introduces the new models which integrates the variables of freedom, democracy and human rights into the existing models and argue that any future economic growth-development of any nation depends on this emerging model as we witness the third wave of unfolding demand for democracy in the Middle East. He develops the knowledge sector in growth theories with two new concepts of 'micro knowledge' and 'macro knowledge'. Micro knowledge is what an individual learns from school or from various existing knowledge and macro knowledge is the core philosophical thinking of a nation that all individuals inherently receive. How to combine both these knowledge would determine further growth that leads to economic development of developing nations.

Yet others believe that a number of basic building blocks need to be in place for growth and development to take place. For instance, some economists believe that a fundamental first step toward development and growth is to address property rights issues, otherwise only a small part of the economic sector will be able to participate in growth. That is, without inclusive property rights in the equation, the informal sector will remain outside the mainstream economy, excluded and without the same opportunities for study.

Goals: In the United States, Project Socrates outlined competitiveness as the driving factor for successful economic development in government and industry. By addressing technology directly, to meet customer needs, competitiveness was fostered in the surrounding environment and resulted in greater economic performance and sustained growth.

Economic development typically involves improvements in a variety of indicators such as literacy rates, life expectancy, and poverty rates. GDP does not take into account other aspects such as leisure time, environmental quality, freedom, or social justice; alternative measures of economic well-being have been proposed. Essentially, a country's economic development is related to its

human development, which encompasses, among other things, health and education. These factors are, however, closely related to economic growth so that development and growth often go together. Due to globalization growth and development in those countries are interrelated to trends on international trade and participation in Global_Value Chains (GVCs) and international financial markets. The last financial crisis had a huge effect on economies necessary to make financial markets in developing countries more resilient by providing a variety of financial institutions. This could also add to financial security for small-scale producers. in developing countries. Economist Jayati Ghosh states that it is.

Regional policy:

In its broadest sense, policies of economic development encompass three area Governments undertaking to meet broad economic objectives such as price stability, high employment, and sustainable growth. Such efforts include monetary and fiscal_policies, regulation of financial institutions, trade, and tax policies.

-Programs that provide infrastructure and services such as highways, parks, affordable housing, crime prevention, and K–12 education.

-Job creation and retention through specific efforts in business finance, marketing, neighborhood development, workforce development, small business development, business retention and expansion, technology transfer, and real estate development. This third category is a primary focus of economic development professionals.

One growing understanding in economic development is the promotion of regional clusters and a thriving metropolitan economy. In today's global landscape, location is vitally important and becomes a key in competitive

advantage.

International trade and exchange rates are a key issue in economic development. Currencies are often either under-valued or over-valued, resulting in trade surpluses or deficits.

2-5-5. Human Development:

The concept of human development. It is in the line with the integral role of education (services).The purpose of development is to expand the capabilities of people, to increase their ability to lead long, healthy lives, to enable them to cultivate their talents, interests to afford an opportunity to live indignity with self-respect. The means by which is achieved may be drivers by increasing the stock of physical capital, introduce new technologies, changing institution, altering incentives. Equally important& sometimes more important are investment in human capital by improving of lives, education plays central role in development through human capital formation, leads to expansion of human capabilities.(M.1998). The first Human Development Report in 1990 opened with the simply stated premise that has guided all subsequent Reports: “People are the real wealth of a nation.” By backing up this assertion with an abundance of empirical data and a new way of thinking about and measuring development, the Human Development Report has had a profound impact on policies around the world. p this assertion with an abundance of empirical data and a new way of thinking about and measuring development, the Human Development Report has had a profound impact on policies around the world.

"The basic purpose of development is to enlarge people's choices. In principle, these choices can be infinite and can change over time. People often value achievements that do not show up at all, or not immediately, in income or growth figures: greater access to knowledge, better nutrition and health services, more secure livelihoods, security against crime and physical violence, satisfying

leisure hours, political and cultural freedoms and sense of participation in community activities. The objective of development is to create an enabling environment for people to enjoy long, healthy and creative lives." - Mahbub ul Haq (1934-1998), founder of the Human Development Report

"Human development, as an approach, is concerned with what I take to be the basic development idea: namely, advancing the richness of human life, rather than the richness of the economy in which human beings live, which is only a part of it." - Amartya Sen, Professor of Economics, Harvard University Nobel Laureate in Economics, 1998

"That was the original vision and remains the great achievement of the creators of the Human Development Reports, Mahbub ul-Haq of Pakistan and his close friend and collaborator, Amartya Sen of India, working with other leading development thinkers. Their concept has guided more than 20 years of global Human Development Reports, more than 600 National Human Development Reports—all researched, written and published in their respective countries—as well as the many provocative regionally focused reports supported by UNDP's regional bureaus."

"Perhaps most important, the human development approach has profoundly affected an entire generation of policy-makers and development specialists around the world—including thousands within UNDP itself and elsewhere in the UN system." - Helen Clark, Administrator, United Nations Development Programme. The past decades have seen substantial progress in many aspects of human development. Most people today are healthier, live longer, are more educated and have more access to goods and services. Even in countries facing adverse economic conditions, people's health and education have greatly improved. And there has been progress not only in improving health and education and raising income, but also in expanding people's power to select leaders, influence public decisions and share knowledge. Yet much more remains to be done in expanding choices and improving well-being for all

people in all countries and communities, and for generations yet to come. The human development approach is as relevant as ever to making sense of our changing world and finding ways to improve people's well-being. Human development is an evolving idea, not a fixed, static set of precepts. And as the world changes, analytical tools and concepts will also continue to evolve. Yet the core insight at the center of the human development approach remains constant and as valid today as it was two decades ago: Development is ultimately best measured by its impact on individual lives.

2-5-6 Agricultural Development:

Agricultural Development is one of the largest initiatives of the Bill & Melinda Gates Foundation. To date, we have committed more than US$2 billion to agricultural development efforts, primarily in Sub-Saharan Africa and South Asia. Our approach is based on the following principles:

-Listening to farmers and addressing their specific needs. We talk to farmers about the crops they want to grow and eat, as well as the unique challenges they face. We partner with organizations that understand and are equipped to address these challenges, and we invest in research to identify relevant and affordable solutions that farmers want and will use.

-Increasing farm productivity. We support a comprehensive approach to helping smallholder farmers prosper that includes access to heartier seeds, more effective tools and farm management practices, locally relevant knowledge, emerging digital technologies, and reliable markets. We also advocate for agricultural policies that support farmers in their efforts to better feed themselves and their communities.

-Fostering sustainable agricultural practices. In an era of increasingly scarce resources and growing impact of climate change, we encourage farmers to

embrace and adopt sustainable practices that help them grow more with less land, water, fertilizer, and other costly inputs while preserving natural resources for future generations.

Agricultural development must also address gender disparities. In Sub-Saharan Africa and South Asia, women are vital contributors to farm work, but because they have less access to improved seeds, better techniques and technologies, and markets, yields on their plots are typically 20 to 40 percent lower than on plots farmed by men. Addressing this gap can help households become more productive and reduce malnutrition within poor families.

It is growth of marketable production& integration production of small subsistence farmers into national market. The genuine poverty focus- poorest of poor "is given up& instead middle peasantry, who control required productive resources, is sought for leading programmes. The program may still claim to have the "small farmers" as target group**.** Researchers are seeking ways to combat crop disease such as those infecting the plants on the farm.We support research to develop more productive and nutritious varieties of the staple crops grown and consumed by farming families. These include varieties adapted to local conditions that deliver specific benefits farmers seek, such as increased yields, better nutrition, and tolerance to drought, flood, and pests. We fund research to discover ways to better manage soil and water resources and reduce crop loss due to spoilage, weeds, pests, disease, and other threats.

Agricultural Policies:

Timely, relevant, and accurate information is crucial to farmers. Policymakers in developing countries also need good data to inform their decision making. We support data collection, research, and policy analysis to help evaluate the impact of various approaches, get accurate information to farmers, and assess

the effects of national and international agricultural policies. Our research also includes measuring the progress of our grants to ensure that they are delivering the anticipated benefits to farming families.

Livestock: Livestock is a key part of farming in developing countries and is crucial to the livelihoods of more than 900 million people in Sub-Saharan Africa and South Asia. We support efforts to improve the health and productivity of livestock—particularly chickens, goats, and cows—by improving animal genetics and veterinary care. To ensure that farmers can benefit from animal health and genetics technologies, we test models for providing farmers with the knowledge and tools they need to increase their on-farm production and connect to stable markets.Our work particularly aims to increase income-generating opportunities for women, who may have little control over productive resources such as land but sometimes own and control livestock, especially poultry and goats**.**

To achieve greater impact with farmer. They should committed to communicating the strategy more effectively and sharing what they've learned with grantees and other partners, including governments, nongovernmental organizations, traditional, and the private sector. Our resources, while significant, represent only a fraction of what is needed. Collaborating effectively with others maximizes collective impact in helping farming families

2-5-7 Rural Development:

It difficult to find frigid definition to this category of development because of the different views of interested parties and geographies. Anyway, the definition or concept of rural development is a complex and complicated. It does not cover a particular aspect or area of economic completely but it encompasses all aspects of economic life in addition to cultural and social life. That means that it aims at improving the life conditions of population, developing of their

technical skill, knowledge, social status (education and health) in addition to rational exploitation stabilization of their local natural resources with the necessity of its appraisal and sustainability guarantee for the future generation. Rural development differs in their objectives and dimensions from other types of development especially the agricultural development, but they are linked by dialectical relationship. So, rural development cannot be achieved without the presence of rural agricultural development. Despite, rural development still remains the basis of development in countryside, because it focuses on a holistic approach that concerns dealing with society issues and the economy of the villagers.

Rural development also means qualitative and quantitative improvement for the economic activities that are practices in rural areas with a guarantee of its sustainability. It does not mean merely to manufacture a rural area or an establishment of economic activities in it, but an interrelated phenomenon that works on local resources development and to fight rural poverty, all problems that afflict the rural world. Anyway, are found it difficult to give a unified dignified definition to rural development because of the enormous definition of RD but despite that, rural development can be given the.

Following definitions:

It is continuous complex and holistic serial that can accommodate all the structural transformations that are known to the rural world.

This series can be expressed through the level of improvement, development in agricultural activities, and exploitation of natural, human resources diversify of economic foundations for the rural population, improvement of their economic, social, cultural condition working to increase the attractiveness of life, and any work in rural areas at local or regional, national or international level. Despite the comprehensiveness of this definition as it is seemed to be, but it can't be considered only definition in this context (Http://Tanmiaarticle.php.2010).

There are some other definition of which are as follows: Lele (1975).

Defined as: Income population residing in rural area and making the process of their development self-sustaining".

Three important features can be drawn from this definition. The first one is improving of standard of living, which involves mobilizing and allocating resources. Second feature is participation of rural population in the development process, in designing, implementing monitoring and evaluating the development activities. The last one is that, development projects or programmers should be built on a sustainable manner and self-reliance through enabling rural people to have more contribution to the process of the development.

Rural development as concept, which include efforts to help poor farmers as well as staffing the field of agricultural marketing. This definition on one side is to provide assistance to rural families. Others argue that the concept of rural development is beyond the advancement of the agricultural sector that it includes economic sectors related to agriculture, while some say that it includes development of the human, natural resources at the same time-to achieve prosperity, social justice for the rural population. It is clear from the above rural development must base on the following:

*To accept the participation of the population (villagers) in all stages.

*To accept the collective agreement between residents and planners of development programs etc. Rural development depends on the following methods &goals in the implementation of its programs:

1- The technical infrastructure and the planned frameworks for its programs must be flexible because by so doing can create advantages, as giving priority to the humanitarian nature in, the relations between the departments and institutions in the field of development.

2- Resident, problems advancement in addition to identification of priority of demands.

3-Revitalization of the role of the civil society organizations and professional association's activists in rural area.(Http: //Tanmia.ma/article.php., 2010).

2-5-8 Principles of rural development programmes:

Rural development strategies usually take the form of programmes which implement projects in a specific rural area. Such programmes form the basis of most government and non-government efforts to assist rural areas, and they include both agricultural and non-agricultural projects, e.g maternal and child health programmes. Specialized staff supply the expertise required, and ministerial or other institutional budgets provide the necessary financial resources. External aid is also usually channeled into such programmes in the rural areas. While this guide does not intend to examine the areas of programme planning or implementation; it does suggest a number of very broad principles which should be followed by rural development programmes. The content of these programmes is a matter for the specialists in the particular field, i.e., agriculture, health or water supply. It is important, however, for all such programmes to establish beforehand a set of principles to guide their activities. The following principles are suggested to implement rural development program.

Access. Try to ensure that the programme and its benefits can reach those in need, and beware of the consequences if some farmers have access to the programme while others do not.

Independence. Devise a programme which helps and supports the farmer but which does not make him or his livelihood dependent upon the programme. **Sustainability.** Ensure that the programme's plans and solutions are relevant to

the local economic, social and administrative situation. Short-term solutions may yield quick results, but long-term programmes that are suitable to the local environment have greater success.

Going forward. Technological aspects of rural development programmes should help the farmer to take the next step in his development and not demand that, he take a huge technological leap. It is better to secure a modest advance which can be sustained than to suggest substantial advance which is beyond the ability.

Participation. Always try to consult the local people, seek out their ideas and involve them as much as possible in the programme.

Effectiveness. A programme should be based on the effective use of local resources and not necessarily on their most efficient use.

While efficiency is important; its requirements are often unrealistic. For example, the maximum use of fertilizer is beyond the means of most farmers. But an effective use of resources, which is within the capabilities of most farmers, will have a better chance of a wider impact.

2-5-9 Rural Development Characteristics (RD).

1-Rural development programs aimed primarily at rural population.

2-Recognizing the importance of local initiatives& maximization of available resources.

1- It strives to achieve economic prosperity and rural friendly based on the principle of direction general guidance.

2- The studies and development processes must be driven in coordination with beneficiaries and actors, should lead to a critical assessment and change of directions when necessary.

3- Rural development calls for the participation of residence truth.

4- Spread of social justice with clear choice.

5- Given to the less privileged in the village community.

6- RD are known for its comprehensiveness, rely on decentralization method in decision making meaning that decisions are made locally, all members of village community.

7- RD is a general issue for those that are concerned in it or the farmers, the elected members, decision makers, local resident.

2-5-10 Agriculture and rural development

This guide is primarily concerned with rural extension and with the livelihoods of farmers and their families. The concept of rural development must therefore be considered with particular reference to agriculture, since agriculture is the basis of the livelihood of most rural families. In the past two decades there has been increasing emphasis on rural development programmes and projects, and recognition that the development of rural areas is just as important as the building up of urban, industrial complexes. Development must have two legs: urban industrialization and rural improvement.

There are very strong reasons why resources should now be put into rural development. More than half the people of the world and the vast majority of the people in developing countries (Asia, Africa and Latin America) live in rural areas and gain part or all of their livelihoods from some form of agriculture. Most of these people are also still very poor and dependent on agricultural practices that have benefited little from modern technology.

They live in isolated and often inhospitable places, with little access to the resources they need to improve their agriculture. Many lead their Lives barely at

subsistence level. Solely in terms of numbers of people, there is a very strong case for giving high priority to rural development. It can also be argued that agriculture is a vital part of the economy of any country and that its development is critical to the development of the country's economy as a whole. This relationship can perhaps be best understood by studying the following. Agriculture's important role is one of production, both of food for the rural, the urban population and of cash crops for the export market, to earn foreign currency. In this process demand is stimulated for other products and services, and employment opportunities. Emerge to absorb the society's work-force. As the cycle develops, the increasing agricultural production causes an increasing demand for inputs, which ensure the resources required to maintain the agricultural production. Land is a basic resource for most countries and the exploitation of that resource in the interest of its citizens is one of a country's main responsibilities.

2-5-11 Scope/Objectives of rural development.

2-5-11-1 The scope of Rural Development**.**

In certain respects, the problems of rural development are similar, to those of central cities, deteriorating infrastructure, losing businesses that relocated deciding average income level, than urban once because of long distance required to deliver services so the scope at the rural development programs focusing on the living& employment condition of the rural development. In contrast with farm policy, many of the policies and programs designed to help rural community& business. The government policy is to facilitate and change to provide new ideas and technical assistance to rural leader. Rural people have also great deal of useful information to contribute in their role as consumers. Even if they are not familiar with production or ecology of particular plans action in order to build a stronger one with citizens that are more self-reliant, this entails community building, development, and organization& community

empowerment. These concepts are strongly interrelated (Http://Tanmia.ma/article.php,2010).

As for community development, it has been defined as the process of social action in which the people at a community organize themselves for planning and action. Community development involves the defining of their problems and the execution of these plans. Execution relies a maximum of reliance upon community resources and supplements these resources when necessary with services and material from government and non-government agencies outside the community.

2-5-11-2 Objectives of Rural Development.

There are short & medium term objectives:

1- Making high efforts to improve the workers income through increment in production by improving methods and mechanism for agricultural activities.

2-Improve the nutritional level of the rural population, an increase of

food production, with the possibility of the spillway and drainage of waste in the market (Http://Tanmia.ma/article.php.,2010).

Long-term objectives for rural development:

1-The introduction radical changes to the means of production, productivity services, social, economic institutions, and handicraft cooperatives operating in rural area.

2- Diversification of non-farming productive activities to help the resident and to provide them with rural employment. We have to point out that the multiplicity in the order patterns of development does not help in anything. But its interference and companion efforts will lead to the achievement. (Http://Tanmia.ma/article.php,2010).

To achieve that, the following are necessary:

1- The existence of democratic institutions& representation of affiliation of the population as prerequisite in the development path, because the changing of the reality is not exemplified in passing law& educational division.

2- Provision of high academic and technical frameworks in the field of development.

3- Development and accomplishment of specific development program for some goals aiming at the resident's the environmental preservation.

4- Low enactments and applying of work facilities and methods that helps in work distribution and improvement of working methods in perused method with tighter control over the conduct of transaction in order to achieve an efficiency the performance &economy in time.

5- Provision or availably of local leadership capable of playing major, effective role in development process in the favor of his experience.

6- Adoption of comprehensive, permanent participation of residents, effectiveness of governmental, non-governmental organizations.

7-Individual enjoys ability of freedom movement, political inducement persuasion, the right to have sense of security and dignity life.

8- Creation of joint relationships, solidarity between individuals of same societal component.

9- Elaboration and completion of several projects of all themes.

10-Interference, integration of goals, dimensions that development is aiming to achieve (Http: //Tanmia.ma/article.php., 2010).

2-5-12 the term "Extension".

The use of the word "extension" derives from an educational development in England during the second half of the nineteenth century. Around 1850, discussions began in the two ancient universities of Oxford and Cambridge about how they could serve, the educational needs, near to their homes, of the rapidly growing populations in the industrial, urban area. It was not until 1867 that a first practical attempt was made in what was designated "university extension," but the activity developed quickly to become a well-established movement before the end of the century. Initially, most of the lectures given were on literary and social topics, but by the 1890s agricultural subjects were being covered by peripatetic lecturers in rural areas (Jones, 1994).The growth and success of this work in Britain influenced the initiation of similar activity elsewhere, especially in the United States. There, in many states, comparable out-of-college lectures were becoming established by the 1890s (True, 1900, 1928). During the first two decades of this century, the extramural work of the land-grant colleges, concerned with serving the needs of farm families, was to expand dramatically and become formally organized; but the use of the term "extension" continued and has persisted as the designation for the work. The overt use of the notion of "extending" relevant and useful information to the adult population at large, however, predates the university extension movement. Earlier in the nineteenth century, a British politician, Lord Henry Brougham, an influential advocate of formal education for the poor and of mass adult education, founded the Society for the Diffusion of Useful Knowledge in 1826. Its objective was "imparting useful information to all classes of the community, particularly to such as be unable to avail themselves of experienced teachers, or may prefer learning by themselves." The society sought to do this largely through producing low-priced. Publications and establishing local committees throughout the country "for extending the object of the Society" (Society for the

Diffusion of Useful Knowledge 1827). During its twenty years' existence, agricultural topics were well covered in the society's publications. Similar, albeit short-lived, societies were also established before 1840 in several other European countries, India, China, Malaysia, United States (in Virginia) (Grobel, 1933; Smith,1972).

2-5-12-1 The concept of Extension

Extension is a term which is open to a wide variety of interpretations. Each extension agent probably has his own understanding of what extension is. This understanding will be based on past experience and the particular type of extension service in which the agent is working. In other words, there is no single definition of extension which is universally accepted or which is applicable to all situations. Furthermore, extension is a dynamic concept in the sense that the interpretation of it is always changing. Extension, therefore, is not a term which can be precisely defined, but one describes a continual and changing process in rural areas. The term extension may be examined by

looking at a number of statements that have been written about it.

- Extension is an informal educational process directed toward the rural population. This process offers advice and information to help them solve their problems. Extension also aims to increase the efficiency of the family farm, increase production and generally increase the standard of living of the farm family.
- The objective of extension is to change farmers' outlook toward their difficulties. Extension is concerned not just with physical and economic achievements but also with the development of the rural people themselves. Extension agents, therefore, discuss matters with the rural people; help them to gain a clearer insight into their problems and also to decide how to overcome these problems.

- Extension is a process of working with rural people in order to improve their livelihoods. This involves helping farmers to improve the productivity of their agriculture and also developing their abilities to direct their own future development. The above statements are presented to illustrate the range of interpretations that can be found about extension. They do, however, contain a

Number of common points. They all stress that extension is a process which occurs over a period of time, and not a single, one-time activity. They also all underline extension as an educational process which works with rural people, supports them and prepares them to confront their problems more successfully. If statements such as those above are examined more carefully, and if the current ideas and practice of extension are considered, four main elements can be identified within the process of extension: knowledge and skills, technical advice and information, farmers' organization, and motivation and self-confidence.

2-5-12-2 Principles of Extension

Extension activities are widespread throughout the developing world and most governments have set up formally structured extension services to implement extension programs and projects. The practice of extension is supported by budget, offices, personnel and other resources. Before examining extension in detail however, it will be useful to consider the principles which should guide it.

2-5-12-3 Extension works with people.

Extension works with rural people. Only the people themselves can make decisions about the way they will farm or live& an extension agent does not try to take these decisions for them. Rural people can and do make wise decisions about their problems if they are given full information including possible alternative solutions. By making decisions, people gain self-confidence.

Extension, therefore, presents facts, helps people to solve problems and encourages farmers to make decisions. People have more confidence in program and decisions which they have made themselves than in those which are imposed upon them.

2-5-12-4 The importance of extension

Within the framework presented in the concept extension work in rural communities. Extension is essentially the means by which new knowledge and ideas are introduced into rural areas in order to bring about change and improve the lives of farmers and their families. Extension, therefore, is of critical importance. Without it farmers would lack access to the support and services required to improve their agriculture and other productive activities. The critical importance of extension can be understood better if its three main elements are considered

2-6 Knowledge's and skills.

Although farmers already have a lot of knowledge about their environment and their farming system, extension can bring them other knowledge and information which they do not have. For example, knowledge about the cause of the damage to a particular crop, the general principles of pest control, or the ways in which manure and compost are broken down to provide plant nutrients are all areas of knowledge that agent can bring to farmers. The application of such knowledge often means that the farmer has to acquire new skills of various kinds: for example, technical skills to operate unfamiliar equipment, organizational skills to manage a group project, the skill to assess the economic aspects of technical advice given, or farm management skills for keeping records and allocating the use of farm resources and equipment. The transfer of knowledge and skills to farmers and their families is an important extension

activity and the extension agent must prepare himself thoroughly. He must find out which skills or areas of knowledge are lacking among the farmers in his area, and then arrange suitable learning experiences through which the farmers can acquire them.

Knowledge, Communication in Farm Family

Extension is not concerned directly with generating knowledge; that is done in specialized institutions such as agricultural research center's agricultural colleges or engineering departments. Extension takes this knowledge and makes it available to the farm- family.

Rural extension, therefore, is the process whereby knowledge is communicated, in a variety of ways, to the farm family. This process is usually guided and supported by an extension agent who works at the program and project level, and who is in direct contact with farmers and their families. To do this extension work; agents have to be trained in the different aspects of the extension process. One aspect of this training is giving the agent the technical or scientific knowledge required for the job. This is usually done during the agent's professional training; however, it is only one element in the process.

The other two elements of the process are equally important. It is not enough for an extension agent to have technical knowledge; he must also know how to communicate this knowledge and how to use it to the benefit of the farm family. Training in extension, therefore, is an equally important aspect of the training of any agent who wishes to work with farmers.

2-7 Diffusion and adoption of Innovation:

The communication process**.**

Definition: Roger and Shoemaker (1971)

Define it as" the process by which messages are transferred from the source to a receiver or in other words, the transfer of ideas from a source with a view-point of modifying the behavior of receiver.

Leagns (1961), define it, as "The process by which two or more people exchange ideas, fact, feedings or impressions in ways that each gains common understanding of the meaning and use of message"

Element of communication

There is generally an agreement on four elements the communication process:

1- **The source**(s): who issues the message?

2- **The message:**

This is the content, which the source wants to transmit to the receiver with the aim to influence him.

3- **The channel**:

This is the means by which the message gets from the source to receiver.

4-**The receiver:** is the person or group of persons to whom the message is directed.

Van Den Ban and Hawkins (1988) added a fifth element to the process of communication, which is "to know how of treating the message to guarantee the needed effects." Hence, we can discuss these communication elements:

Sender Yella (1991), defined the source in extension as" the communicator being. The person who starts the process. He may be an extension worker, block

personnel, information officer, specialist, or may even a neighbor, relative, friend, a village leader, and others".

The message:

Sender (1966), stated the purpose is" the objective the change in behavior the message is intended to bring about. These changes may be new knowledge, change in attitudes, change in skill, change in thinking or change in practices.

The content: Is the subject matter with which the message in concerned.

The treatment: makes the soil favorable for acceptance and growth of message

The channel:

Yella(1991),mentioned that" Personal contact by farm and home visit, group meetings, demonstrations, exhibitions, motion pictures, radio, written materials like newspapers, pamphlets and tours are some of channels commonly used in extension work". He added that proper selection and use of channel, which is varying with type of audience (background), type of message and the recipient stage in the adoption process, are important and determine successful communication.

Roger (1983) mentioned that. "Mass-media channels are often the most rapid and efficient means to inform an audience of potential adopters about the existence of an innovation that is to create awareness knowledge. On the other hand, interpersonal channels are more effective in persuading an individual to adopt a new idea especially if the interpersonal channel links two or more individuals who are near-peers.

Adam (1982) stated, "The communication channels used by farmers are commonly classified as fallows".

1- Mass-media channels such as radio, T.V, newspaper, leaflets...etc.from government or commercial sources.

2-Personnel contact with extension workers and representatives of commercial firms either on an individual bases or in small groups.

3- Personnel contact with other farmers.

The receiver (Recipient):

The receiver is the person or a group of persons to whom the message is directed. The receiver is the most important link in the communication process.

Singh (1981), stated that" many personal, social, physiological, economical and other factors influence the communication skills of the farmer (the receiver).Such as socio-economic status, level of education, social participation, age, adoption process, existing level of knowledge about the message, his attitude towards himself, towards the communicator and towards the message, his change-process, value orientation, aspiration for future attainment, past experience with the communicator and his length of farming career."

2-7-1. the classical models of the innovation-decision process.

The classical model of the innovation-decision process developed by Roger, (1983), is based on the potential adopter and his behavior. The classical models of the innovation-process developed by Rogers, (2003, 1995, 1983, 1971, 1962), are given great consideration by scholars and researchers, interested in the literature of adoption and diffusion of innovation. Roger and Shoemaker (1971) McIntosh Dolch and Hernan, 1978, McIntosh, 1983, Mo Lnar 1979, and Zey-Ferrell (1986), stated that, the classic model of the innovation-decision process (the demand side perspective).

“The major constrains on successful adoption in his perspective are the adaptor’s characteristics and psychological toward approved innovation paying attention on individual farmers and their personnel characteristics. Therefore, age, education, cosmopolitanism, agrarianism, and the use of information sources are variables that have been used to distinguish adopters of innovative agricultural technology from non-adopters. The demand side perspective has focused on the organizational characteristics of farms, the size of the farm operation, the diversity of its crops, the complexity of its division of labor, and the centrality of decision-making.

Rogers (1995) defined the innovation-decision –making process as “ a mental process through which an individual (or other decision making unit) passes(1)from first knowledge of innovation, (2) to form attitude toward the innovation, (3) to a decision to adopt or reject (4) to implementation of the new idea, and (5) to confirmation of this decision”. This concept of the innovation-decision process consists of five stages: namely knowledge, persuasion, decision, implementation and confirmation. Rogers (1995).

1- Knowledge- occurs when individual (or other decision-making unit) is exposed to innovation`s existence and gains some understanding of how it functions.

2-Persuation occurs when an individual (or other decision making unit) forms a favorable or unfavorable attitude toward the innovation.

3- Decision, occurs when individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation.

4-**Implementation**, occurs when an individual (or other decision-making unit) put an innovation into use.

5-Conformation, occurs when individual (or other decision making unit) seeks reinforcement of an innovation-decision already made, or reverses a previous decision to adopt.

2-7-2 Attitude:

Badran (1995), defined attitude as follows: Attitudes refer to inclination to react in a certain way to a certain situation, to see and interpret events according to certain predispositions, or to organize opinions into interrelated structures. Attitude object the emphasis now in much research is on the feelings or emotions. Researchers reported that: in the past it was thought that an attitude influences aboard range of behaviors, for example, appositive attitude towards modern agriculture will stimulate the adoption of many different innovations. Therefore, it was considered an important task for extension agents to change negative attitudes. However, in the 1960s researchers showed that the relationship between attitude and behavior is often week. Consequently, there is hardly any relationship between change in an attitude and change in behavior. If empirical facts do not confirm a theory, researchers have a good reason to do more research in order to develop a better theory. This was the case with attitudes; many social psychologists now assume that, among other factors, behavior is influenced by behavioral intentions. These intentions are influenced not only by the attitudes of people, but also by the expectation regarding their behavior from their social environment. The subjective norms, in addition, by their perceived ability to carry out this behavior, the self-efficacy. On one hand, Sharma and Kumar (2000) defined attitudes as the degree of a farmer`s positive or negative feelings towards an innovation. It is assumed that attitude largely depend on household values, beliefs and circumstances.

Attitudes are abstract qualities that cannot be measured directly, and their measurement requires different conceptual framework from measuring

knowledge. This new way of studying attitudes was developed by Ajzen and Fishbe (1980) in their model of reasoned action, which is reproduced in (6). It does not describe properly spontaneous actions to which little thought has been given and routine decisions which we mention late and developed by Ajzen (1988). The behavior intention model to predict this behavior we have to measure the attitudes towards the same behavior and take into unfavorable consequences. The most important consequences should be measured in order to predict behavior.

According to. A.W.Van den Ban, and Hawkins H.S. (1996), he mentions that if we study attitude in order to predict behavior, both have to be measured at the same level of specificity. For instance, a general attitude towards modern varieties of maize will only have a week relationship with choice of maize variety grown by the second wife of a Tanzanian farmer to feed her children and her husband in a year that rain start late. To predict this behavior we have to measure the attitude towards the same behavior and take into account that a change in behavior usually has several favorable and unfavorable consequences. The most important consequences should be measured in order to predict behavior. For instance, when compared with the local maize, hybrid maize may differ in average yield, seed cost, drought resistance and resistance to stem-borers and steak-taste cooking quality, seed color, etc. One would ask the farmers which characteristic are most important to them in deciding which variety to grow and what they think about each of these characteristic .This opinion then can be assumed by attaching a weight to each characteristic according to the importance it has for the farmers. It is also possible that a farmer will not accept a variety which does not meet at least a minimum standard on characteristic he or she requires, such as very good drought resistance for example most Tanzanians farmers will not accept yellow maize irrespective to how good it is in all other characteristics, because maize porridge

should be white. This approach to measuring attitudes has the advantage that it gives clear indications of how effective extension message can be formulated. A difficulty with this way of measuring attitudes is that people have different goals at the same time. For example, farmer`s goals may be high income, low risk, to be well liked by his or her family to have high status in community and a reasonable amount of work. It can be very difficult to estimate how each characteristic of an attitude contributes to the optimization of the aggregate of these goals.

According to Judith N.Woff (1995), people`s behavior is conditioned by commonly norms and consensus. Preserving or promoting practices required for sustainable development in agriculture, or natural resources management, require more than individual incentives persuasion local institutions encourage people to take longer-term view by creating common expectations and a basis for cooperation that goes beyond individual interests, if local institutions are considered legitimate, people comply without (or with fewer) inducements and sanctions.

According to Dillon and Hard Aker (1993), risk attitude is the extent to which a decision-maker seeks to avoid risk (i.e. Risk aversion) or three basic element.

1. An actor 2. Orienting 3. A situation.

This conceptualization of human behavior implies:

(a) Behavior is oriented towards attaining ends or goals.

(b) It takes place in situation (c) It is normatively regulated.

(d) It involves an expenditure of effort of motivation.

Badran (1995) stated that" the trio of knowledge gathered and practice combination govern all aspects of life inhuman societies, and all three pillars together make up the dynamic system of life itself, he also mentioned that knowledge, practice and attitude constitute a trio of interactive factors characterized and by dynamism and unique interdependence.

2-7-3 Relationship among knowledge, beliefs, attitudes, and behavior:

Naster and Glotzer (1961) stated that, change in attitudes is gained as a result of increase in knowledge, which in turn improves behavior. The relationship among knowledge, attitudes, belief and behavior are complex and simply a causal chain individual acquires knowledge or belief that if an. Many educators assume that if an individual acquires knowledge or belief that is inconsistent with his behavior, the need to resolve this dissonance will cause him to adjust his attitudes and behavior appropriately order to relive the insuring psychic distress.

Method for measuring attitudes:

According to (Anonymous, 1988), there are three basic approaches to measure attitudes.

1-Equal intervals 2.Summated-rating 3. Semantic-differentials.

Equal interval Measurement:

The basic idea behind the equal intervals scale is attitudes about issues exist in graduation on a continuum from positive negative and therefore the attitude of one person can be describe according to its place in the continuum.

The first step in developing the continuum a attitude is to clearly described the attitude in question. The usages of short phrases or even one word communicate

the attitude. The next step is to develop large statements (at least 50) that describe various aspects of the attitude components.

2-7-4 Adoption process:

A- A model of stages in the innovation-decision process.

The innovation process is the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to decision to adopt or reject, to implementation of new idea, and to confirmation of this decision. ((Note that for the sake of simplicity we have not shown the consequences of the innovation in this diagram. Everett. M. Rogers (1995, p 163).

1- Previous practices. 2- Felt needs/problems.3- Innovations 4-Norms of the social system.

Steps of adoption:

1 – Knowledge, -Characteristic Of the decision-making unit. Socio-economic Characteristics. B- Personality Variables. C Communication behavior.

2 –Persuasion; Perceived Characteristics of the innovation. A Relative advantage; B- Compatibility, C Complexity, D Triabilty, E- Observably.

3 –Decision, A. Adoption, B. Reject.

4 -implementation, A. Reject, B. Adoption

5-confirmation, A Continued adoption, later adoption, Discontinuance, and Continued Reject.

2-8 Extension in rural development.

Agricultural extension, whether public or private, operates in a context or an environment that influences the organization, form content of transfer activities (Moris,1991).The dominant characteristic of that context is change. Because the changes affect all aspects of extension, the context should be examined and understood so that extension can be better managed. The first places extension within a system of agricultural technology generation and transfer.

Two major sections follow. One describes the macro-context factors: agro ecological, infrastructural, policy, political-economic, and socio-cultural. The other looks at the institutional context, namely, other institutional actors involved in activities related to agricultural extension such research, transfer,

education, training, input supply, and credit. Historically, extension has mainly involved technology transfer, with the village extension worker (VEW) transferring knowledge from research to farmers by using individual, group, mass media methods. More recently, extension has been asked to play a "technology development role" by linking research with community group needs and helping to facilitate appropriate technology development. It is in the historical context that many government agencies developed national policies for rural development and designed a policy to help rural people become organized, so that the delivery of services could be channeled through various. Types of farmer organizations or groups. Well-meaning policies also provided blueprint structures for farmer organizations (FO) in the form of cooperatives and commodity organizations in order to provide various input, marketing, and educational services to the farmers. Targets for forming groups and farmer organizations were given to VEWs without training them properly in the theory and principles of community organization. VEWs did not have many skills and not much experience in the process of establishing these organizations. Some countries such as Thailand had VEWs for establishing cooperatives in rural

areas, while other countries like Malaysia and Indonesia developed "nucleus estates" for small rubber producers where smallholders bring their rubber to process it. India has introduced dairy cooperatives with some success. However, because VEWs in many countries lack knowledge, skill and blueprint policies, and high targets, they resorted to shortcut methods to establish farmer organizations and groups. Many VEWs presented government policies in an oversimplified way to rural communities, suggesting that unless they are organized into cooperatives or associations or groups, they will not get government subsidies or access to credit and technical services. As a result, several FOs were established overnight on paper. Many FOs remained active during the period that Government subsidies were distributed, but did not actively create cooperatives or partnerships and mobilize local resources to help achieve agricultural development. Mostly the elite of rural communities captured all of the services and resources, while the poor and women were left out or received little benefit. Very few attempts were made to develop the management capacities of FO leaders, their members, and VEWs. Community organization and facilitation skills were not part of staff

training program. The traditional approaches to organize farmers and forming cooperatives need to be revised to meet the following development challenges of the twenty-first century:

- The increasing absolute and relative poverty in many countries
- The degradation of natural resources such as soil, water, flora, and-fauna.
- The low involvement of women in health, agriculture, and other development programmes
- The poor health and education facilities in rural areas
- The increasing sociopolitical unrest among the communities.

2-9 Economic contributions of agricultural extension &rural development.

Agricultural extension programmes are quite diverse from an international perspective. Most are managed as public sector agencies, usually located in the ministry of agriculture, but some are located in other ministries such as education or rural development. Many are managed by nongovernmental organizations (NGOs). Many private firms and private organizations (for example, coffee-growers' associations) conduct extension program. Even within the most typical organizational structure, where extension is part of the government's ministry of agriculture, there is great variation in the degree of decentralization of management of extension services. In some countries, extension is decentralized, as in India, where it is a state subject. In most developing countries; however, governmental services are highly centralized with varying forms of regional and sub-regional units designed to serve local areas. Further, there is great variation in the skill level and agricultural competence of field staff. In some systems, field staff has little formal technical training in the agricultural sciences. In some cases, this is dictated by a village worker philosophy, in others by local language demands. But, in most cases, it simply is the result of the decisions to expand Agricultural extension programmes rapidly during the 1950s and 1960s, when few highly trained agriculturalists were available (see Bindlish& Evenson, 1993 and Bindlish, Gbetibouo, &Evenson, 1993 African studies; and Swanson &Claar, 1984 for a general history).Finally, this diversity of skills, management systems, and objectives has changed over time in many countries. Perhaps the major changes in the management and design of agricultural extension systems over the past four decades is associated with the training and visit (T&V) system introduced in the 1970s by Benor, Harrison, and Baxter (1984) and implemented in many countries with World Bank lending support.

2-10 Challenges for sustainable agriculture development:

During the past fifty years, agricultural development policies have been remarkably successful at emphasizing external inputs as the means to increase food production. This has led to growth in global consumption of pesticides, inorganic fertilizer, animal feed-stuffs, and tractors and other machinery. These external inputs have, however, substituted for natural processes and resources, rendering them less powerful. Pesticides have replaced biological, cultural, and mechanical methods for controlling pests, weeds, and diseases; inorganic fertilizers have substituted for. Livestock manures composts, and nitrogen-fixing crops; information for management decisions comes from input suppliers, researchers, and extensionists rather than from local sources; and fossil fuels have substituted for locally generated energy sources. The basic challenge for sustainable agriculture is to make better use of these internal resources. This can be done by minimizing the external inputs used, by regenerating internal resources more effectively, or by combinations of both. Evidence is now emerging that regenerative and resource-conserving technologies, practices can bring both environmental and economic benefits for farmers, communities, and nations. The best evidence comes from countries of Africa, Asia, and Latin America, where the concern is to increase food production in the areas where fanning has been largely untouched by the modem packages of externally supplied technologies. In these complex and remote lands, some farmers and communities adopting regenerative technologies have substantially improved agricultural yields, often using only few or no external inputs (Bunch,1991;GTZ, 1992;UNDP,1992; Lobo&Kochendörfer1992;Krishna,1993;Shah,1994;SWCB,1994;Pretty, 1995). But these are not the only sites for successful sustainable agriculture. In the high-input and generally irrigated lands, farmers adopting regenerative technologies have maintained yields whilst substantially reducing their use of

inputs (Kamp, Gregory, &Chowhan, 1993; UNDP, 1992; Kenmore, 1991; van der Werf& de Jager, 1992; Bagadion& Korten, 1991). And in the very high-input lands of the industrialized countries, farmers have been able to maintain profitability even though input use has been cut dramatically, such as in Europe (Vereijken, 1992; Vereijken, Wijnands, Stol, &Visser, 1994; Van, Weeperen Röling, Van Bon, & Mur, 1995; Pretty &Howes, 1993; Jordan, Hutcheon, & Glen, 1993; El Titi&Landes, 1990) and in the United States (Liebhart et al., 1989; NRC, 1989; Hanson, Johnson, Peters, & Janke,1990; Dobbs, Becker,& Taylor, 1991; Faeth, 1993). All of these successes have three elements in common. They have made use of resource-conserving technologies such as integrated pest management, soil and water conservation, nutrient recycling, multiple cropping, water harvesting, and waste recycling. In all, there has been action by groups, communities at the local level, with farmers becoming experts at managing farms as ecosystems and at collectively managing the watersheds or other resource units of which their farms form a part. There have also been supportive, enabling external government and nongovernment institutions, which have reoriented their activities to focus on local needs. Most successes, though, are still localized. They are simply islands of success. This is because an overarching element, a favorable policy environment, is missing. Most policies still actively encourage fanning that is dependent on external inputs and technologies. It is these policy frameworks that are one of the principal barriers to more sustainable agriculture (Pretty, 1994).Illustrates area of discourse and its focus on the interfaces between natural resources, local stakeholders, supportive institutions, and the policy cont

2-10-1. satiability and levels of action.

A necessary condition for sustainable agriculture is that large numbers of farming households must be motivated to use coordinated resource management. This could be for pest and predator management, nutrient

management, controlling the contamination of aquifers and surface water courses, coordinated livestock management, conserving soil, water resources, and seed stock management. The problem is that, in most places, platforms for collective decision making have not been established to manage such resources (Röling, 1994a, 1994b).The success of sustainable agriculture therefore depends not just on the motivations, skills, knowledge of individual farmers, but on action taken by groupsor communities as a whole. This makes task more challenging.e.g extension of the message that sustainable agriculture can matchConventional agriculture for profits, as well as produce extra benefits for society as a whole, wills not suffice. Sustainability is commonly seen as a property of an ecosystem. But Sustainability can be seen from other perspectives, which are more relevant for extension. Environmental issues emerge from the human use of natural resources. Sustainability can therefore be defined of human reasons, activities, and agreements. The definition of Sustainability then becomes part of the problem because people need to agree on how they define Sustainability and what priority they'll give it (Pretty, 1994b)In this approach, Sustainability is not a scientific, "hard" property which can be measured according to some objective scale, or a set of practices to be fixed in time and space. Rather, Sustainability is a quality that emerges when people individually collectively apply their intelligence to maintain the long-term productivity of the natural resources on which they depend (Sriskandarajah, Bawden, & Rackham, 1989). In other words, Sustainability emerges out of shared human experiences, objectives, knowledge, decisions, technology; and organization. Agriculture becomes sustainable only when people have reason to make it so. They can learn and negotiate their way towards Sustainability. In any discussions of Sustainability, it is important to clarify what is being sustained, for how long, for whose benefit and at whose cost, over what area, and measured by what criteria. Answering these questions is difficult, because it means assessing and trading off values and beliefs.

Campbell (1994) has put it this way: "[Attempts to define Sustainability miss the point that, like beauty, sustains ability is in the eye of the beholder. It is inevitable that assessments of relative Sustainability are socially constructed, which is why there are so many definitions."It is therefore crucial to focus on more than one system level (Fresco, Stroosnijder, Bouma& van Kerulen, 1994). At the farm level, there is the farm household. At the above-farm level, there are the collective stakeholders, who might or might not be organized for sustainable use of the whole resource unit. In an irrigation scheme, it is common for an irrigators' association collectively to manage water use at the scheme level. But when it comes to watersheds or other vulnerable resource units, it is usually impossible to identify an appropriate "platform" for decision making (Roiling, 1994a, 1994b).A key example is the Indonesian programme for integrated pest management (IPM) in irrigated rice(FAO, 1994; Van de Fliert, 1993; Röling&Van de Fliert, 1994; Kenmore, 1991). At the farm level, this programme involves farmer field schools teaching individual farmers to manage their rice plots as ecosystems, carefully maintaining the balance between pests and their natural predators and only reverting to pesticides when observation shows that the situation is running out of hand. But IPM also needs management of resources comprising several farms. Thus nematodes can effectively be controlled by interrupting the cultivation of wet rice by a dry land crop such as soybeans. This requires decision making at the irrigation block level. The population dynamics of rats, the most important pest in irrigated rice, cannot be controlled at the farm level. Integrated rat management requires collective action at the village level (Van de Fliert, van Elsen, &Nangsir Soenanto, 1993).

2-11 Rural Development in Sudan:

Sudan is largest African country, it has huge resources but the rural areas of whole Sudan are still without development. During the colonial period, development plan were focused in the center and directed to development of

modern agricultural sector to secure production of raw materials to provide industries in their countries and ignored the whole traditional sectors and rural areas. After independence in 1956, Sudan followed the same strategies of the Colonial, established Managel Extension new halfa irrigated schemes to expand export the production for European factories as well as the mechanized rain fed agricultural schemes in Gadarif and Habla. But generally rural development strategies in Sudan have been subjected to various changes and orientation related to variations in the political ideologies and moods, commitments and objectives of the different regimes and the result was little growth without real development at many faces like increasing of unemployment, migration from rural areas to urban areas and proportionately High food prices. Sudan`s occupies in the 26 th rank out of 31 in the middle income Africa order in the comparative social indicators of 1978, which emphasized that; Sudan occupies the 12 th rank out of 18 in Aruba countries GDP imbalance (Merier 1984). Development efforts in Sudan were generally dictated from the above "Top-down" and designed for the country as a whole while the pattern of rural life and values vary from pure nomads to transhumant and sedantarization. Rural development projects were centrally sponsored and their goals have been perceived in the context of national objectives. Even local organization and local community participation were centrally controlled and affected by the political affiliation. But generally the rural development in Sudan, is express the pattern of life in rural varies from the nomad life and sem-nomadism where people joint farming.

2-11-1 Rural Development in Darfur Region:

Rural development in Darfur region has introduced since twenty's.

1-Jubal Mara for Rural Development Project (JMRDP), this project was financial mainly by European Economic Community, Sudan Government and some minor donors like United State Aid and Ford Foundation Gifts.

2-Western Savanna Development Corporation (W.S.D.C), is an integrated rural development corporation, established at southern Darfur state in 1978 and dissolved in 1997, the main objective was raising income and living standard of beneficiaries in the project. The project was jointly financed by IDA, IFAD, Saudi Fund For Development, Abu Dhbi Fund loans and Sudan Government the project which enjoyed hunting technical assistance were established to lay the foundation sustainable long term strategy for development, availability of food per person, introduced permanent system of farming, water resources, this project constituted the pioneer socio-economic rural development project in the area and follow an integrated rural development approach.

3- The United Nations Organization (UN) representing in the Development Program (UNDP) has established the Area Development Scheme (ADS) in Darfur Region (South Darfur).It was participatory community base—rural development program, financed by United Nations Development program (NUDP), and Government of the Sudan (GOS) local component, the aims at increasing the income& improving the living standard. This were carried on five areas in Sudan, south Darfur was one. The program came as an alternative to the conventional "Top down" rural development. Villages were the key decision-makers with financial, technical assistance provided through ADS and local component on regional.

2-12 Poverty:

Has clearly been defined in term of low income ,and since rural development was to reduce poverty ,it had according to the world bank- to be designed to increase production and raise productivity. The social components were seen to be subordinated to the priority of production. The description of target population of rural development includes the following definition of rural poor .Approximately 85% of 750 million poor in the developing world are considered to be in absolute poverty – based on the arbitrary criterions of an

annual per capita income equivalent to $50 or less. The remaining 15 and are judged to be in relative poverty –having incomes above the equivalent of 50$. But below one /third of national average /capita income (Ibid4).

In 2002, the number of Sudanese people living below poverty level of less than a dollar a day was approximately 20million .It is estimate that some 19 million people, or 85% of rural population, live below extreme poverty line most of them suffer in order to obtain a living for themselves and their families, with no or narrow access to safe drinking water, health services. Sudan is ranked sixty –first place of the human Development Index of (UNDP) among the seventy–seven least developed countries in the world. The population that is mostly exposed to poverty are those living in areas affected or still being affected by drought and conflict www.IFAD.org, 2007)in this connection, drought and recent conflict which started in 2003 in Darfur states (greater Darfur) in western part of the Sudan, have led to consequences (www.suaneseonline.com,2006). Disappearance of traditional livelihood systems, as result of that population had been displaced; refuges and they are living in the margin of the big cities. The prevalence of the malnutrition where wide spreading among the whole communities' particular children, children less than five years of age are suffering. Decreasing of productivity of agriculture (Plant & animal) so that the produce of majority of the families is not sufficient to feed its.

CHAPTER THREE

Research design &Methodology

3-1 Area of study:

Edd El fursan and RehaidElberdy localities are located in south-west of south Darfur state, which located in Western region of the Sudan. On the total area estimated at (21,000) K2.The localities boarding Central Africa republic from west. It is an important agricultural area and insecurity is not as high as in other areas in South Darfur State. Main towns of study area are Edd Elfursan, are Edd elfursan,Umjanah,Norly,Dery,Elsarakh.RehaidEIbirdie town are RehidElberdie,

Towal,Tahem,Elwahda, and small villages are scattered over the two localities. The localities ofEddElfursan area &RehaidElberdy are ethnically and tribally diverse (mixture) of different tribal groups, mainly inhabited with the largest groups being the BeniHelbaa, Berno, Fur, Gimer and El Taasha ,there are no clear out—line of demarcation between the people in different area. The main economic activities are agriculture (rain-fed). The rain-fed cultivatable area is estimate by 24 million feddans. (Ministry of agriculture- Southdarfur Report 2002). The average annual rain fall range between 400-800mm, the area consider as agricultural production of food and cash crops, some groups is based around nomadic\pastoral livelihood with livestock and other groups is clustered more around farming livelihood. For many hundreds of years the people of that area are living homogenous with good, strength relationship.

cover area of (21,000)k2,consists of 5 administrative units, the study area was one locality known as Edd Elfursan but later divided to two localities Edd Elfursan& Rehaid Elberdie locality. The population of it was 753,562 with annual growth 2.8% according to 1993 population censes, consists of 70,482 families distributed in 355 villages. But the 2008 population census showed the population of Edd Elfursan locality is 53342. Number of household (HH) 70334, the number of farmers is 66818. The population of Rah aid Elberdiy is

295036, number of household (HH) 38416, farmer is 36495.People of two localities are farmers, nomads, with different attitudes toward agricultural work and livestock. The area was one called the bread basket of south Darfur, but due to many reasons, drought, recent war the level of household food security and number of the animal have declined in certain communities in the area.

The livelihoods& food security assessment found that ownership of cattle declined from 34% to 31%, sheep& Goat from 36% to 34 %(Ministry of Agriculture report**,** 2006**).** According to Humanitarian Aid Commission (HAC) records, WFP&WVI records, and the researcher observations during the survey, the localities are became host of large numbers of Internal displace people (IDPs) from different parts of the state, due to recent conflict in Darfur region since 2003.Thestudy area having 160 voluntary societies Community Base Organization (CBOs), (9) coordinating unions joining all together beneficiaries in addition to (4) women centers,(3) professional unions having different local provisions

3-2 Conceptual framework

The Conceptual framework of this research involves dependent variable, a set of variables constituting, access to asset, adoption of technical packages, credit and loan services, technology used and participation in the Net.

The independent variables in the model include Gender, Age, Family size, and Family income. Occupation, Education level, total cultivated area (farm size), land ownership and social participation.

The model is designed to measure the impact of innovation of agricultural technical packages by Rehaid El fursan Development Net on farmers knowledge, to improve farm production in the study area.

3-3 Hypotheses.

1-The Rehaid Elfursan net for rural development (CBO) had no significant effect on adoption of recommended technical packages for rain- fed crops.

2- There was no significant influence of socio-economic factors on participation in the Community Based Organization (CBOs).

3-There was no significant influence of socio-economic factors on adoption of cultural practices, access to asset, technology used and credit &loan services.

4- There was no significant influence of participation in Net on cultural practices, access to asset, credit & loan and extension services.

5-Majority of the farmers in study area lacked the knowledge of recommended technical packages that increase the production.

3-4 Operational definition of research variable.

Sex: It refers to the condition of respondent male or female.

Age: The number of years the respondent lived from the birth to the date of the interview.

Family size: The number of the family members per household supported by the respondent.

Education: refers to the level of formal and informal education reached by respondent including Khalwa attendance.

Marital status: Refer to the status of household head as being married, single, divorced and widow.

Occupation; Refer to the occupation of the respondent.

Social participation: social participation refers to membership in social organization, community base organization (CBOs).

Extension services.

This variable is measured by number of sources available to the respondent for access agricultural knowledge's.

Knowledge of technical packages:

This variable reflect the level of knowledge by farmer about the technical packages (cultural practices) for crops (Millet, Sorghum and Ground Nut) production recommended by extension agent to farmers as means of improving crops production.

Farm size:

Refers to area of farm land per feddan/Mukhamas cultivated by farmers**.**

Family farm income:

Refer to annual income of the farm of respondent from farm activities; farm revenue was measuring by total value of grown crops in the season (2010-2011)**,** minus total expenses. The value of the crops largely affected by the price prevailing during survey.

Access to credit& loan:

Refers to direct of supply sources available to the respondent and magnitude of credit received during the agricultural season.

Agricultural production: This variable is measured in terms of the average number/ sacks of crops produced per feddan/Mukhmas or total crops produced.

House Hold (HH).

Household is defined as a group of people who routinely eat out of same pot, and sleep, live on the same structure or family compound (or physical location).It is possible that they may have lived in different structures. Members of household were not necessarily relatives by blood or marriage. If a polygamous family lived & eat together, they are considered one household.

House Hold Head HHH.

Definition of HH head is member of the family who manages the family resources and decisions (He/ She) is final decision maker on most of decisions related to income allocation& what family has to do).

3-5 Research population.

Research population, is comprised of all rain fed farmers, whom agricultural activities is main occupation, distributed in 45 villages ,in two localities namely; Edd Elfursan and Rehaid- Elberdiy. The nature of population was homogeneous. Overall researcher objective was to select a representative sample that is manageable with available resources and suitable for purpose of the research. The researcher was directly targeting all farmers subjected by Rehaid El furan development Net.

3-5-1 Sampling and sample selection.

The activities of the Net covered two localities and included 45 villages.

3-5-2 Sample size:

The sample size is determined according to the simplified formula as follow:

Population (number of farmer in two administration units was 1333 farmers).

Equation $n = \frac{N}{1+N(e)2}$

.n = Sample size.

N = population = 1333 farmers.

.e = level of precision = (10%).

.n = $\frac{1333}{1+1333x(0.10)2} = 93$

For more precision the researcher selected 100 respondents as sample size.

3-6 Administrative units Selection.

Out of 5 administrative units in the study area, the researcher selected one administrative unit from each locality, then selected villages and households, all villages are homogeneous.

Table (1) Administrative unit and Villages selection.

No	Locality	Admin/Unit	Villages	H/H
1	EdElfursan	EddElFursan	Norly	25
			Um Janah	25
2	Rehaidalberdy	Tuwal	Tuwal	25
			Taham	25
	Total		4 villages	100

Source Field survey 2011.

3-6-1. selection of villages.

Two villages were selected randomly from each administrative unit; there were four villages, representative of all villages in the study area, because villages were homogenous.

3-6-2 selection of households heads H/HH

25 Households were selected from each village randomly. The total numbers of selected HHs were 100 in two localities. All household heads in selected villages were to be investigated.

3-7 Research Methodology.

Asocial survey research method was used.

3-7-1 Data Collection Tools.

The study employed both primary and secondary data tools for gathering information.

***Primary data:** Was collected through structured interview. The quantitative data collected by comprehensive questionnaire prepared to collect all information for the study from the selected farmers.

*The process of data collection from the community leaders in study area was conducted through direct interview by the researcher.

***Observation**: As important tool of data collection. This was done through the

field survey in the area.

***Secondary data:** Was collected from Organizations, Nets reports, Ministry of agriculture documents, reports, and Net documents, Ministry of animal resources documents, ADS, WSDCS documents and other relevant documents.

***Library stage:** Published MSC, PHD in rural development, scientific syllabus and internet web sites.

Data Analysis.

The collected quantitative data was organized and arranged and coded. then entered to computer and analyzed using Statistical package for social sciences (SPSS), the data was analyzed, frequencies and percentages were calculated, also chi-square test.

3-8 **Problems encountered.**

There were difficulties encountered during the conducting of the study:

1- Difficulties in the proper understanding of questions. The researcher had to clarify and explain the questions.

2- Conflict in region, additional to the rough and tough impassable roads.

Chapter Four

Results and Discussion

This chapter presents the findings and Discussion of the study, divided into two parts, one deal with description of the respondent socio-economic factors, two presents test of significance to determine dependency between farmer characteristics, change of knowledge's and adoption of cultural practices of rain fed crops.

4-1 Personal characteristic of Respondents.

Table (4-1-1)Frequency distribution and percentages of respondents by Gender

Gender	Participation in project		Total	Percentage %
	Participant	Non- participant		
Male	47	25	72	72%
Female	14	14	28	28%
Total	61	39	100	100%

Source: study survey

Table (4-1-1) illustrates the result of respondent's participant and non-participant, showed that 72% of respondents were Male (47participant+25 non-participants), while female represented by 28% of respondents (14 participant +14 non-participant), headed household in study area. Percentage of female was high in study area, this was positive sign, may be increase in the future.

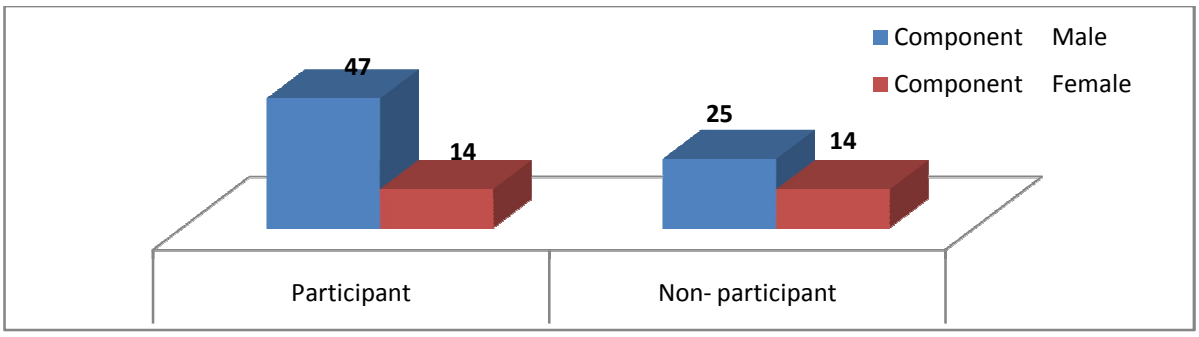

Figure 1 participant &non-participant by gender

Table (4-1-2) Frequency Distribution and Percentages of respondents by family size

Family size	Participation in project		Total	Percentage %
	Participant	Non- participant		
3-5	16	9	25	25%
6-9	17	14	31	31%
10-12	14	11	25	25%
13-15	5	2	7	7%
16 and over	9	3	12	12%
Total	61	39	100	100%

Source: study survey 2011.

Family is a group of people whose are related to each other, such as a mother, a father, and their children.

Table (4-1- 2) the result of household head respondents (participant and non participant) by family size of study area, shows that, families that consist of (6 - 9) members constitute 31 %,(17 participant+14 non-participant), medium size. 25% of families (14 participant+ 11 non-participants) range between (10-12) members in Net, representing medium to large.

Note: Large families in rural area consider as power and have an effect powerful and having a lot of influence on production and others activities.

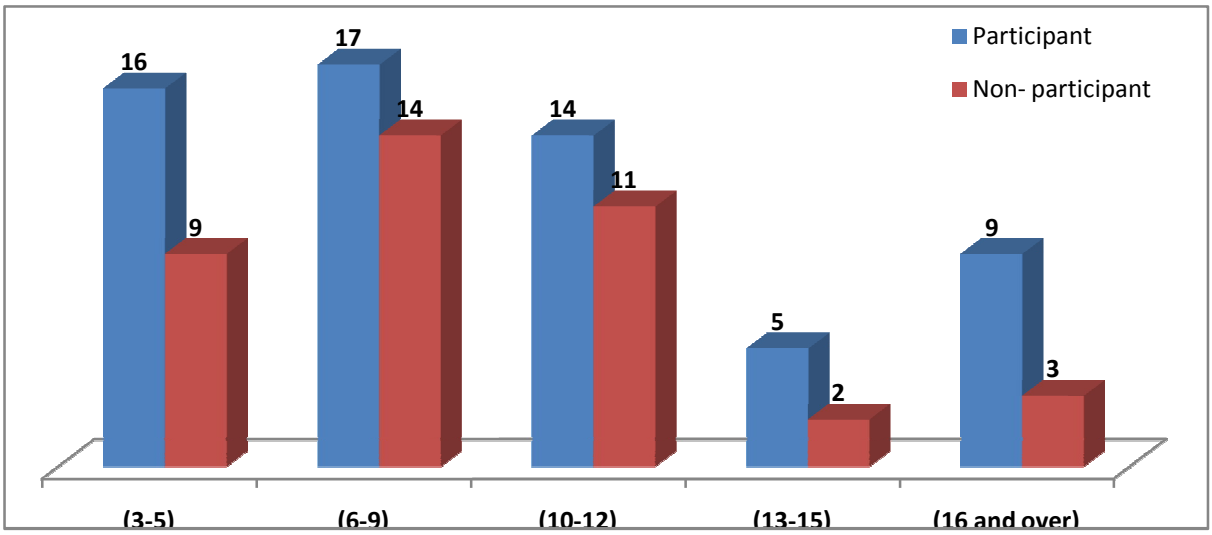

Figure 2 participant &non-participant by Family size.

Table (4-1- 3) Frequency Distribution and Percentages of respondents by age group

Household age	Participation in project		Total	Percentage %
	Participant	Non- participant		
18-24	2	4	6	6%
25-34	11	10	21	21%
35-44	24	12	36	36%
45-54)	20	9	29	29%
55 and over	4	4	8	8%
Total	61	39	100	100%

Source: Study survey 2011

Age has an important effect on output of an individual either on manual or mental output. Young people have good and strong opinion, belief and point of view, and decision that someone has reached after a lot of thought.

Table (4-1-3) the result of household head age of study area shows that, 36% of respondents (24 participant +12non-participant), were between (35-44), and 29% of them (20 participant+9 non- participant), were range between (45-54). It is observed that, the majority of respondents were young and this expected to influence of the rate of adoption of innovation (Van de ban, 1985), started that young people are more innovative than older people).

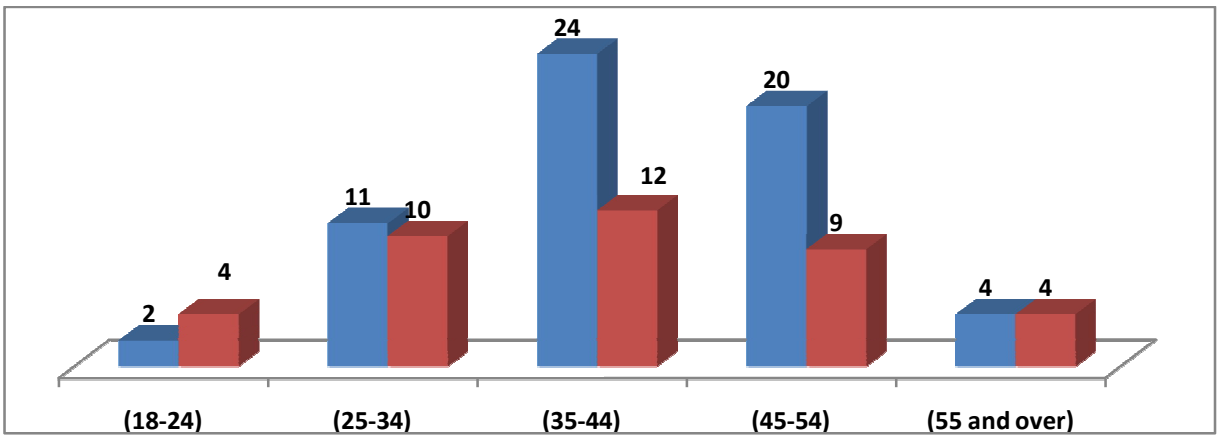

Figure 3 participant &non-participant by household heads Age.

Table (4-1-4) Frequency Distribution and Percentages of Respondents by Education level.

Education level	Participation in project		Total	Percentage %
	Participant	Non -participant		
Illiterate	12	9	21	21%
khalwa	25	12	37	37%
Formal school years	22	18	40	40%
University &post graduate	2	0	2	2%
Total	61	39	100	100%

Source: Study survey 2011.

*Education is the process of teaching or learning, it is well recognized that education plays very important and vital role in increasing, improving farmer's production. Through which knowledge, attitude and skills can be improved.

Table(4-1-4) the result of respondents participant & non participant by education level in study area, shows that 21% of respondents (12 participant+9 non-participant) illiterate, information's explained 37% of the respondent,(25participant +12 non-participant) attended Khalwa, that most of villagers in rural attend only it.

Roger (2003), indicate that there is relationship between adoption of innovations and level of education.

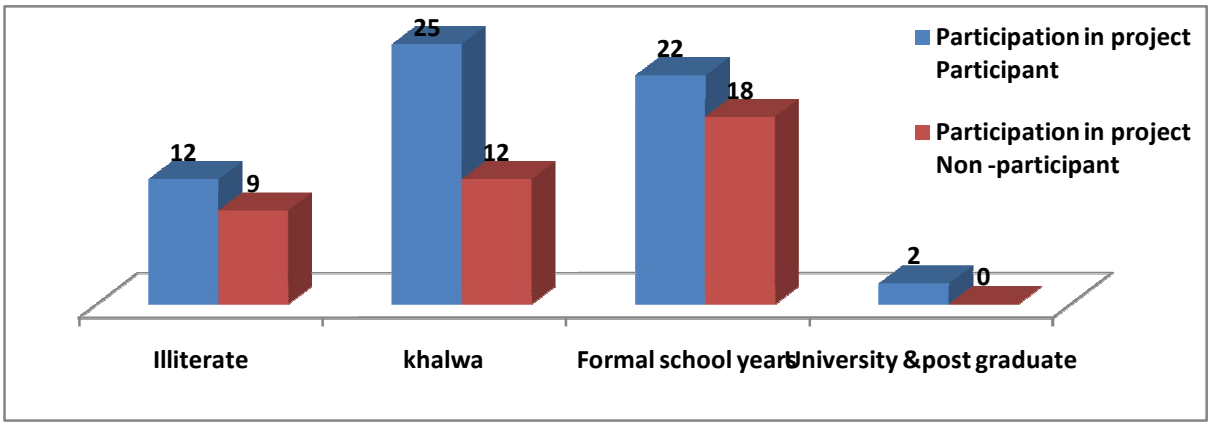

Figure 4 participant &non-participant by Education level.

Table (4-1- 5) Frequency Distribution and Percentages of Respondents by Marital status.

Marital status	Participation in project		Total	Percentage %
	Participant	Non participant		
Single	1	1	2	2%
Married	58	36	94	94%
Divorced	0	2	2	2%
Widow	2	0	2	2%
Total	61	39	100	100%

Source: Study survey

Table (4-2-5) the result of household heads respondents (participant and non-participant) by marital status, shows that the majority of the household were married, 94% of respondents,(58participant+36non-participant). That seems to be consistent with traditions & customs which are widely spreading in rural area, where people used to get married early, many of them marry more than one. Moreover, in rural communities marriage is considered as sign of maturity.

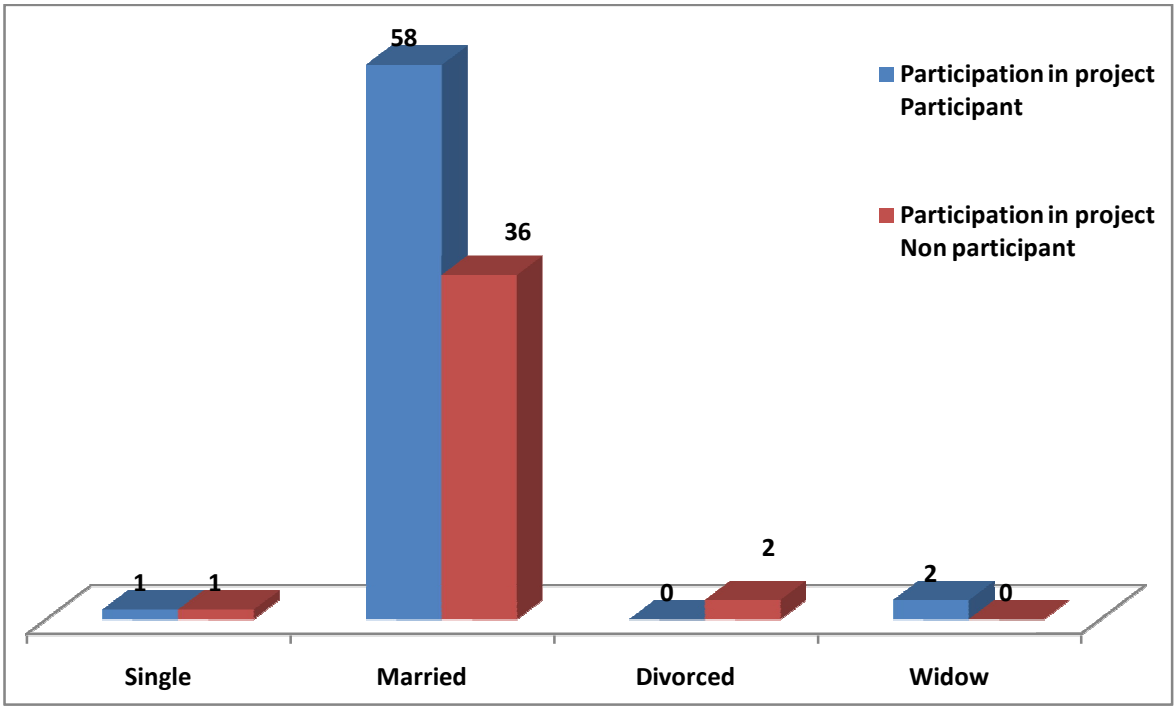

Figure 5 participant &non-participant by marital status.

Table (4-1-6) Frequency Distribution and Percentages of respondents byOccupation

Occupation	Participation in project		Total	Percentage
	Participant	Non participant		%
Salaried employment	10	1	11	11%
Casual workers	6	6	12	12%
Business	0	3	3	3%
Farmer	45	29	74	74%
Total	61	39	100	100%

Source: Study Survey2011

Table (4-1- 6) the result of household heads respondents (participant and non-participant) by occupation, result shows that, 74% of the respondents, (45 participant +29 non-participant) were farmers, this indicates that the majority were dependent on agriculture as main activity. However farmers were engaged in other activities, to boost their income, agricultural activities were most dominant practices; majority of respondents were farmers, the agriculture represents the main activity and main source of income and food security.

Note: Occupation is a person's job or a regular activity or hobby, usually is socially valuable.

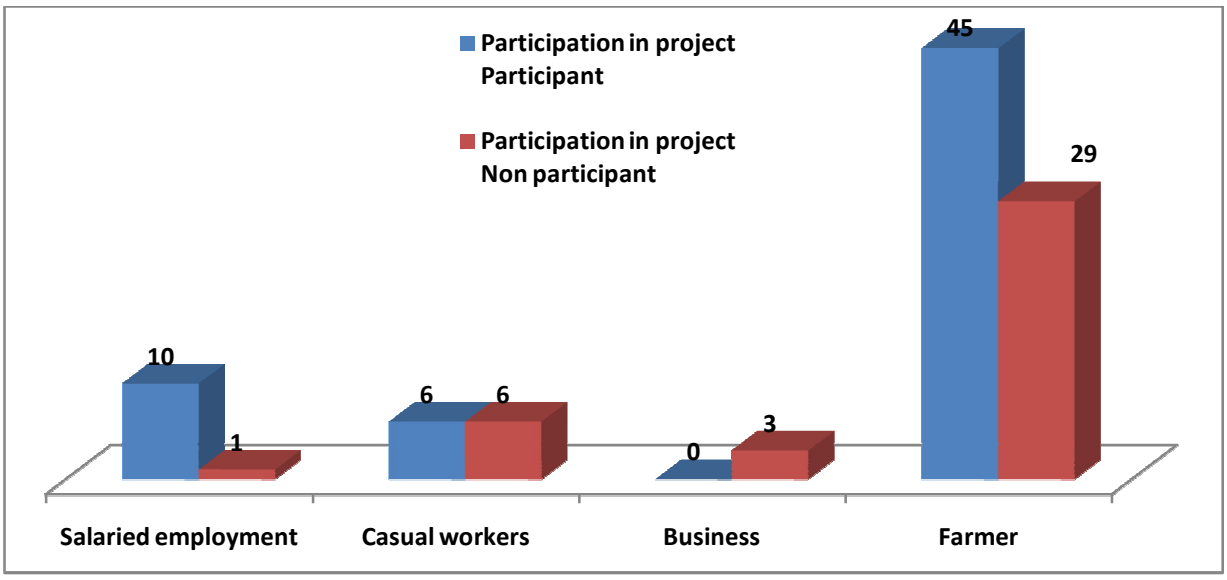

Figure 6 participant &non-participant by Occupation.

Table (4-1-7) Frequency Distribution and Percentages of Respondents by average family income.

Family income	Participation in project		Total	Percentage %
	Participant	Non participant		
less than 500SDG	43	17	60	60%
500-900SDG	11	19	30	30%
901 - 1200	4	3	7	7%
above 1201	3	0	3	3%
Total	61	39	100	100%

Source: Study survey-2011

Table (4-1-7) the result of household heads, participant and non-participant shows that, average family income of 60% of the respondents (43 participant+17 non-participant) , was less than 500 SDG per month. This may indicate that, majority of respondents had no sufficient money to cover their basic needs and to improve the living standard. The results may give us an idea about extent of permanent poverty prevailing in study area.

Clarify: Income is money that earned from doing work or received from investments or farming, is an essential element for production and human life; also it is an indicator for measuring of poverty.

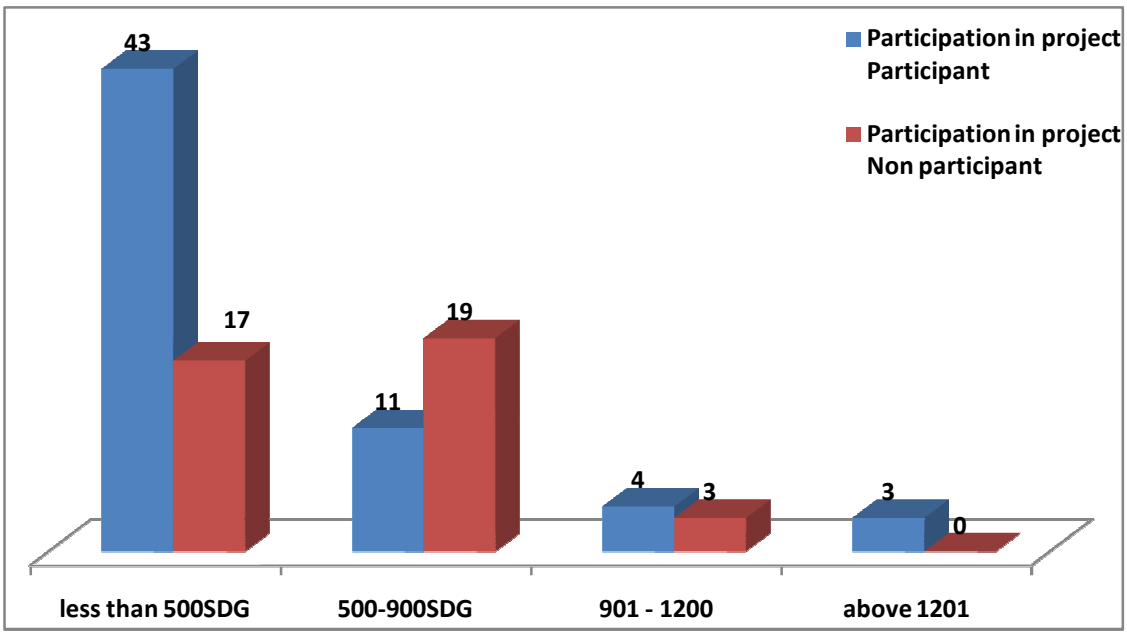

Figure 7 participant &non-participant by Average family income.

Table (4-1-8) Frequency Distribution and PercentagesRespondents by kind of cultivated crops

Kind of crops	Participation in project		Total	Percentage %
	Participant	Non- participant		
Sorghum	23	7	30	30%
Millet	8	12	20	20%
Groundnut	28	20	48	48%
Sesame	1	0	1	1%
Others	1	0	1	1%
Total	61	39	100	100%

Table (4-1-8) the result of respondent household heads participant &non participant by kind of crops, shows that 30% of respondent (23 paticipant+7 non- participant) grew sorghum, 20% of the respondents (8 participant +12 non-participant) grew millet, 48% of respondents (28 participant +20 non-participant) grew Groundnut. The majority of respondents grow Ground Nut, as cash crop. It is grown mainly to be sold, rather than used by the household.

Clarify: Sorghum and Millet, are used as staple food for poor and rural people, while the Ground nut today is an important oilseed, and used as cash crop.

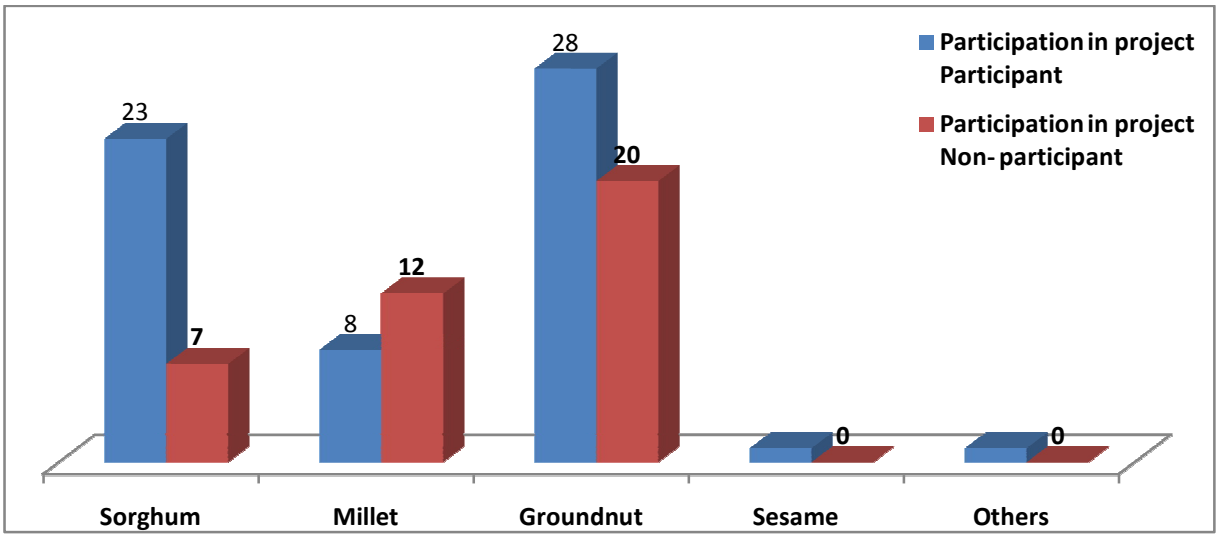

Figure 8 participant &non-participant by Kind of crops.

Table (4-1-9) Frequency Distribution and PercentagesRespondents by their knowledge in differentiating betweenimproved seeds and local seeds

knowledg	Participation.			Percentage
	Participant	Non participant		%
Knew	28	27	55	55%
Did not know	33	12	45	45%
Total	61	39	100	100%

Source: Study Survey 2011

Table (4-1-9) the result of household heads participant and non-participant by differentiating between improved seed variety of crops and local. Result shows that 55% of the respondents, (28 participant +27 non-participants), knew the differences between improved &local seed, while 45% of the respondents (33 participant+ 12 non- participants).did not know. This may due to weakness of agricultural extension in study area.

Clarify: knowledg is understanding of or information about a subject which a person gets by experience or study, and which is either in a person's mind or known by people generally

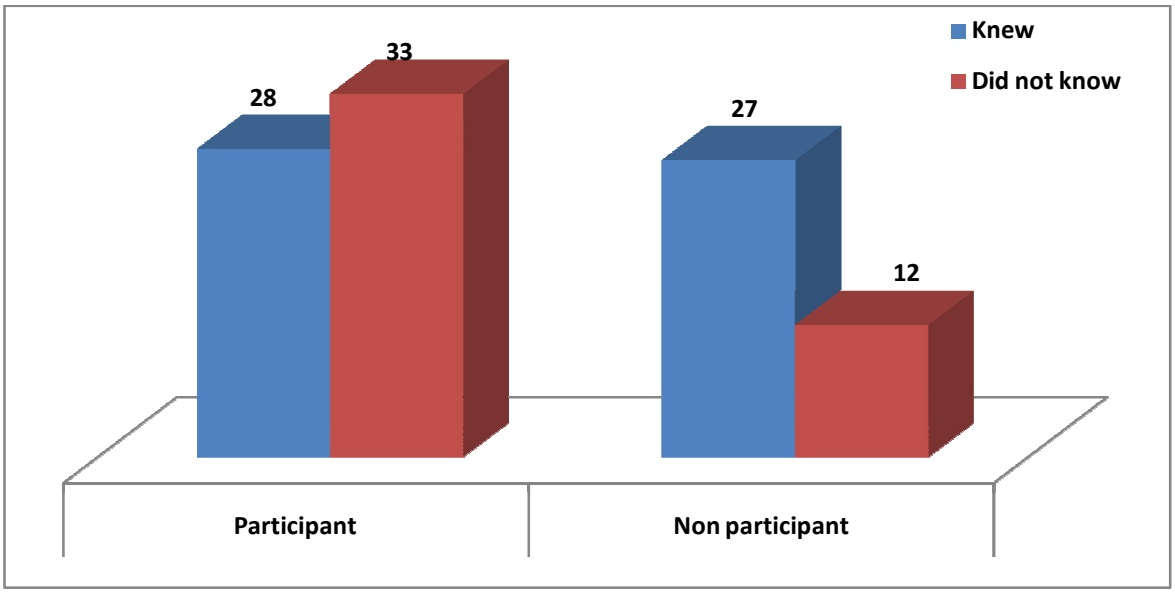

Figure 9 participant &non-participant by differentiating between crops.

Table(4-1-10) Frequency Distribution and Percentages of Respondents by total cultivated area in Feddan

Total Cultivated area	Participation in project		Total	Percentage %
	Participant	Non- participant		
4-6 feddan	20	6	26	26%
7-9 feddan	17	16	33	33%
10-12feddan	19	13	32	32%
More than 13	5	4	9	9%
Total	61	39	100	100%

Source: Study survey 2011

Table (4-1-10) the result of household head participant and non-participant by total area cultivated by respondent, shows 26%of the respondents (20 participant +6 non-participant),had (4-6) Feddan, 33% of the respondents (17 participant+16 non participant) had (7-9) Feddan.

It is observed that, most of the farmers in the study area had small farm, ranged between4-6feddan, and 7-9 feddan and representing by 59%.

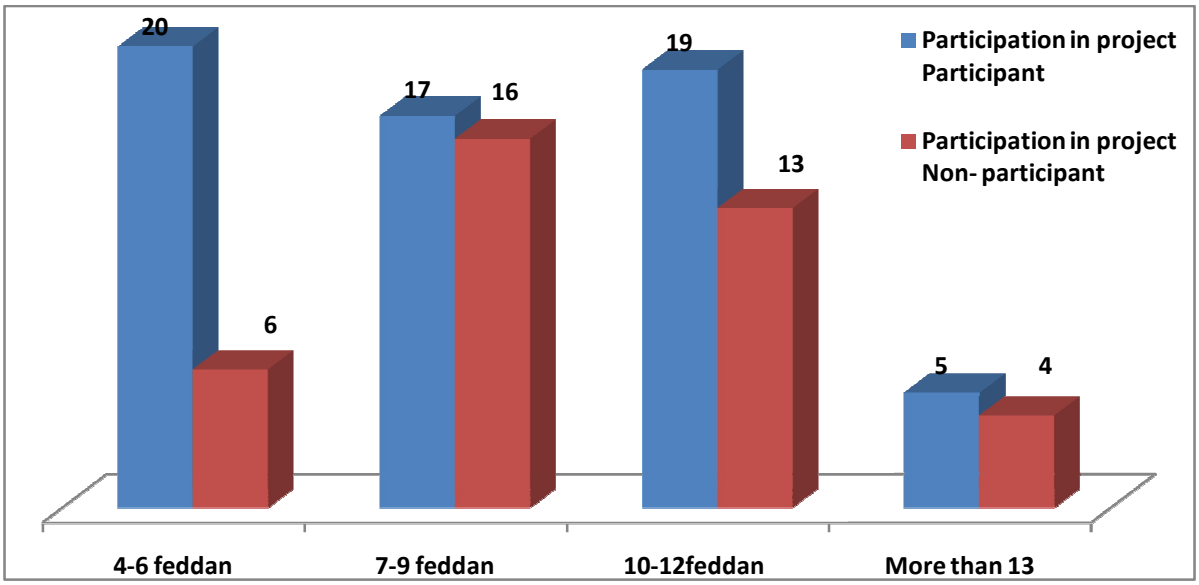

Figure 10 participant &non–participant by total cultivated area.

Table (4-1-11) Frequency Distribution and Percentages of Respondents by kind of land ownership.

kind of land ownership	Participation in project		Total	Percentage %
	Participant	Non- participant		
Owned	46	29	75	75%
Rent	13	7	20	20%
Others	2	3	5	5%
Total	61	39	100	100%

Source: Study survey 2011

Table (4-1-11) the result of household head participant and non- participant by land ownership, shows that the majority represent by 75% of respondents (46 participant +29 non participant), had owned land. This is may be a positive sign of hopeful and confident, or may giving cause for hope and confidence for future.

Clarify: Ownership is the rules and arrangements connected with the land, especially land that is used for farming.

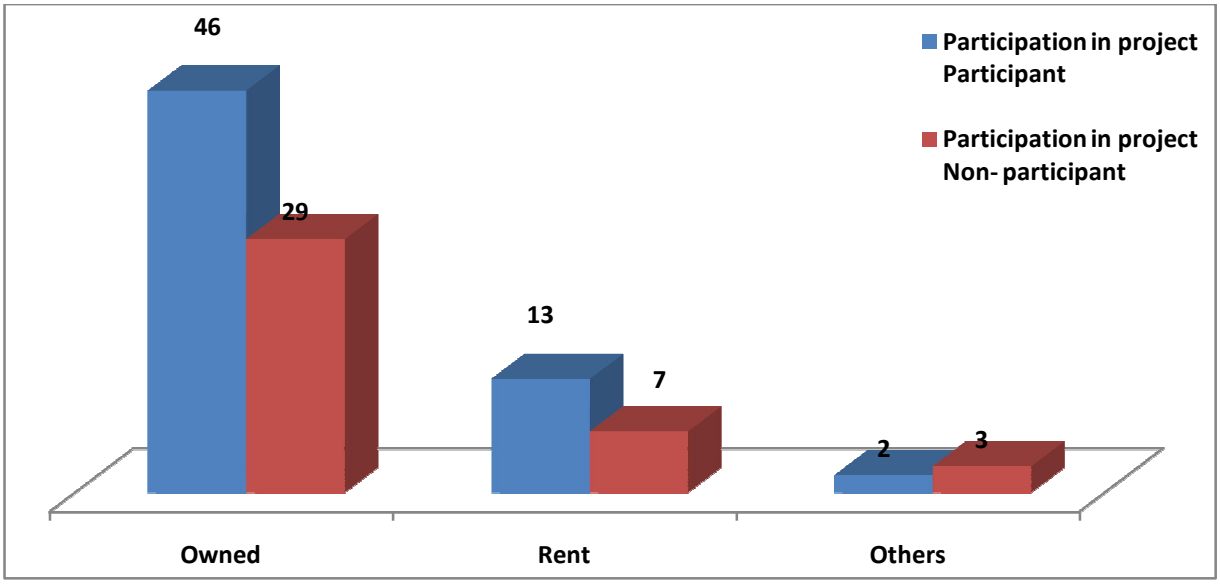

Figure 11 participant &non-participant by land ownership.

Table (4-1-12) Frequency Distribution and Percentages of Respondents By their main source of local seed.

Source of Local seed	Participation in project		Total	Percentage %
	Participant	Non participant		
Market	25	18	43	43%
Previous season	31	20	51	51%
Relative	4	0	4	4%
Others	1	1	2	2%
Total	61	39	100	100%

Source: Study Survey 2011

Table (4-1-12) the result of household head respondents participant, non participant, by source of local seeds, shows that 43%of farmers (25 participant +18 none-participant), obtained their local seed from the market, 51% of the respondents (31 participant+20 non-participant), from previous season.It is observed that, majority of farmers dependent on their previous season production as seeds for the next season and also from market, may be due to high price of improved seed, and weakness of extension role in study area.

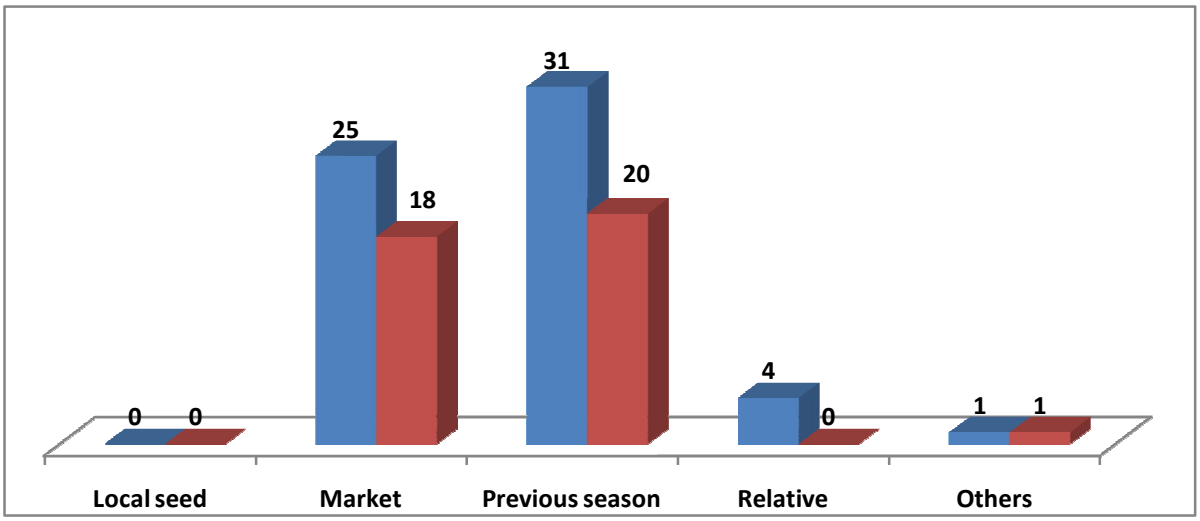

Figure 12 participant &non-participant by source of local seed.

Table (4-1-13) Frequency Distribution and Percentages by their main Source of improved seeds.

Main source of improved seed	Participation in project		Total	Percentage %
	Participant	Non participant		
Ministry of agriculture	48	30	78	78%
Agricultural bank	3	0	3	3%
Farmer bank	0	1	1	1%
Net administration	3	2	5	5%
Others	7	6	13	13%
Total	61	39	100	100%

Source: Data analysis.

Table (4-1-13), result of the respondent house heads hold participant & non participant by their main source of improved seed, shows, the majority of the respondent who, represent 78% (48 participant+30 non-participant), reported that, main source of improved seed was Ministry of Agriculture. This may be indicating that, the ministry of Agriculture will play important role in future, therefore coordination between Net and the ministry very important

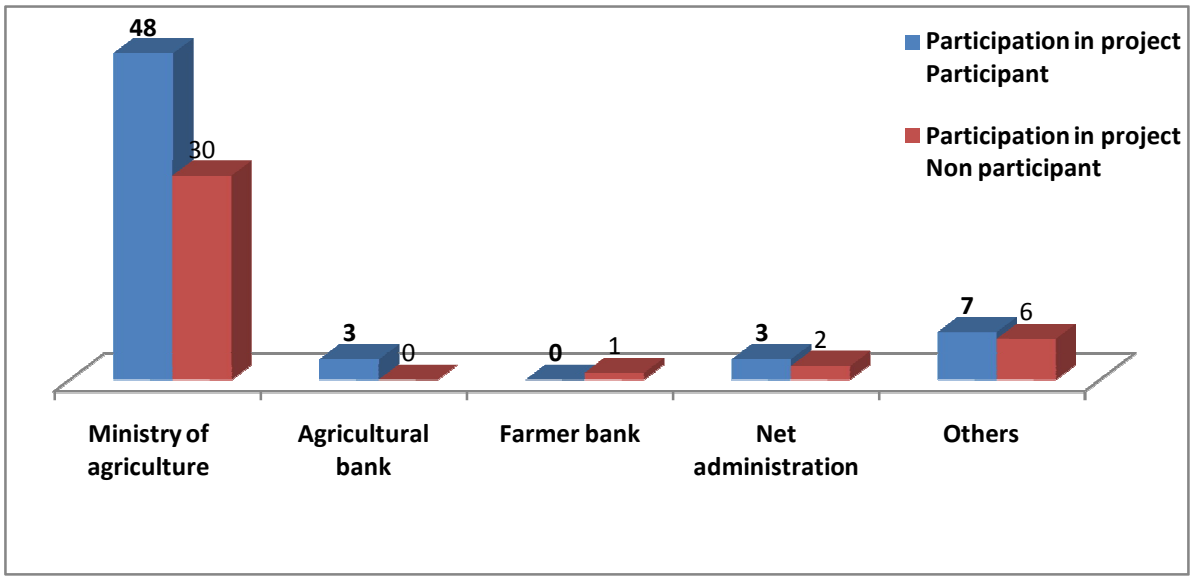

Figure 13 participant &non-participant by source of improved seed.

Table (4-1-14) Frequency Distribution and Percentages of Respondents by the main sources of technical package

Main source of Agricultural package	Participation in project		Total	Percentage %
	Participant	Non participant		
Ministry of Agriculture	43	27	70	70%
The Net administration	10	7	17	17%
Trained fellow farmers	2	1	3	3%
Mass media	0	1	1	1%
Others	6	3	9	9%
Total	61	39	100	100%

Source:survey study 2011

Table (4-1-14) result of respondent household heads (participant and non participant) by main sources of technical package, the result shows that, 70% 0f respondents (43 participants &27 non participants) reported that, main source of technical package from ministry of agriculture, this may due to weakness of extension services in the Net structure.

Clarify: Extension agents and extension workers consider as amine information, whose has a lot of knowledge, methods and means of good information application of respondents.

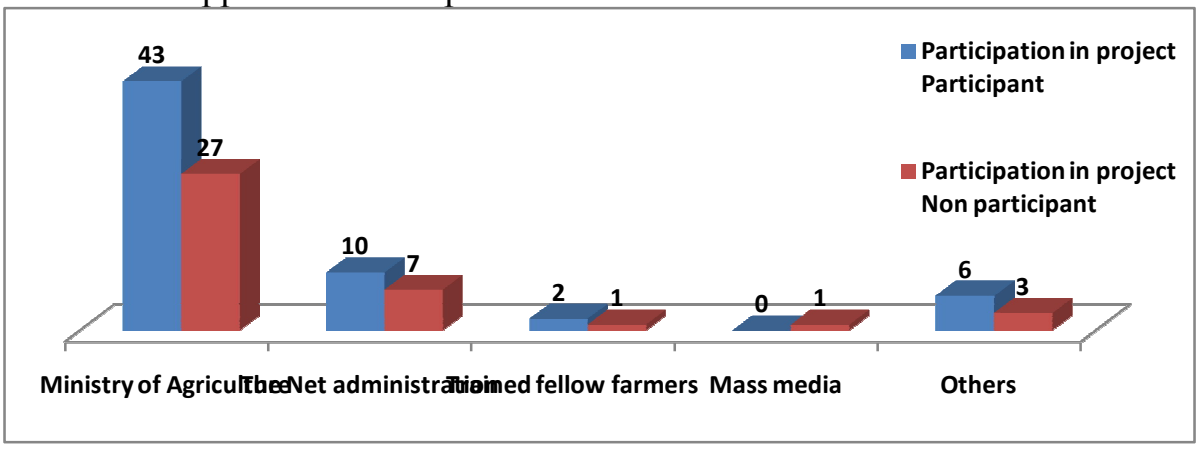

Figure 14 participant &non-participant source of technical package.

Table (4-1-15) Frequency Distribution and Percentages of Respondents by the cost of improved seed for rainfed crops.

Cost of improved seeds	Participation in project		Total	Percentage %
	Participant	Non participant		
very expensive	16	8	24	24%
Expensive	44	31	75	75%
suitable	1	0	1	1%
Total	61	39	100	100%

Source: survey study,2011

(4-1-15) result of respondent household heads (participant and non participant), by the cost of improved seeds for rain fed crops (millet, sorghum and Ground Nut,) the result shows that, 74% (44 participant & 31 non participant), reported that, the cost was expensive, this indicator may be due to low income for the people and high price of improved seeds in the study area.

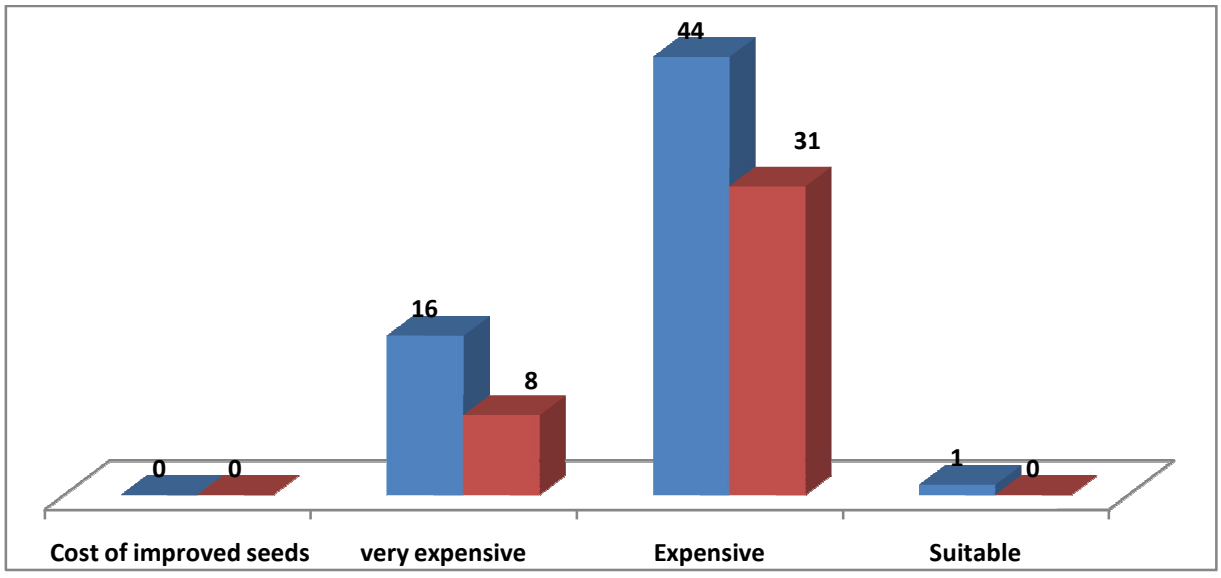

Figure 15 participant &non-participant by cost of improved seed

Table (4-1-16) Frequency Distribution and Percentages of Respondents by source of income.

Source of income	Participation		Total	Percentage %
	Participant	Non participant		
Agriculture	27	13	40	40 %
Agriculture +small trade	21	20	41	41%
Business	13	5	18	18%
Agriculture + others	0	1	1	1%
Total	61	39	100	100%

Source: study survey 2011

Table (4-1-16) result of respondent household heads (participant and non participant) by main sources of income, shows that, 40% 0f respondents (27participants &13 non participants)reported that, from agriculture, 41% of the respondents(21 participants &20 non participants), reported that from agriculture+ small business.

It is observed that the majority of respondents were farmer, their main source of income were agricultural activities and small business

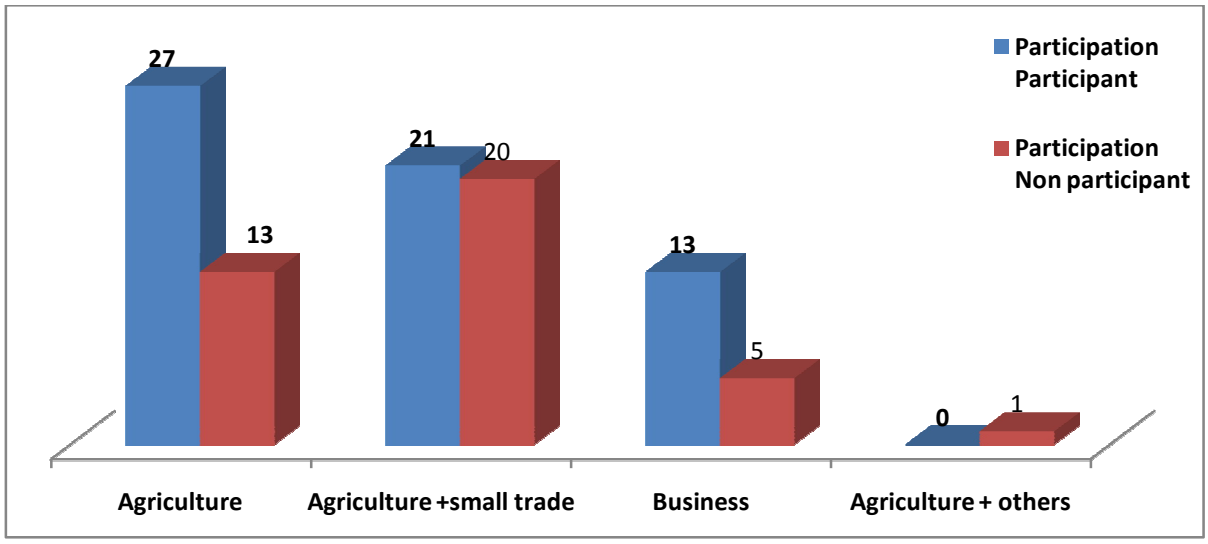

Figure 16 participant &non–participant by source of income.

Table (4-1-17) Frequency Distribution & Percentages of Respondents by yield from local variety for Sorghum.

Yield from local Sorghum	Participation in project		Total	Percentage
	Participant	Non participant		%
V.high	5	3	8	8%
High	17	15	32	32%
low	39	21	60	60%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-17) the result of household heads respondents by yield from local variety for Sorghum, shows the 60% of the respondents (39 participants +21 non-participant), reported that their yield, low.

It is observed that, most of respondents their yield from local sorghum seeds; low, this may be due to high price of seeds and low income.

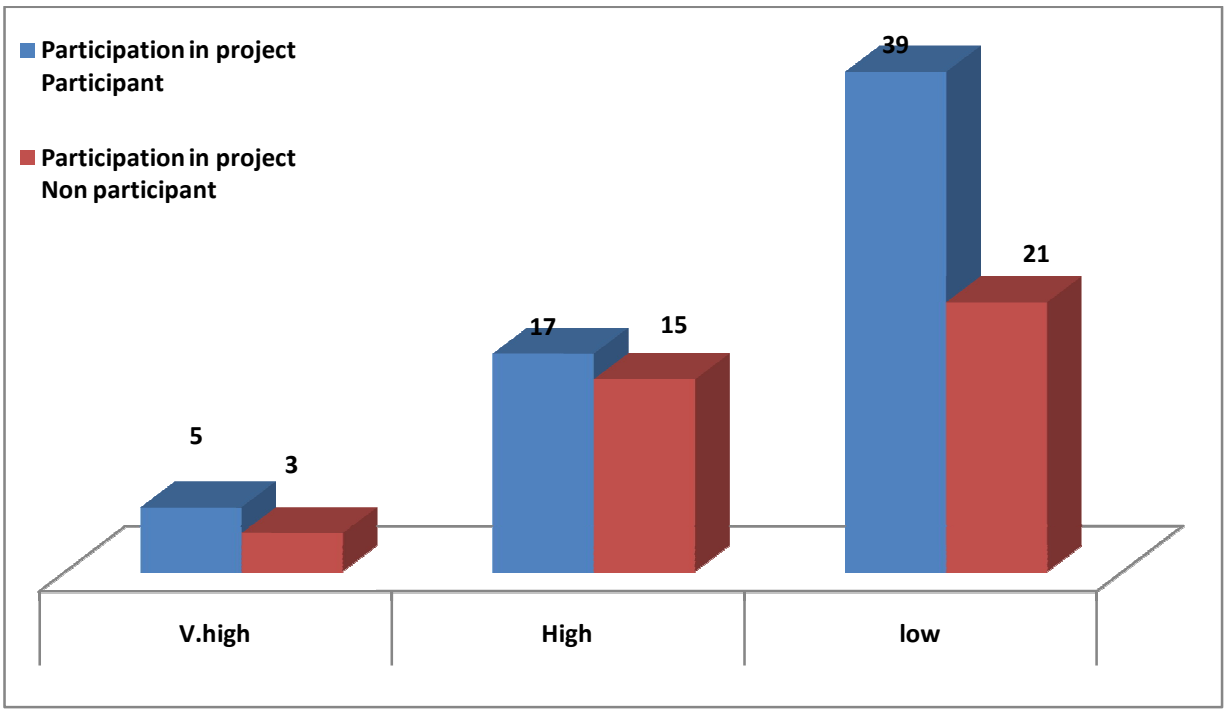

Figure 17 participant &non-participant by yield from local sorghum.

Table (4-1-18) Frequency Distribution and Percentages of respondents by Yield from local variety of Millet.

Yield from local seed of Millet	Participation in project		Total	Percentage
	Participant	Non participant		%
V.high	2	0	2	2%
High	16	9	25	25%
Low	43	30	73	73%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-18) the result of household heads respondents by yield from local variety of Millet, shows that 73% (43 participants +30 non-participant), reported that, their yield from local variety of millet low.It is observed that, majority of respondents their yield from local Millet seeds; low, farmer still using local seeds ,this may be due to high price of improved seeds and low income

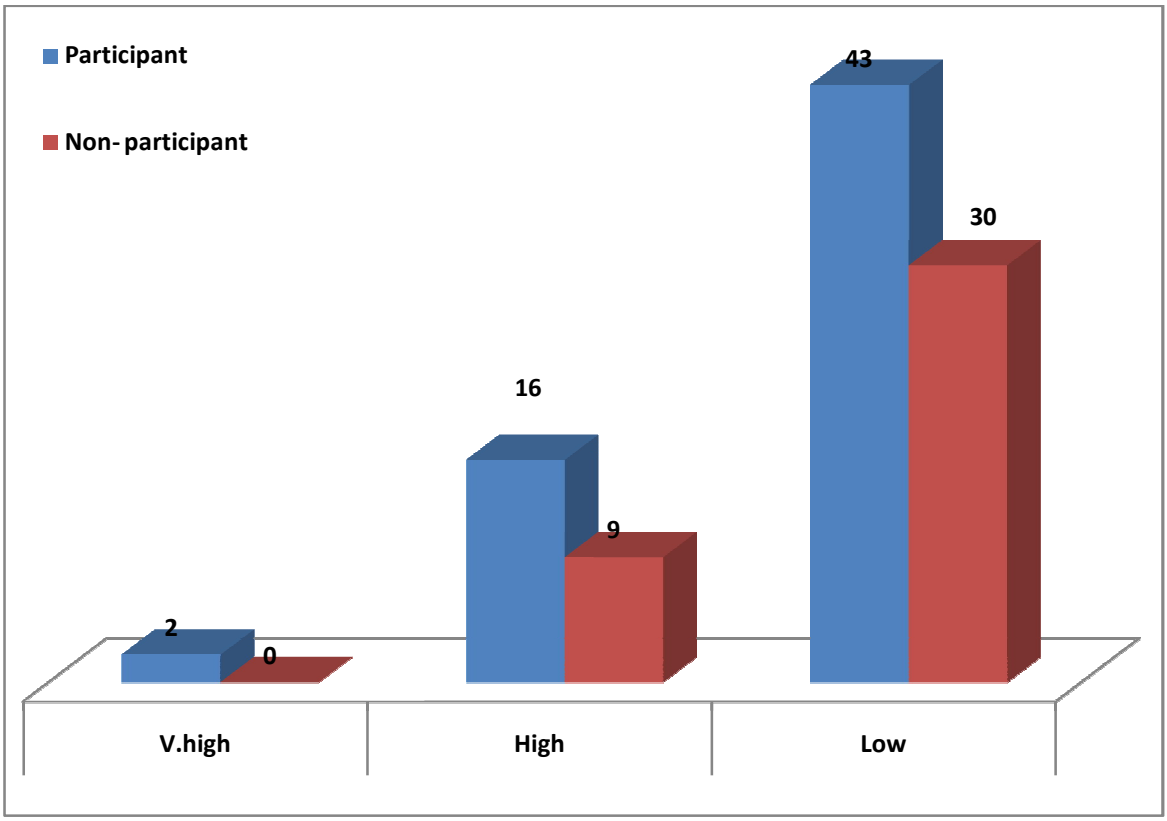

Figure 18 participant &non–participant by yield from local Millet.

Table (4-1-19) Frequency Distribution and Percentages of Respondents **yield from local varietyof Ground nut.**

Yield from local Ground Nut	Participation in project		Total	Percentage %
	Participant	Non participant		
V.high	5	2	7	7%
High	21	12	33	33%
Low	35	25	60	60%
Total	61	39	100	100%

Source: Study Survey 2011.

Table(4-1-19) the result of household head respondents by yield from local variety for Ground Nut, shows that, 60% of the respondents (35 participants +25 non-participant), reported that their yield was low.

It is observed that, most of respondents their yield from local seeds low; this may be due to high price of improved seeds and low income and also may be due to weakness of agricultural extension in study area.

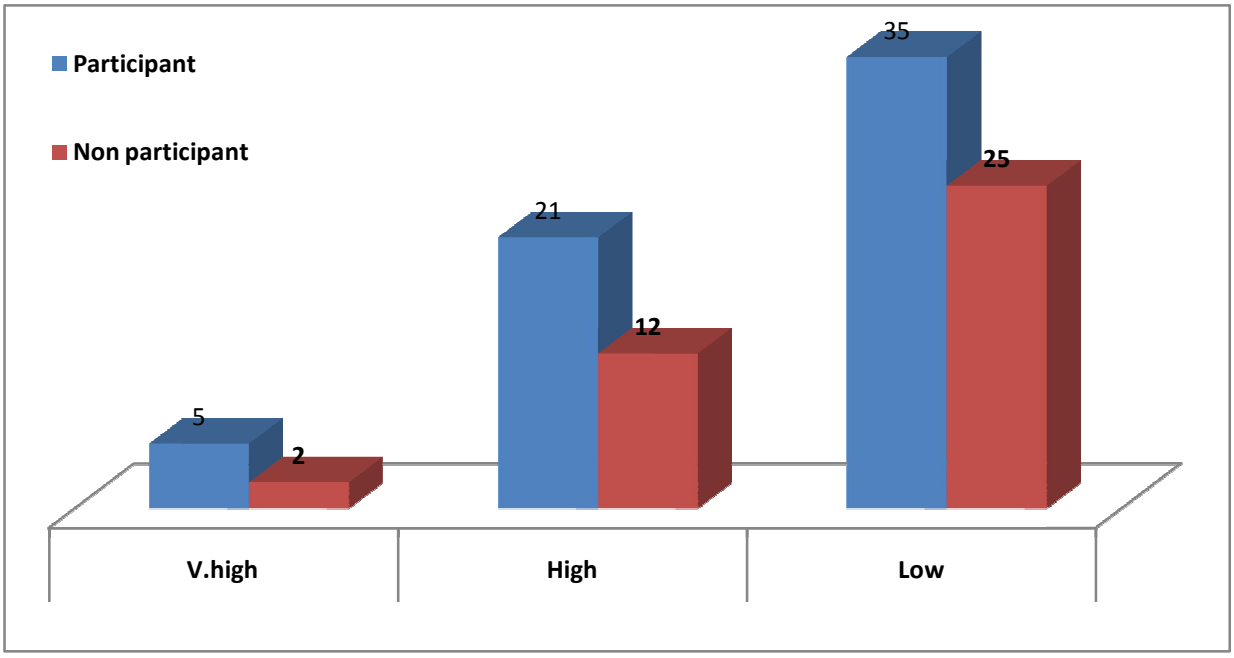

Figure 19 participant &non-participant by Yield from local G/N.

Table (4-1-20) Frequency Distribution & Percentages of Respondents by confidence in improved seeds of three crops.

confidence in improved	Participation in project		Total	Percentage
	Participant	Non participant		%
Very high confidence	24	13	37	37%
High confidence	16	11	27	27%
Confidence	15	8	23	23%
Confidence to some extent	6	7	13	13%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-20) result of respondent household heads (participant and non participant) by confidence of improved varieties of three crops, shows that, 37% of respondents (24participants &13 non participants) reported that, they have very high confidence of improved varieties of three crops, 27% of the respondents (16 participants &11 non participants), high confidence.

It is observed that, majority of respondents certainly gained in confidence and having trust in improved seeds of three crops these last of years.

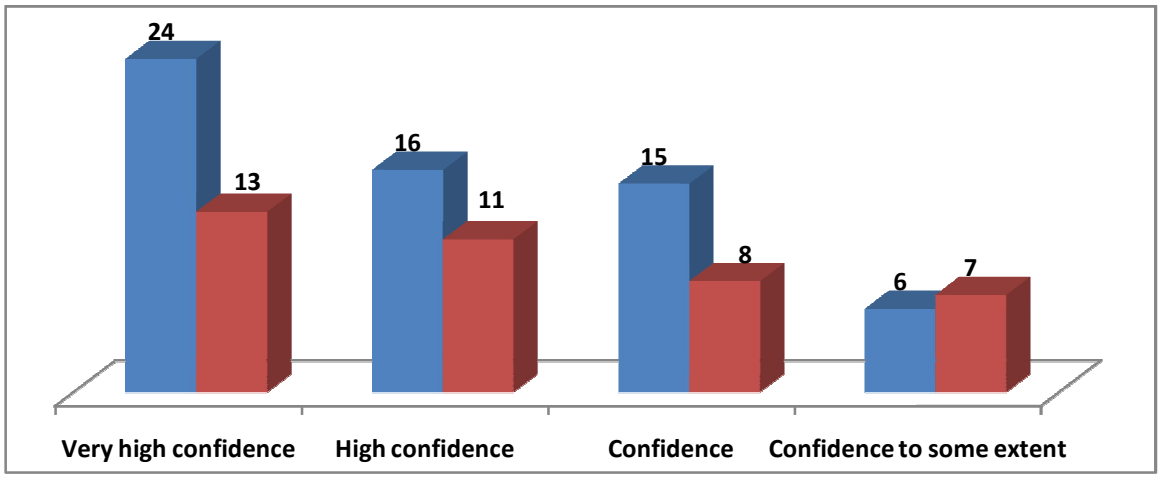

Figure 20 participant &non-participant by confidence of improved.

Table (4-1-21) Frequency Distribution and Percentages of Respondents by credit &loan service.

credit & loan	Participation in project		Total	Percentage %
	Participant	Non- participant		
Took	4	3	7	7%
Did not take	57	36	93	93%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-21), it is observed that, absence of the role of credit and loan services in study area. Although Agricultural bank has two branches in two localities, but unfortunately there's nothing can do, because farmer lacks the guarantee of credit and loan. Also absence of institutions of micro-finance.

Note: A bank that provides services to a national government, puts the official financial plans of that government into operation, banks in general, and Agricultural bank, farmer`s bank and micro-finance institution, are now a major provider of financial services to the farmers, industry, individual and groups.

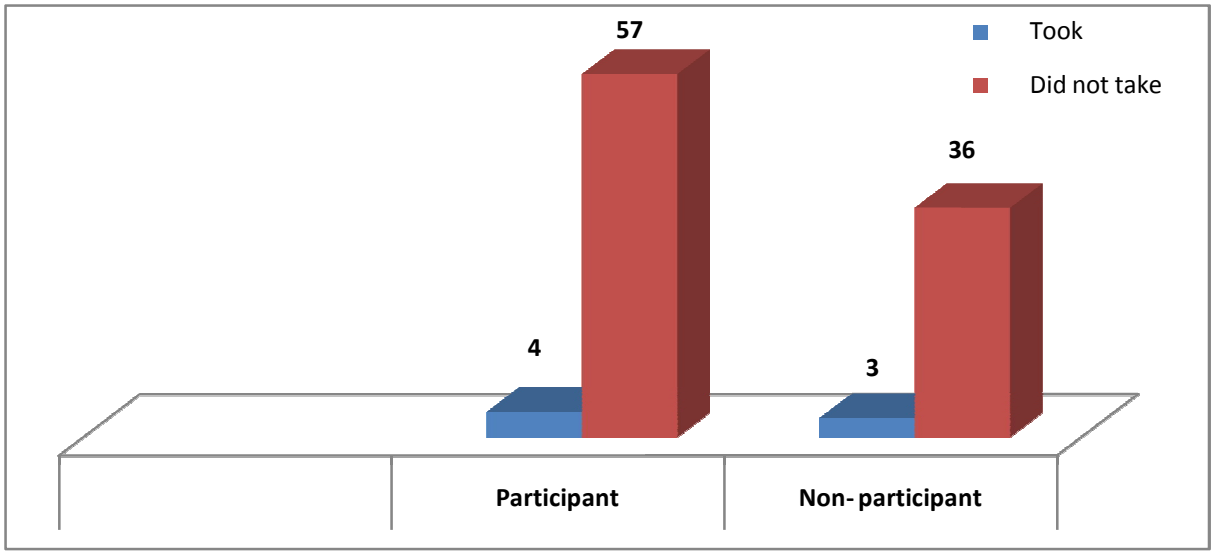

Figure 21 participant &non-participant by Credit &Loan.

T **able (4-1-22) Frequency Distribution and Percentages of Respondents by their tools& equipment used.**

Tools& equipment	Participation in project		Total	Percentage %
	Participant	Non participant		
Used local tools	57	38	95	95%
Used Moderate tools	4	1	5	5%
Total	61	39	100	100%

Source: Study Survey 2011

Table (4-1-22) the result of household heads respondents by Tools &equipment used, shows that 95% of the respondents (57 participants +38 non-participants), reported that they used local tools and equipments. This may be due to low of income and may be absence of credit and loan services.

Note: Tools& equipments, which are used on farms for plough, and land preparation, on which crops are grown, that helps farmers to do their activities, and a useful aid to reduce the effect of a physical force,

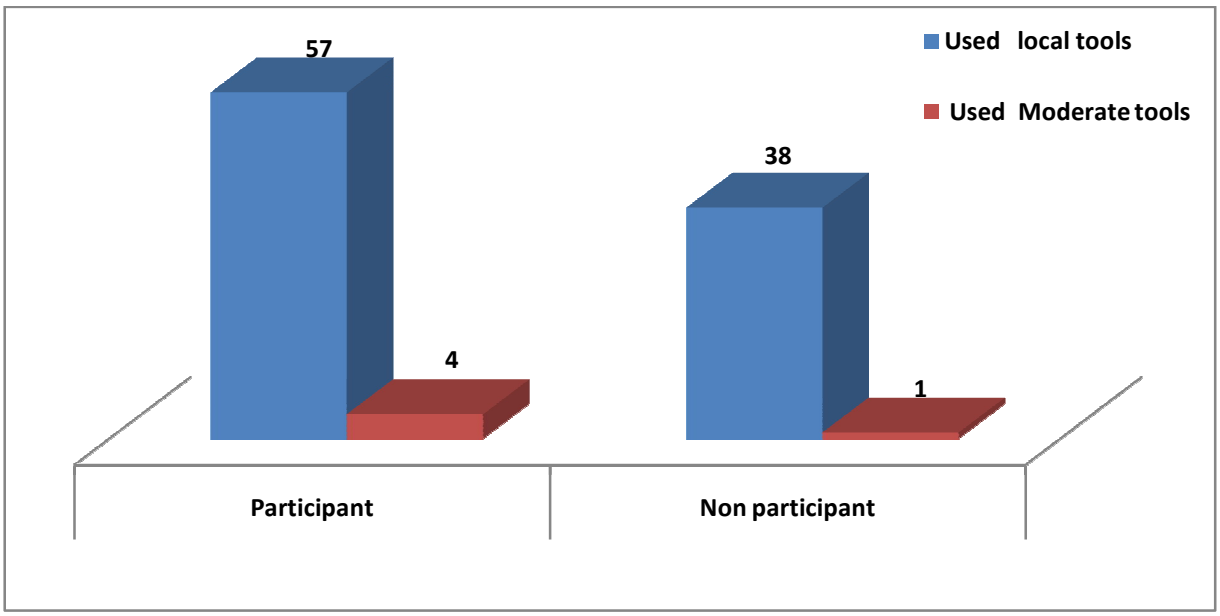

Figure 22 participant &non-participant by using Tools & equipment.

Table (4-1-23) Frequency Distribution and Percentages of Respondents by by using improved seed for Sorghum.

improved seed for Sorghum	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	22	13	35	35%
Did not use	39	26	65	65%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-23) result of household heads respondents by using improved seed for Sorghum, shows that 65% of the respondents (39 participants +26 non-participant) reported that, they did not use improved sorghum. This may be due to low income, high price of improved verities, and weakness of Agricultural extension in study area.

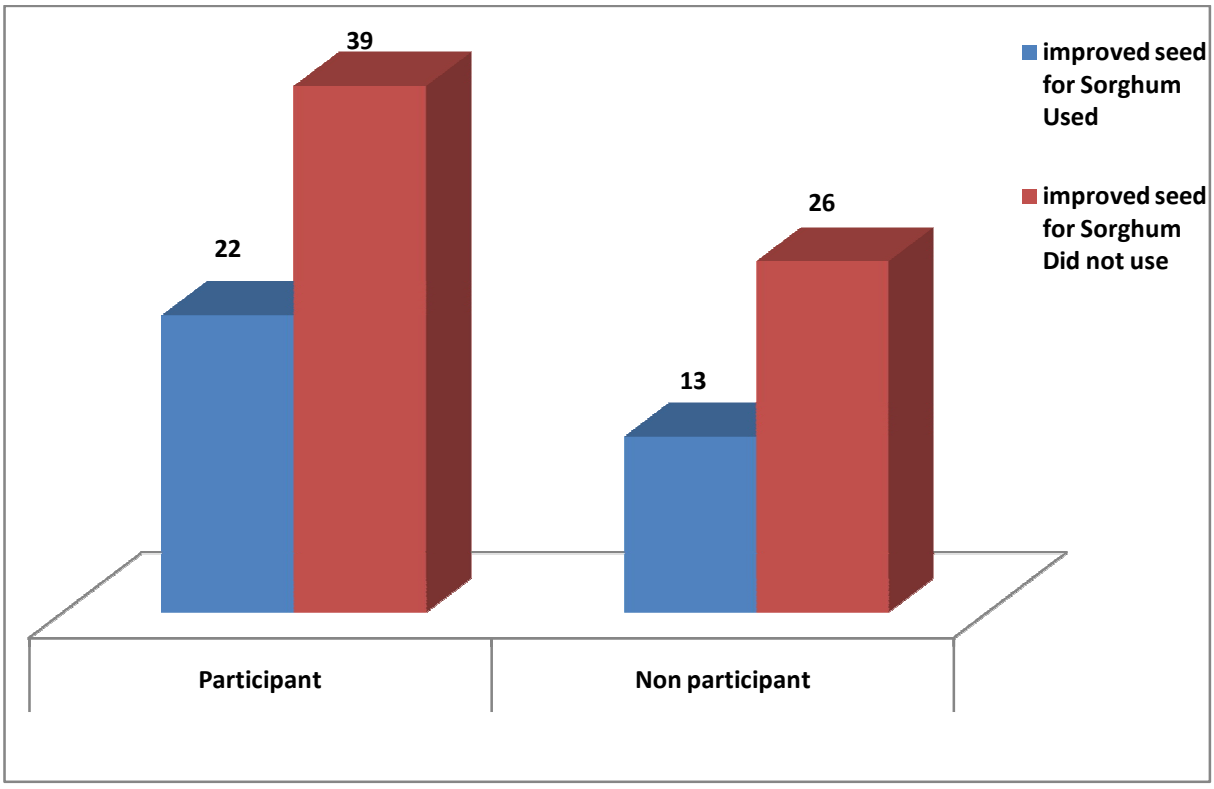

Figure 23 participant &non-participant by using improved Sorghum.

Table (4-1-24) Frequency Distribution and Percentages of respondents by adoption of recommnded Sowing date for improved Sorghum.

sowing date for sorghum	Participation in project		Total	percentage
	Participant	Non participant		%
first July	40	19	59	59%
mid July	15	8	23	23%
last July	6	12	18	18%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-24) the result of household heads respondents by adoption of recommended sowing date for improved variety for Sorghum, shows that 59% of the respondents (40 participants +19 non-participants), reported that they grew on first July, this may be due to weakness of Agricultural extension.

Note: The recommended sowing date for sorghum improved verities is mid July, (Agricultural research corporation, South Darfur

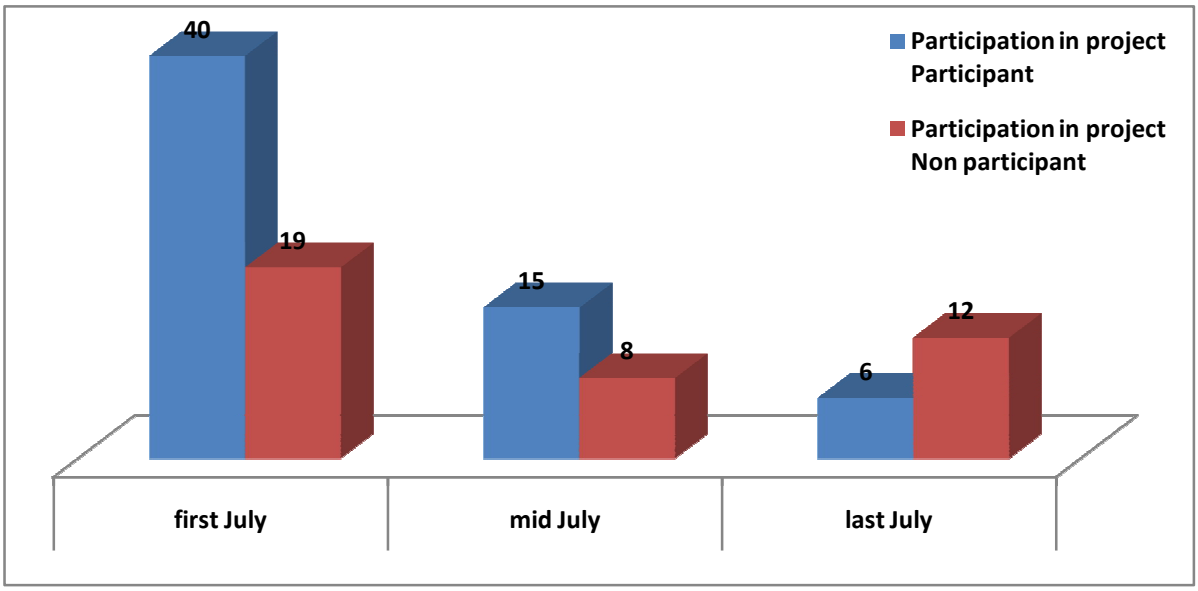

Figure 24 participant &non-participant by sowing date/sorghum.

Table (4-1-25) Frequency Distribution and Percentages of Respondents recommended seed rate for improved Sorghum feddan and seed rate per hole

Recommended seed rate for sorghum	Participation in project		Total	Percentage
	Participant	Non participant		%
Used	27	13	40	40%
Did not use	34	26	60	60%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-25) show that, the result of household head respondents by adoption of recommended seeds rate for improved variety for Sorghum, shows that, 60%of respondents (34 participants +26 non-participant) reported that ,they did not use recommended seed rate for improved variety of sorghum.

Average recommended seed rate used to improve sorghum is 3-4 Kgs per feddan, and 5-7seed per hole according to research advice.

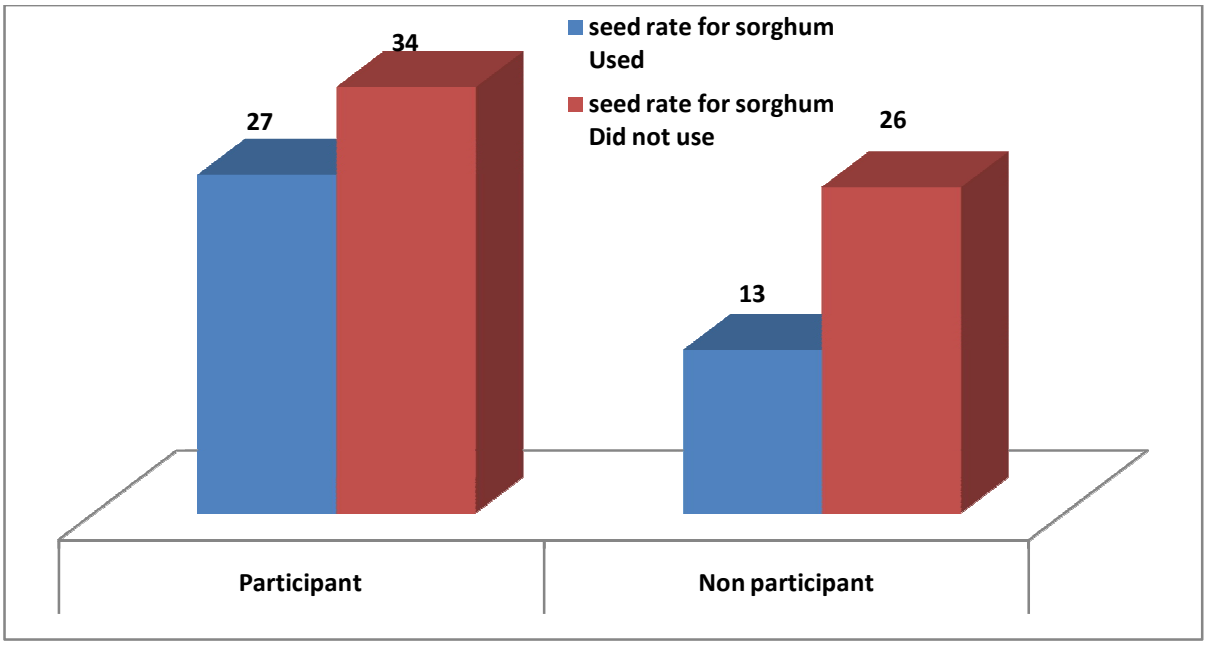

Figure 25 participant &non-participant by seed rate /Sorghum.

Table (4-1-26) Frequency Distribution and Percentages of respondents by recommnded spacing between rows and holes.

recommended spacing for sorghum / rows/ holes	Participation in project		Total	Percentage
	Participant	Non participant		%
Used	33	18	51	51%
Did not use	28	21	49	49%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-26) show the result of household heads respondents by recommended spacing betwwe rows and holes for improved Sorghum, shows that 51% of the respondents (33 participants +18 non-participants), reported that, they used recommended spacing, while 49% of the respondents (28 participants +21non-participant) did not use. May due to weakness of extension.

The average recommended spacing to improved sorghum variety, the distances between rows 50cm and between holes 50 cm (Agric-research advice).

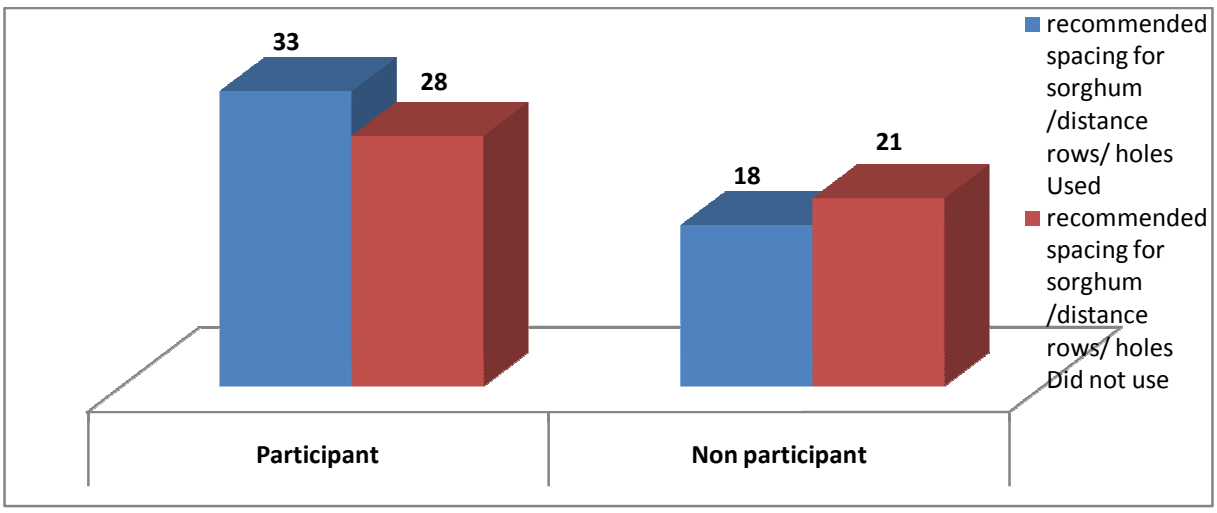

Figure 26 participant &non-participant by spacing/sorghum.

Table (4-1-27) Frequency Distribution and Percentages of respondents by recommnded thining done for improved Sorghum(three plants /hole)

recommnded thinning of sorghum crop	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	28	16	44	44%
Did not use	33	23	56	56%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-27) the result **of** household head respondents by recommended thining for improved Sorghum, shows that 56% of the respondents (33 participants +23 non-participant) they report that, did not use. This may be due to weakness of Agricultural extension.

The average recommended plant per hole, are 3 plants for improved sorghum variety. (Agricultural research corporation –center. South Darfur state).

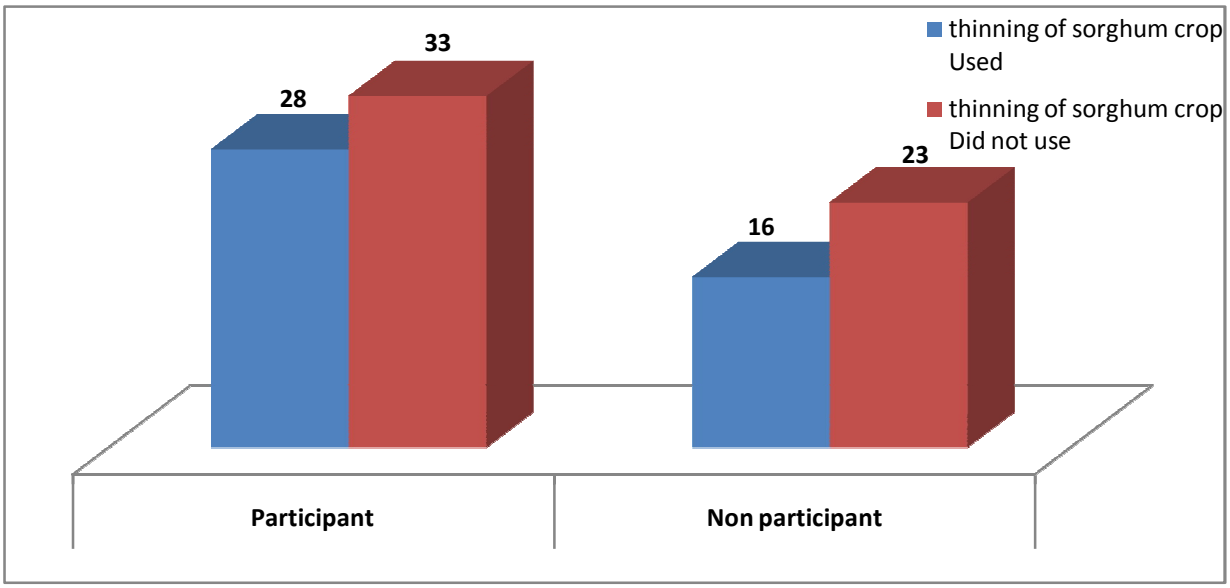

Figure 27 participant &non–participant by thinning/Sorghum.

Table (4-1-28) Frequency Distribution and Percentages of res pondents recommnded weeding done for improved Sorghum variety.

Recommended weeding for sorghum crop	Participation in project		Total	Percentage
	Participant	Non participant		%
Used	26	16	42	42%
Did not use	35	23	58	58%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-28) the result of household head respondents by recommended weeding for improved Sorghum shows that 58% of the respondents (35 participants +23 non-participant) reported that, they did not use recommended weeding.

Clear: The recommended and best time of weeding for sorghum improved variety is, after 2-3 weeks from sowing date (Agricultural Research).

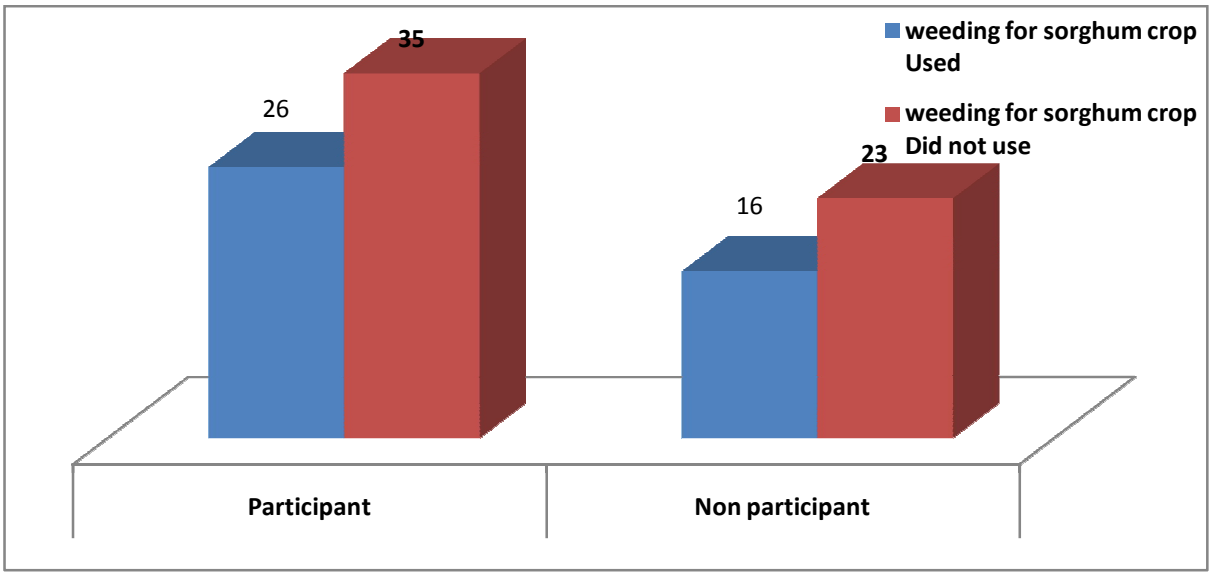

Figure 28 participant &non-participant by weeding/sorghum.

Table (4-1-29) Frequency Distribution and Percentages of respondents by using recommnded pest &disease control for improved Sorghum

Recommended Pest & diseases control	Participation in project		Total	percentage
	Participant	Non participant		%
Used	29	14	43	43%
Did not use	32	25	57	57%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-29) the result of household heads respondents by using recommnded pests and diseaes control for improved Sorghum, shows that 57% of the respondents (32 participants +25 non-participant) reported that, they did not use. This may be due to low of income and weakness of Agricultural extension and also may be due to high price of pesticide and insecticide.

Note: Pest is an insect or small animal or common pest such as rats, mice which is harmful or which damages crops. And disease of plants, caused by infection and lead to failure of crops production.

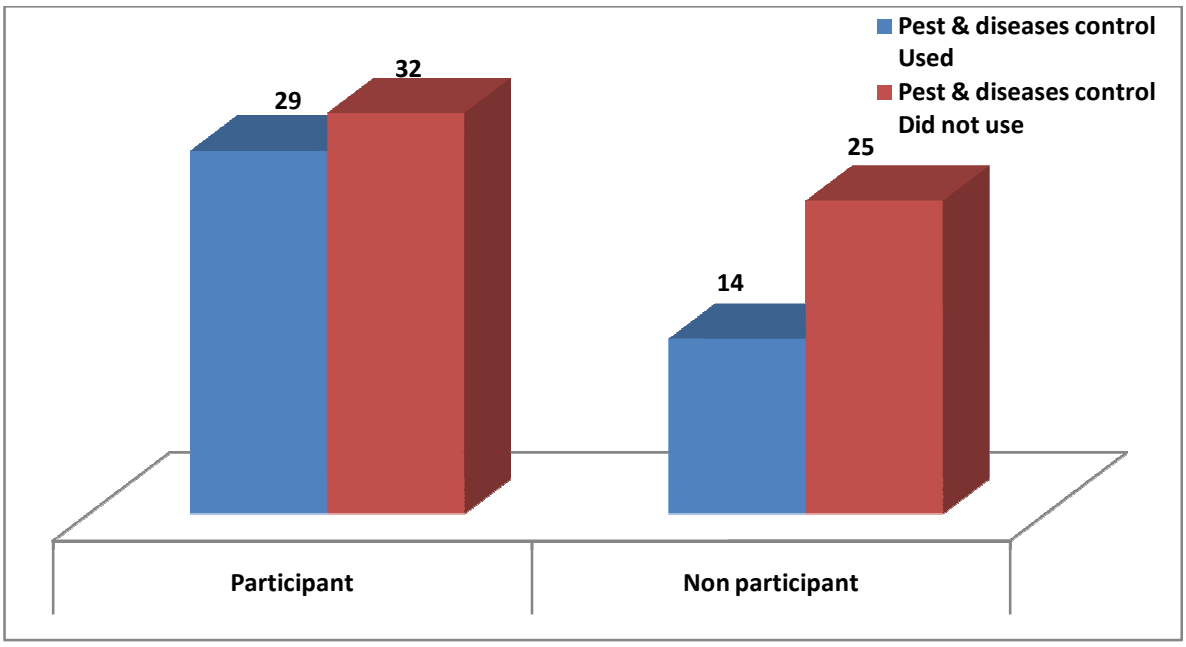

Figure 29 participant &non-participant by pest disease control/sorghum

Table (4-1-30) Frequency Distribution and Percentages of respondents) by using improved variety for millet

Improved seed for millet	Participation in project		Total	Percentage
	Participant	Non participant		%
used	32	17	49	49%
Did not use	29	22	51	51%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-30) the result of household heads respondents by using improved variety for Millet, shows that, 51% of the respondents (29 participants +22 non-participants), reported that they did not use improved variety of Millet. This may be due to high price of improved seeds, low of income and weakness of Agricultural extension in study area..

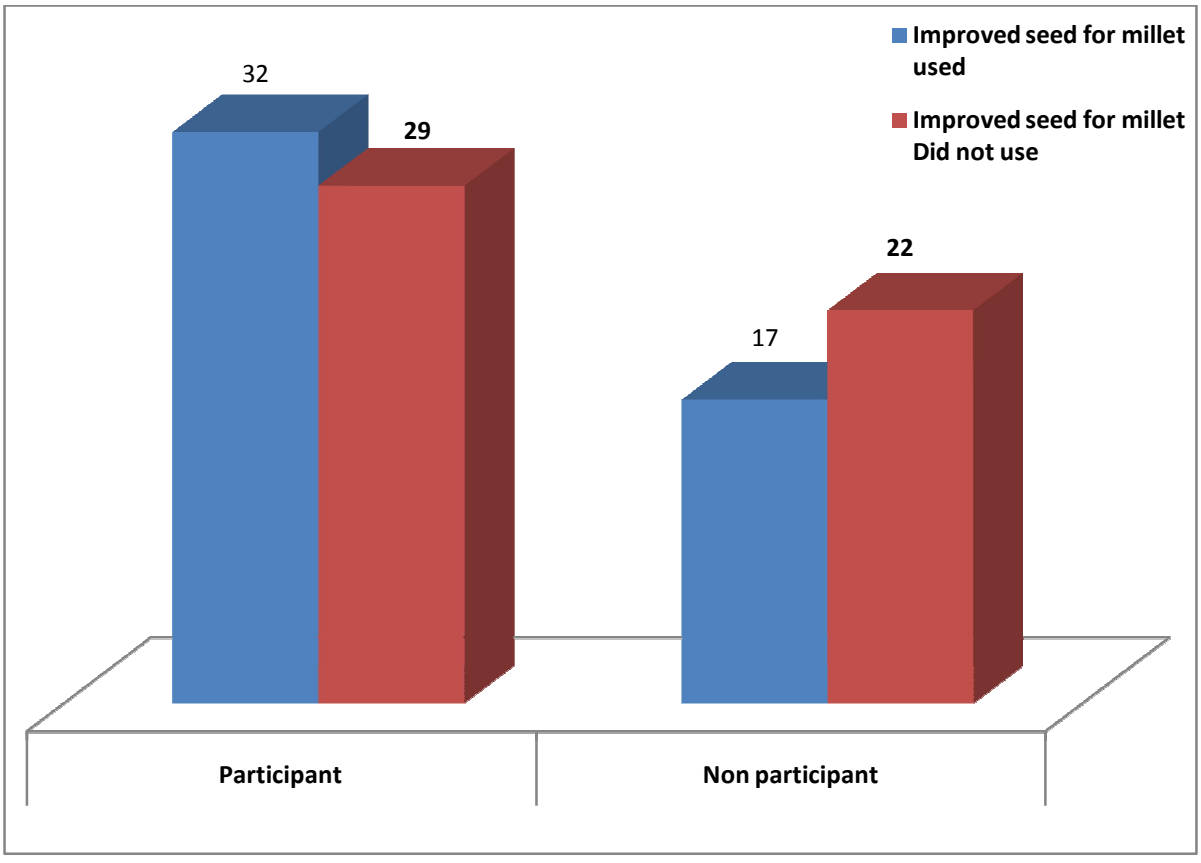

Figure 30 participant &non-participant by using improved Millet.

Table (4-1-31) Frequency Distribution and Percentages of respondents by recommnded Sowing date used for improved Millet.

recommended Sowing date for millet	Participation in project		Total	Percentage %
	Participant	Non participant		
first July	37	17	54	54%
mid July	16	16	32	32%
late July	8	6	14	14%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-31) the result of household heads respondents by recommnded sowing date for improved variety for Millet, shows that 54% of the respondents (37 participants +17 non-participants), reported that they grew millet on first July, this may due to weakness of agricultural extension.

Note: The recommended sowing date for millet improved verities is mid July, (Agricultural research corporation, South Darfur

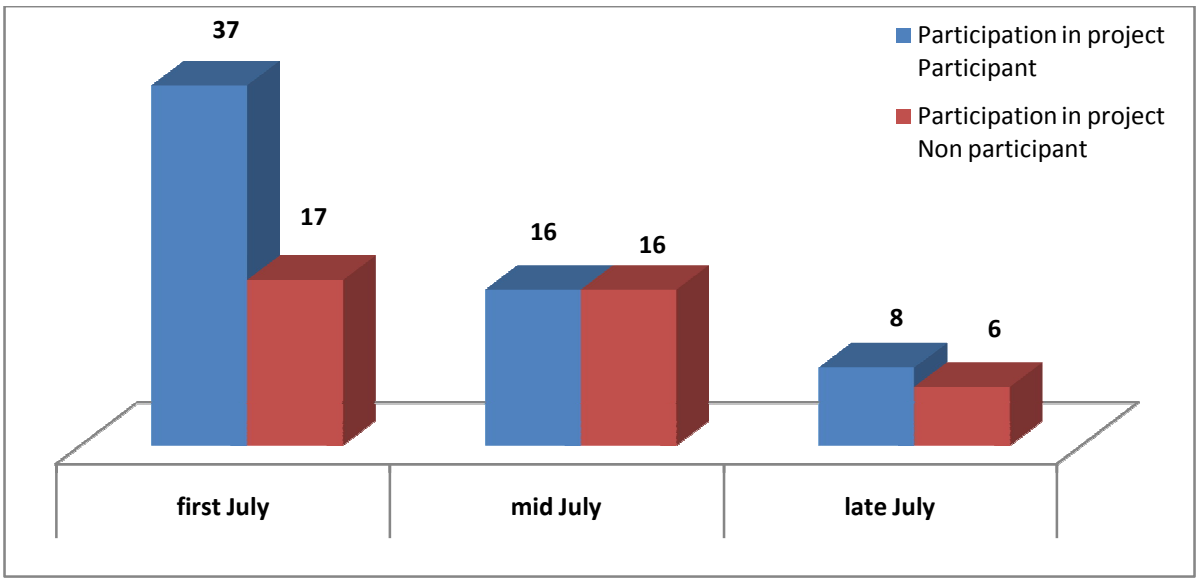

Figure 31 participant &non-participant by sowing date for Millet.

Table (4-1-32) Frequency Distribution and Percentages of respondents by recommnded Seed rate for improved variety of Millet.

recommended Seed rate for millet	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	30	16	46	46%
Did not use	31	23	54	54%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-32) the result of respondents by recommended seed rate used for improved variety for Millet shows that, 54% of the respondents (31 participants +23 non-participant) reported that they did not use recommended seed rate. This may be due to weakness Agricultural extension.

Note: Average recommended seed rate for improved variety for Millet is 3-4 Kgs per feddan and 6-10 seeds per hole.

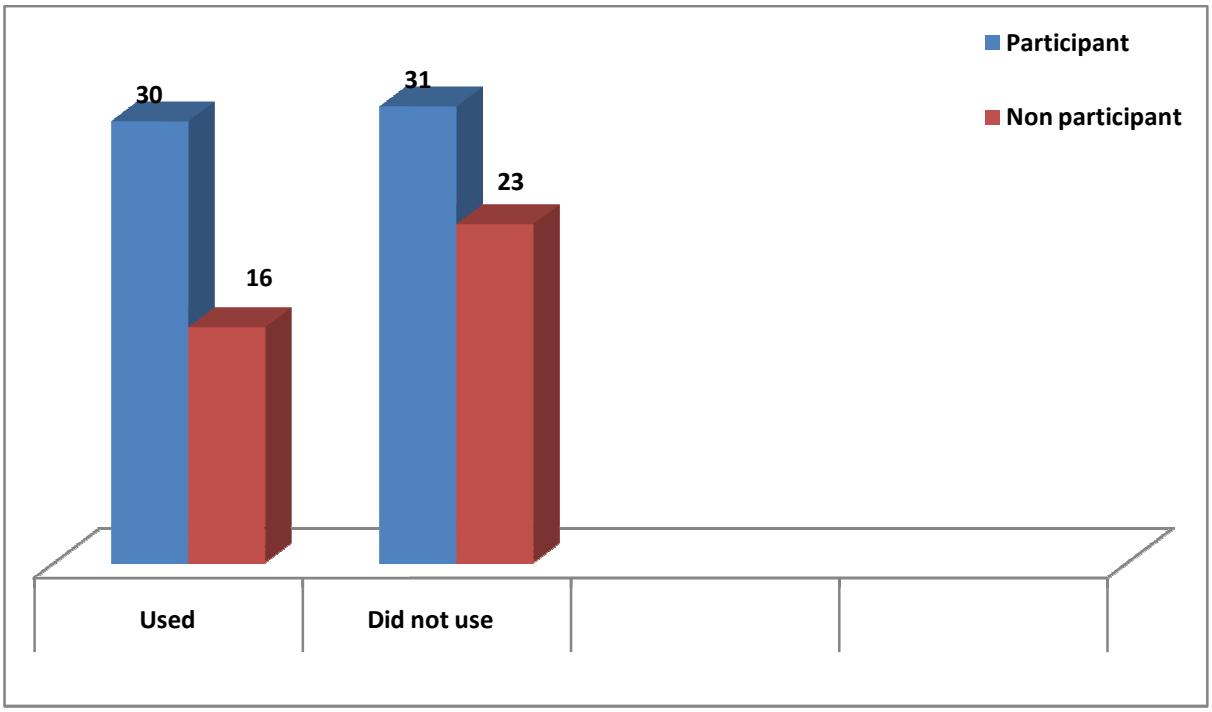

Figure 32 participant &non-participant by seed rate for Millet.

Table (4-1-33) Frequency Distribution and Percentages of respondents by recommnded spacing between holes /rows used for improved millet.

recommended spacing for millet between hole	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	28	13	41	41%
Did not use	33	26	59	59%
Total	61	39	100	100%

Source: Study Survey 2011..

Table (4-1-33) the result of household respondents by spacing for Millet, shows that 41% of the respondents (28 participants +13 non-participants), reported that they used, while 59% of the respondents (33 participants +26 non-participants) they did not use.

Average recommended spacing between rows is 75 cm and 50 cm / holes

Observation: In South Darfur state, the millet forming dense tillers, therefore the recommended distance between rows 100cm and between holes also 100cm.

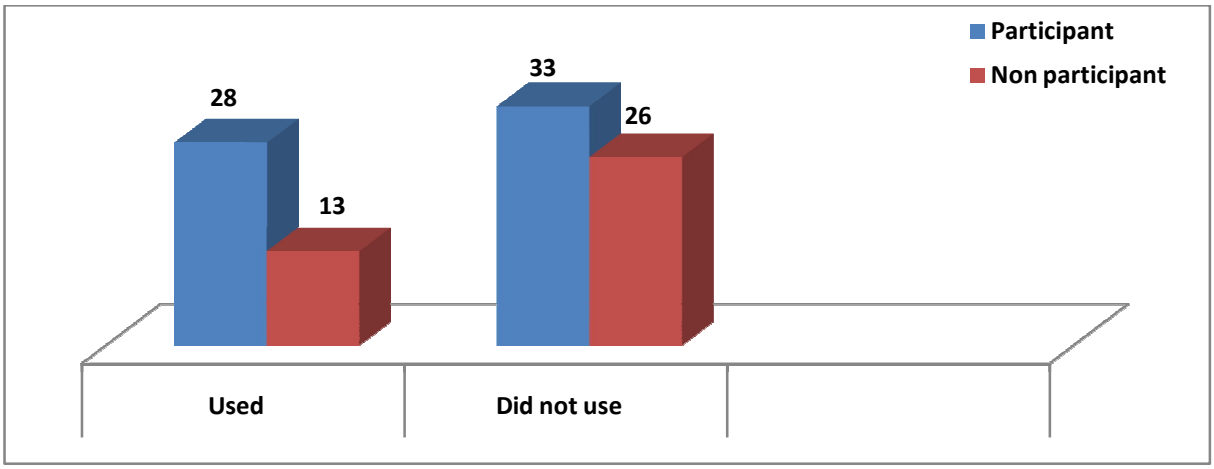

Figure 33 participant &non-participant by spacing/hole/rows for Millet.

Table (4-1-34) Frequency Distribution and Percentages of respondents by recommnded thining done for improved variety of Millet.

recommended thinning for millet	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	27	14	41	41%
Did not use	34	25	59	59%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-34) the result of respondents by recommended thining, shows that 41% of respondents (27 participants +14 non-participants), reported that, they used thinning, while 59% of the respondents (34 participants +25 non-participant) did not use. This may due to weakness of extension.

Clear: The recommended thinning for improved millet is three plants per hole.

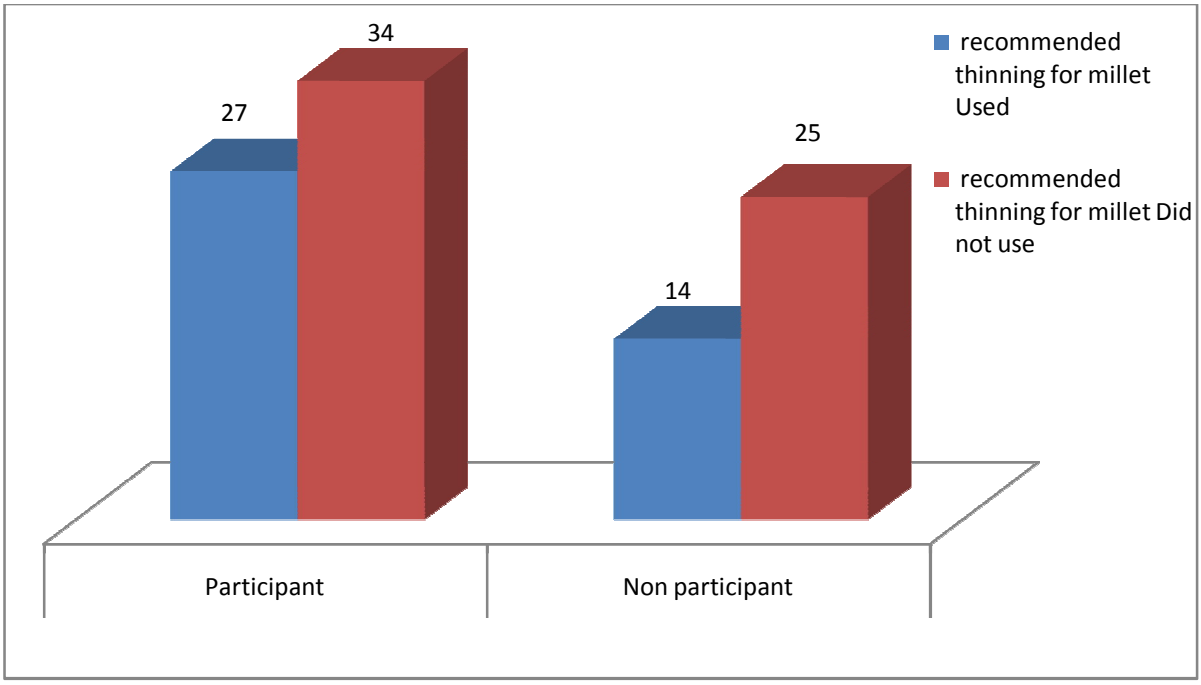

Figure 34 participant &non-participant by thinning for improved Millet.

Table (4-1-35) Frequency Distribution and Percentages of Rspondents(HouseHold heads) by recommended weeding for Millet.

recommended weeding time for millet	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	25	15	40	40%
Did not use	36	24	60	60%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-35) the result of household heads respondents by recommended weeding time for improved millet, shows that 40% of respondents (25 participants +15 non-participants), reported that, they used, while 60% of respondents (36 participants +24 non-participants), did not use. This may be due to weakness of extension and cost of weeding.

Note: Average recommended weeding for improved variety after 2-3weeks. Weeding mean to get rid of unwanted things, stranger plants. Sometimes chemical used for killing weeds.

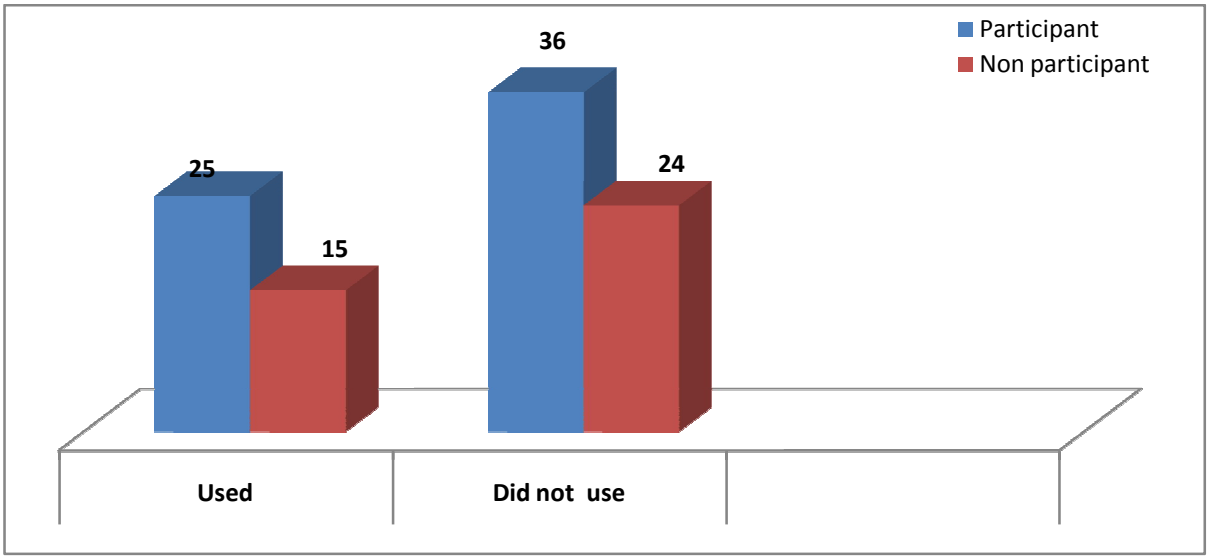

Figure 35 participant &non-participant by weeding for Millet.

Table (4-1-36) Frequency Distribution and Percentages of Respondents by recommended protection used for Millet.

Recommended Pest & diseases control for millet crop	Participation in project		Total	Percentage %
	Participant	Non participant		
used	23	16	39	39%
Did not use	38	23	61	61%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-36) the result of respondents by using pesticide &insecticide for improved variety for Millet, shows that 39% of the respondents (23 participants +16 non-participants), reported that they used pesticide& insecticide for protection for improved variety of Millet, while 61% of the respondents (38 participants +23 non-participant) they did not use. This may be due to of cost of insecticide, low of income and weakness of agricultural extension in study area.

Note; crop protection is a way of covering crops with chemicals in order to kill harmful insects and disease s, by recommended way and scientific methods.

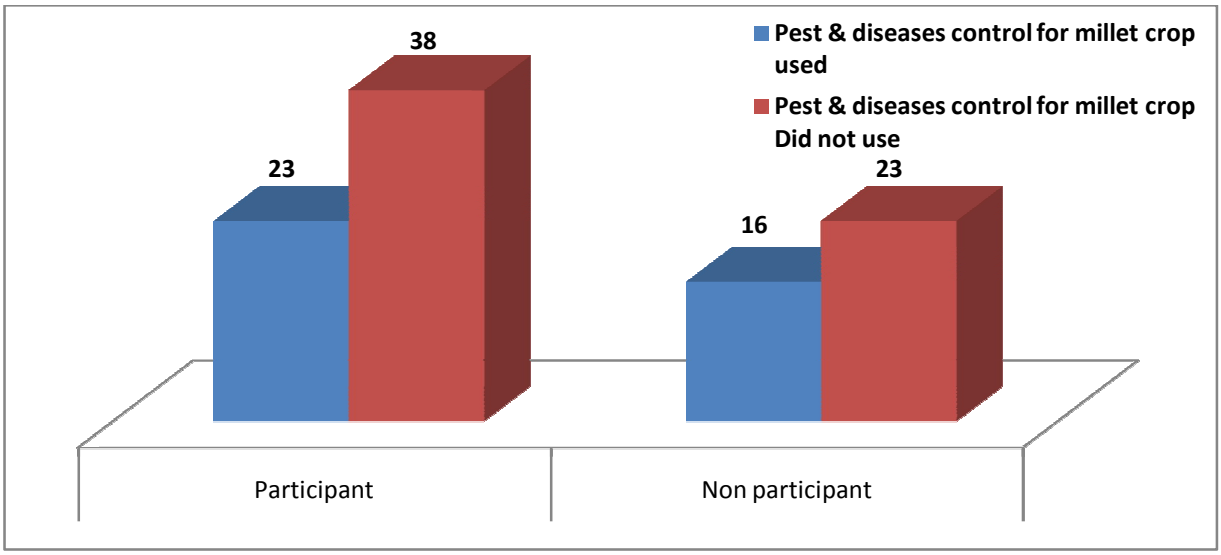

Figure 36 participant &non-participant by using pesticide for Millet.

Table (4-1-37) Frequency Distribution and Percentages of respondent by using of improved Ground Nut seeds .

Improved seed for ground nut crop	Participation in project		Total	Percentage %
	Participant	Non participant		
used	24	21	45	45%
Did not use	37	18	55	55%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-37) the result of household heads respondents by using improved seed for Groundnut, shows that 45% of the respondents (24 participants +21 non-participants), reported that they used improved Ground Nut, while 55% of the respondents (37 participants +18 non-participants) they did not use improved variety. This may be due to low income and weakness of extension.

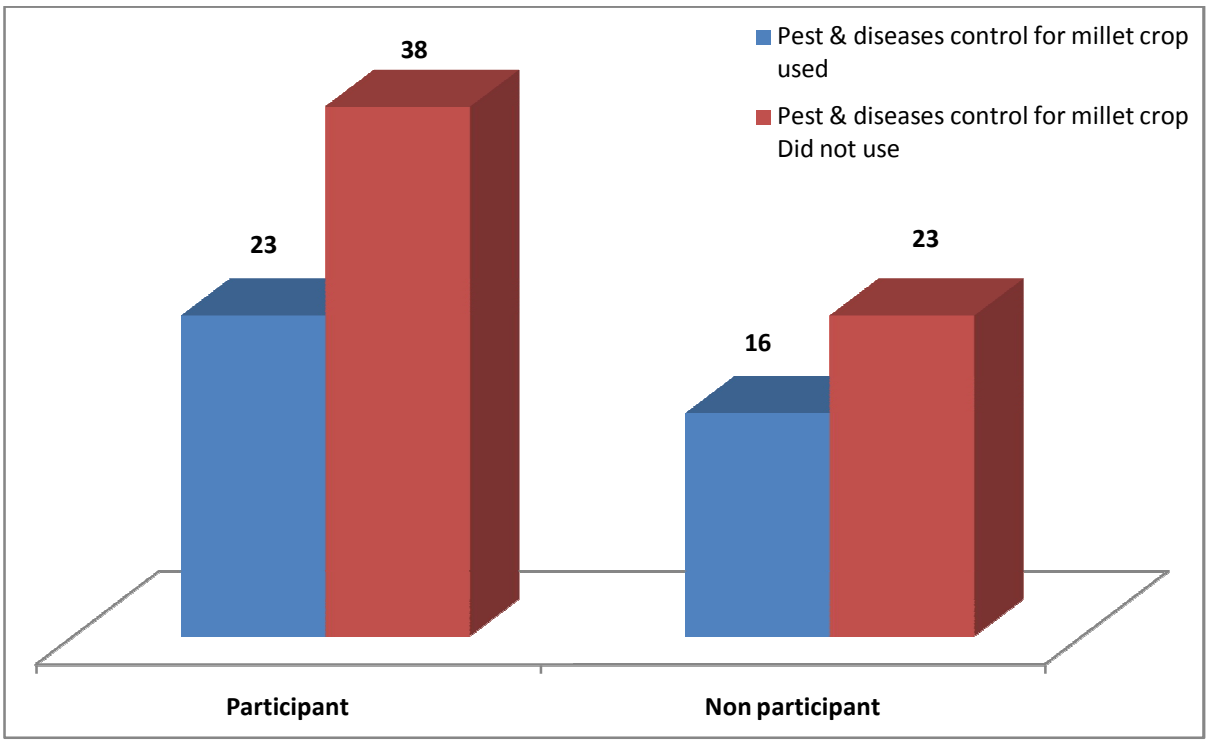

Figure 37 participant &non-participant by using improved Groundnut.

Table (4-1-38) Frequency Distribution and Percentages of respondents by recommnded Sowing date for improved variety of Ground Nut

Recommended sowing date for ground nut crop	Participation in project		Total	Percentage %
	Participant	Non participant		
First July	30	21	51	51%
Mid July	22	15	37	37%
Last July	9	3	12	12%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-38) the result of household heads respondents by using improved seed for Groundnut, shows that 51% of the respondents (30 participants +21 non-participants), reported that they grew improved variety of Ground Nut on first of July. This may be due to weakness of extension role.

Clear: Delaying of sowing date of Ground Nut improved variety after 15July, may causing the decrease of yield by 50% (Agricultural Research advice).

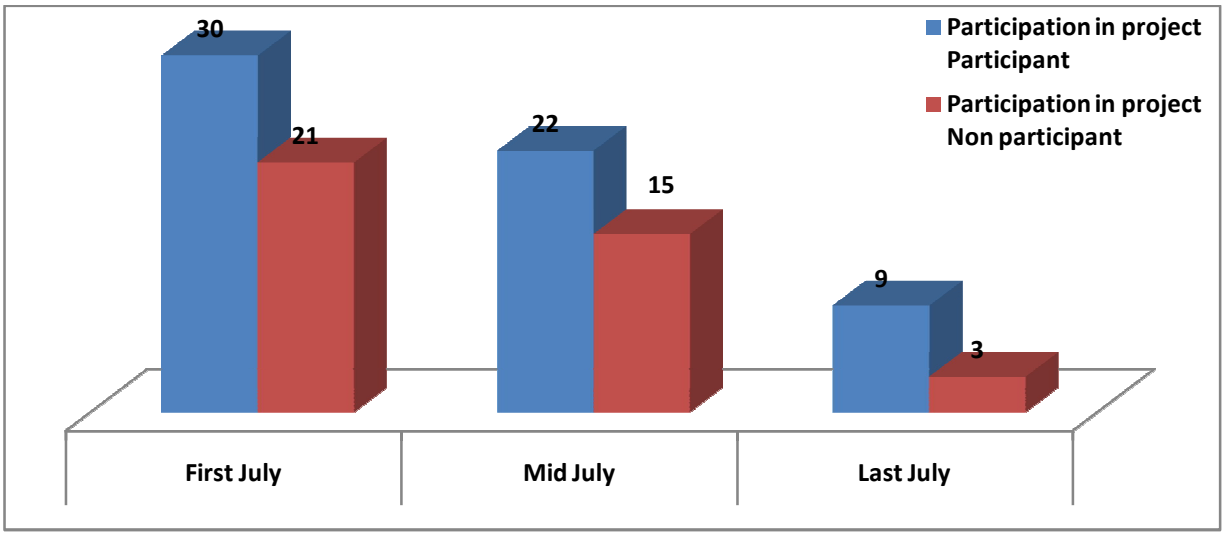

Figure 38 participant &non-participant by sowing date for Groundnut.

Table (4-1-39) Frequency Distribution and Percentages of respondents by recommnded seed rate used for improved Ground Nut/feddan.

Recommended Seed rate for ground nut crop	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	24	17	41	41%
Did not use	37	22	59	59%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-39) the result of respondents by recommended seed rate of improved variety for Ground Nut, shows that 41% of the respondents (24 participants +17 non-participants), reported that, they used, while 59% of the respondents (37 participants +22 non-participant) they did not use. This may be due to weakness of Agricultural extension role.

Note: Average recommended seed rate for improved variety of Ground Nut is 36 kg per feddan (Agricultural research center south Darfur state)

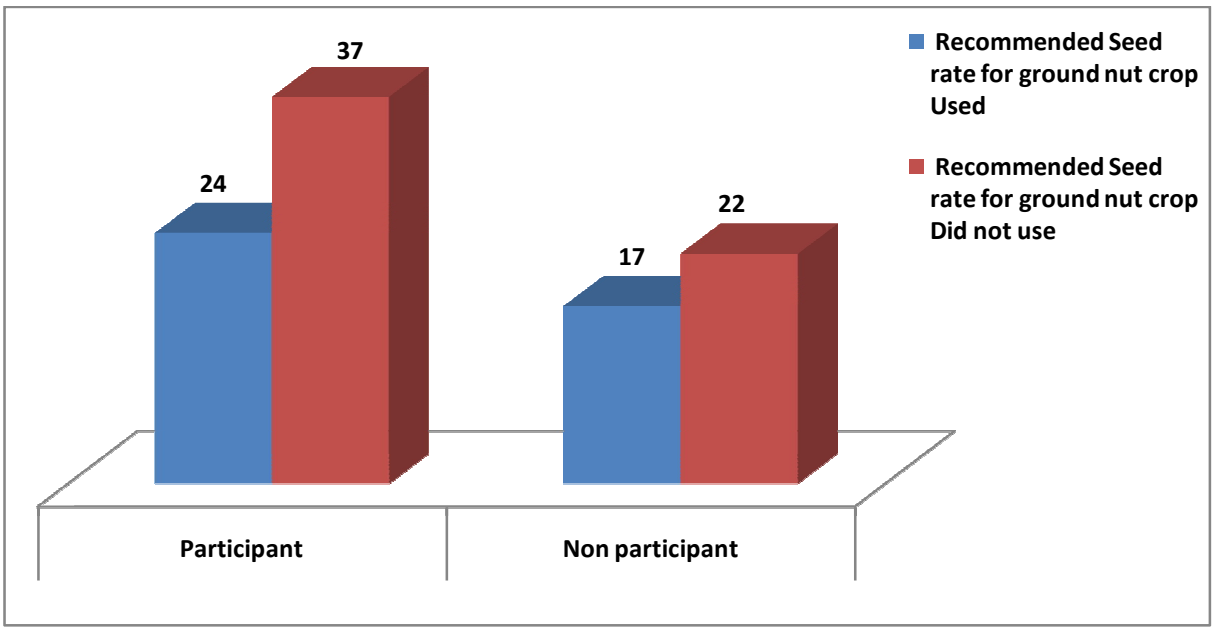

Figure 39 participant &non-participant by seed rate for Groundnut.

Table (4-1-40) Frequency Distribution and Percentages of respondents by recommnded spacing betweenrows/holes used for improved Ground Nut.

Recommended spacing between rows/holes for ground nut crop	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	29	21	50	50%
Did not use	32	18	50	50%
Total	61	39	100	100%

Source: Study Survey 2011

Spacing is the distance between, rows, holes; especially on farming practices, it is very important techniques, which increase the quantity and quality of yield.

Table (4-1-40) the result of respondents by recommended spacing of improved variety for Ground Nut, shows that 50% of the respondents (29 participants +21 non-participants), reported that, they used spacing between holes/rows, while 50% of the respondents (32 participants +18 non-participant) they did not use, may be due to weakness of extension roles.

Note: Average recommended spacing for improved variety of Ground Nut is 30cm between rows and holes is 30 cm between holes and rows.

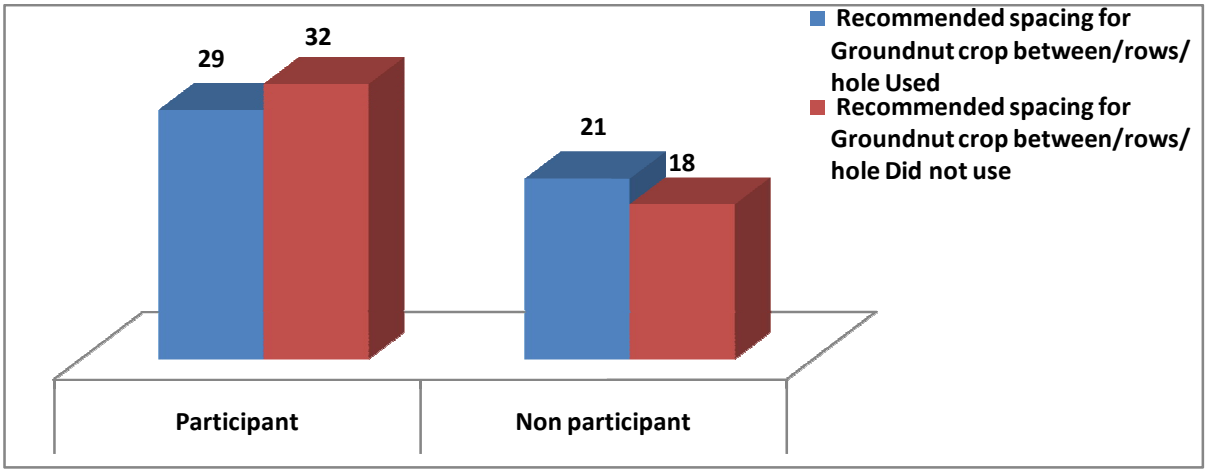

Figure 40 participant &non-participant by spacing for Groundnut

Table (4-1-41) Frequency Distribution and Percentages of respondents by recommnded thinning done for Groundnut. .

Recommended thinning for improved ground nut crop.	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	27	17	44	44%
Did not use	34	22	56	56%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-41) the result of respondents by recommended thinning for improved Groundnut, shows that 44% of the respondents (27 participants +17 non-participants), reported that they used, while 56% of the respondents (34 participants +22 non-participant) they did not use. This may be due to weakness of Agricultural extension.

Note: Thinning having a small numbers or a small amount of plants in the farm compare with size of the farm. It is used to void density, thick; close together of plant and difficult to go or to see through, and may cause serious damage.

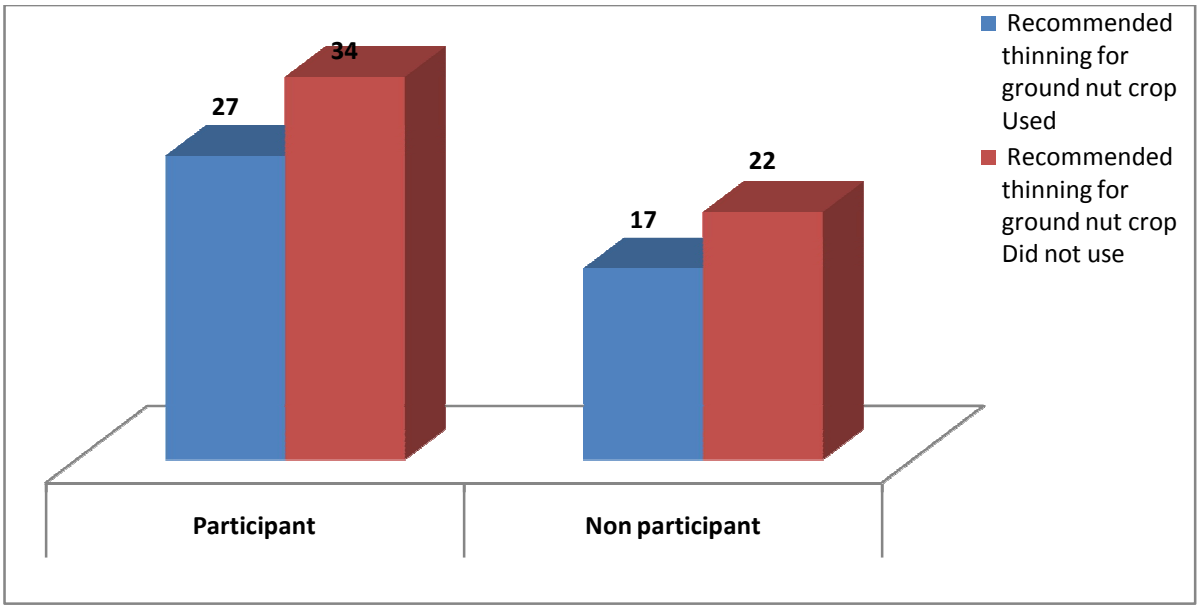

Figure 41 participant &non-participant by thinning for Groundnut.

Table (4-1-42) Frequency Distribution and Percentages of respondents by recommnded weeding done for Groundnut.

Recommended weeding for improved ground nut crop	Participation in project		Total	Percentage
	Participant	Non participant		%
Used	16	18	34	34%
Did not use	45	21	66	66%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-42) the result of respondents by recommended weeding for improved variety for Ground Nut, shows that, 66% of the respondents (45 participants +21 non-participants), reported that, they did not use. This may be the cost of weeding, low of income and may due to weakness of extension.

Clear: Recommended weeding are 2 times, first weeding during 45 day, after 2-3 weeks from growing time, second weeding 4-5weeks.no weeding during 25day from growing time, may caused decrease of yield by25%.

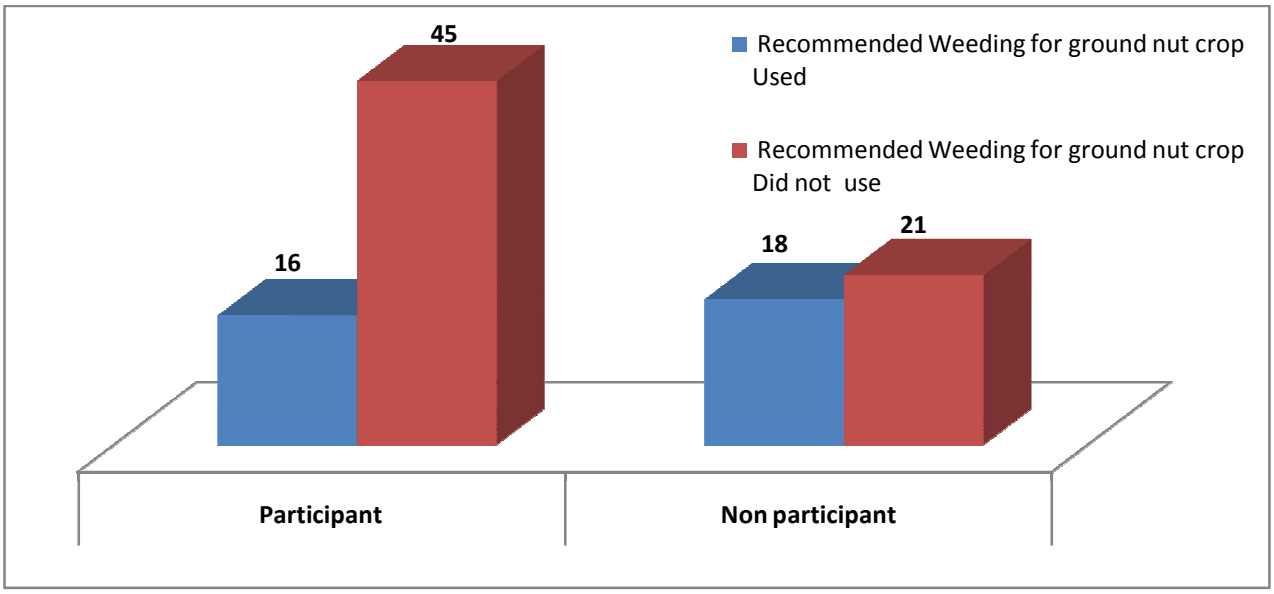

Figure 42 participant &non-participant by weeding for Groundnut.

Table (4-1-43) Frequency Distribution and Percentages of respondents by recommended pest and disease control using for improved Ground nut.

Pest & diseases control for ground nut crop	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	30	15	45	45%
Did not use	31	24	55	55%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-43) the result of household heads respondents by using of pest and disease control(protection), shows that, 55% of the respondents (31 participants +24non-participant) reported that, they did not use pesticide and insecticide for crops protection, this may be due to high price of it, low of income, and also may be due to weakness of extension role in study area.

Note: Pesticide is a chemical substance used to kill harmful insects, small animals, wild plants and other unwanted organisms. The pesticides that farmers spray on their crops kill pests and disease, but they can also damage people's health. While insecticide is chemical substance made and used for killing insects, especially those which eat plants and causes serious damage and risk.

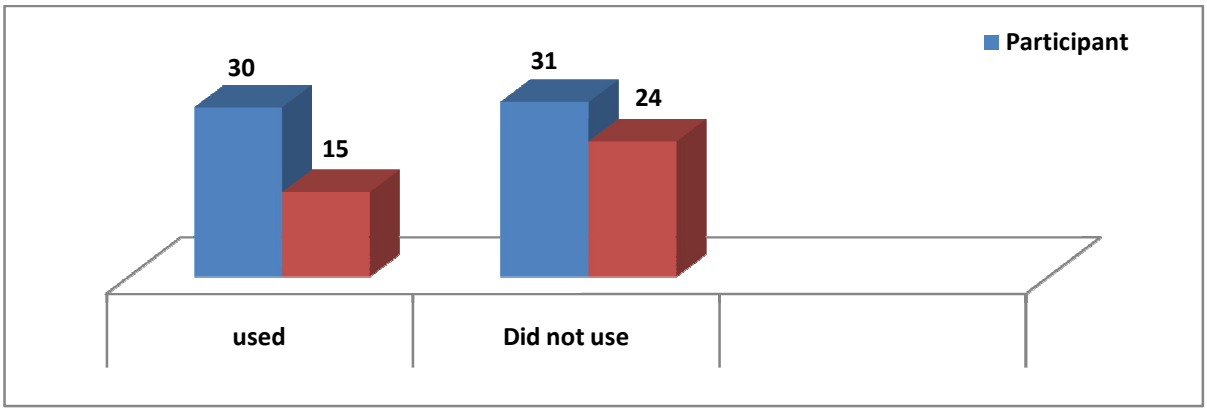

Figure 43 participant &non-participant by pest &disease control for G/

Table (4-1-44) Frequency Distribution and Percentages of respondentsby yield from improved variety for Millet .

Yield from improved Millet	Participation in project		Total	Percentage %
	Participant	Non participant		
Very high	35	27	62	62%
High	19	10	29	29%
low	7	2	9	9%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-44) the result of respondents by yield of improved variety for Millet, shows that 62% of the respondents (35 participants +27 non-participants), reported that their yield very high.29% of the respondents (19 participants +10 non-participants), their yield high. It is observed that the majority of the respondents were the same or very similar in their opinions about the yield from improved seeds, acceptable for them, but still respondents use local verities from previous season; this indicators may be due cost of improved seeds, low of income to weakness of extension role in study area.

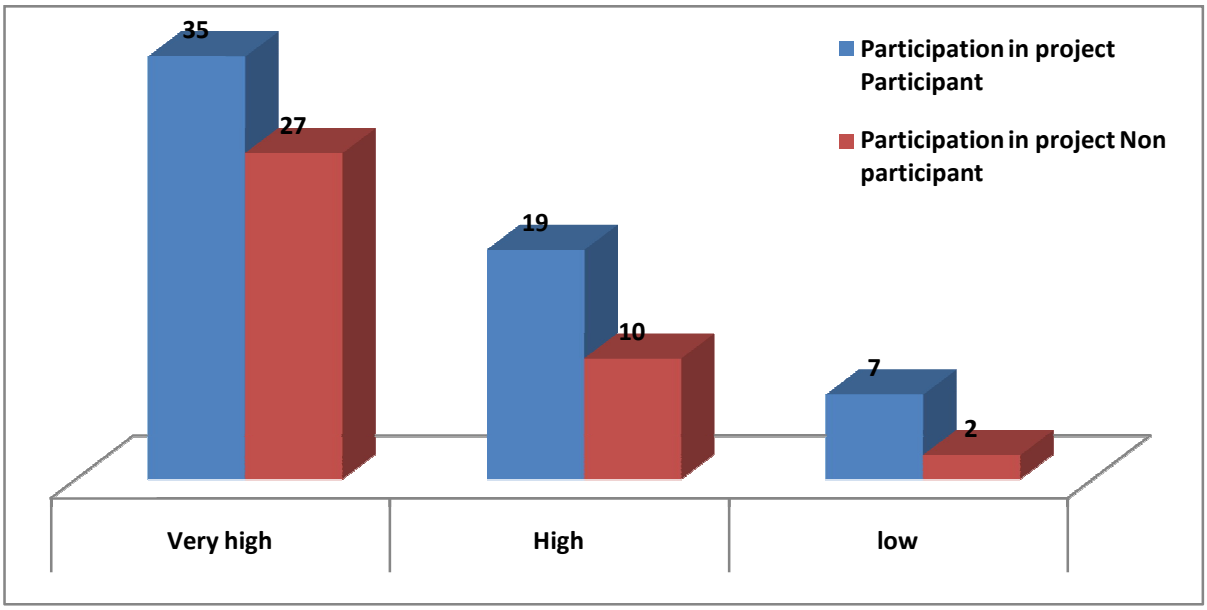

Figure 44 participant &non-participant by Yield of improved millet.

Table (4-1-45) Frequency Distribution and Percentaget of the respondents by yield of improved Sorghum.

Yield from improved Sorghum	Participation in project		Total	Percentage
	Participant	Non participant		%
Very high	31	18	49	49%
High	26	20	46	46%
low	4	1	5	5%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-45) the result of respondents by yield from improved variety for Sorghum, shows that 49% of the respondents (31 participants +18 non-participants), reported that their yield from improved variety of sorghum, was very high, while 46% of the respondents (26 participants+20 non-participants), their yield was high.

Note: Improved sorghum variety is needed to improve the yield, and there is strong relationship between improved seeds and high production.

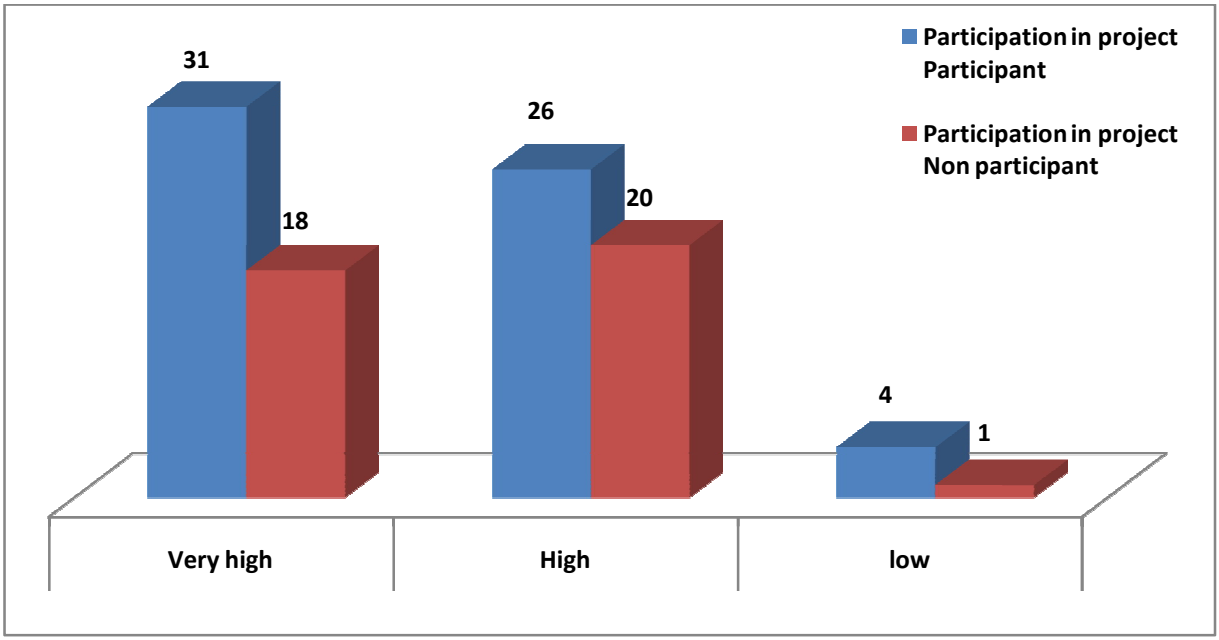

Figure 45 participant &non-participant by Yield of improved Sorghum

Table (4-1-46) Frequency Distribution and Percentages of respondents by yield from improved variety of G/N

Component		Participation in project		Total	Percentage %
		Participant	Non participant		
Yield from improved Ground Nut	Very high	37	20	57	57%
	High	21	18	39	39%
	low	3	1	4	4%
	Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-46) the result of respondents by yield from improved variety for Ground nut, shows that 57% of the respondents (37 participants +20 non-participants), reported that, their yield from improved variety of Ground nut, was very high, while 39% of the respondents (21 participants +18 non-participants), their yield was high. It is observed that, the majorities of the respondents were agreeable by improved variety for Ground nut, and have belief and confidence in improved seeds,to be accepted by respondents.

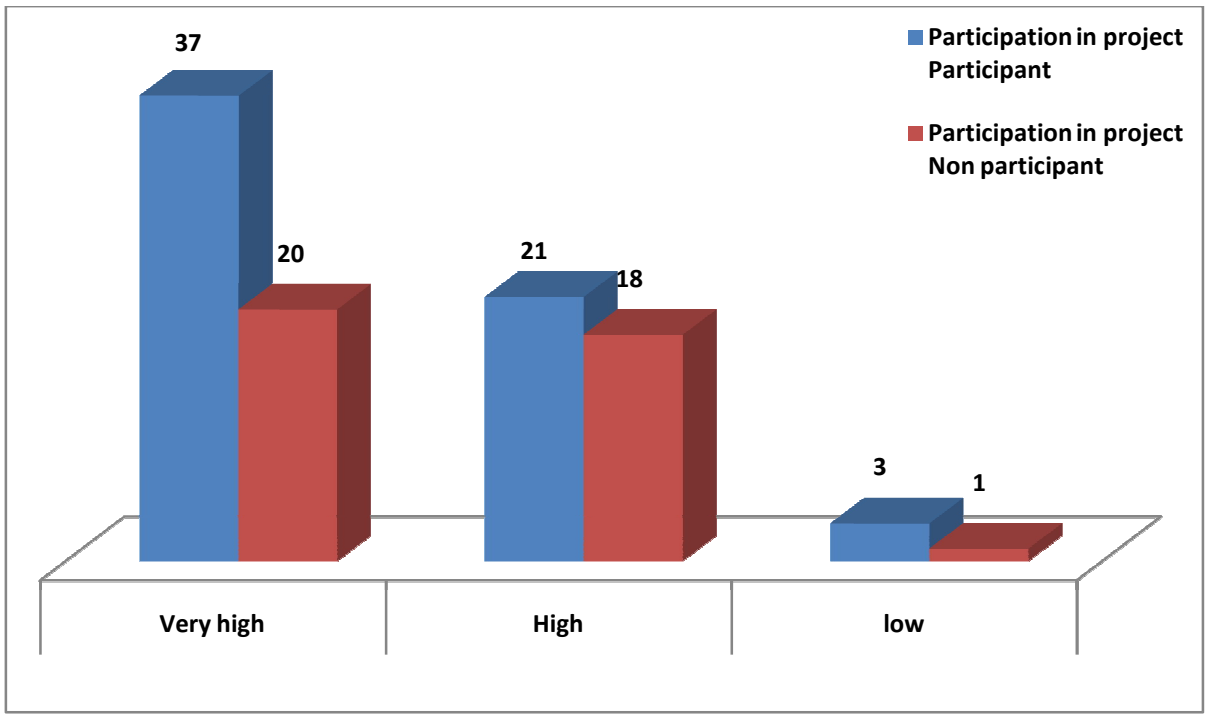

Figure 46 participant &non-participant by Yield of improved Groundnut.

Table (4-1-47) Frequency Distribution and Percentage respondents by degree of complexity of innovation for crops.`

Degree of complexity of innovation for 3 crops	Participation in project		Total	Percentage
	Participant	Non participant		%
V difficult	36	12	48	48%
Difficult	23	23	46	46%
Easy	2	4	6	6%
Total	61	39	100	100%

Source: Study Survey 2011.

Complexity; the feature of something has many parts, may be difficult to understand, relating to ideas that are so modern that they is still being developed

Table (4-1-47) the result of respondents, shows that 48% of the respondents (36 participants +12 non-participants), reported that, the innovation for three crops was Very difficult, and 46% of the respondents (23 participants +23 non-participants) reported that was difficult. It is observed that the majority of respondents found difficulty of innovations adoption.

Roger (2003), indicate that; complexity of innovation as perceived by members of the social system is negatively related to its rate of adoption. Complexity may not be as important as relative advantages or compatibility for many innovations, but for some new ideas, complexity is strong barrier to adoption.

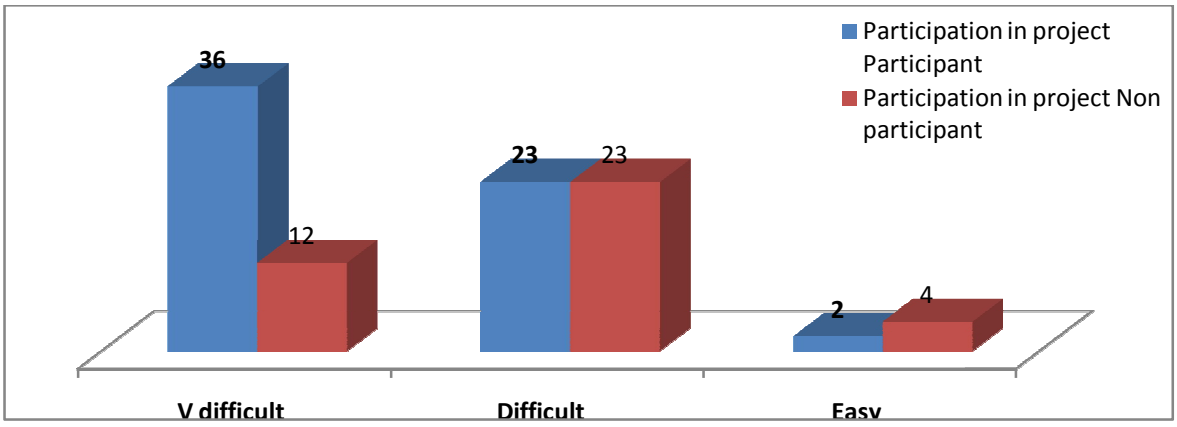

Figure47 participant &non-participant by degree of complexity.

Table (4-1-48) Frequency Distribution and Percentages of respondents by compatiiblity of innovation with Agri- system.

Compatibility with Agric-system	Participation in project		Total	Percentag
	Participant	Non participant		%
Very compatible	20	9	29	29%
Compatible	38	30	68	68%
Not compatible	3	0	3	3%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-48) the result of respondents by campatibility with Agriculture system, shows that 29% of the respondents (20 participants +9 non-participants), reported that, it was very compatible, 68% of the respondents (38 participants +30 non-participant), it was compatible. It is observed the majority of respondents described the innovations compatible with Agricultural system in study area.

Roger (2003) indicated that; an idea that is more compatible is less uncertain to the potential adopter and fit more closely with the individual situation an innovation can be compatible or incompatible with local cultural values and belief, previously introduced ideas or client needs for the innovation.

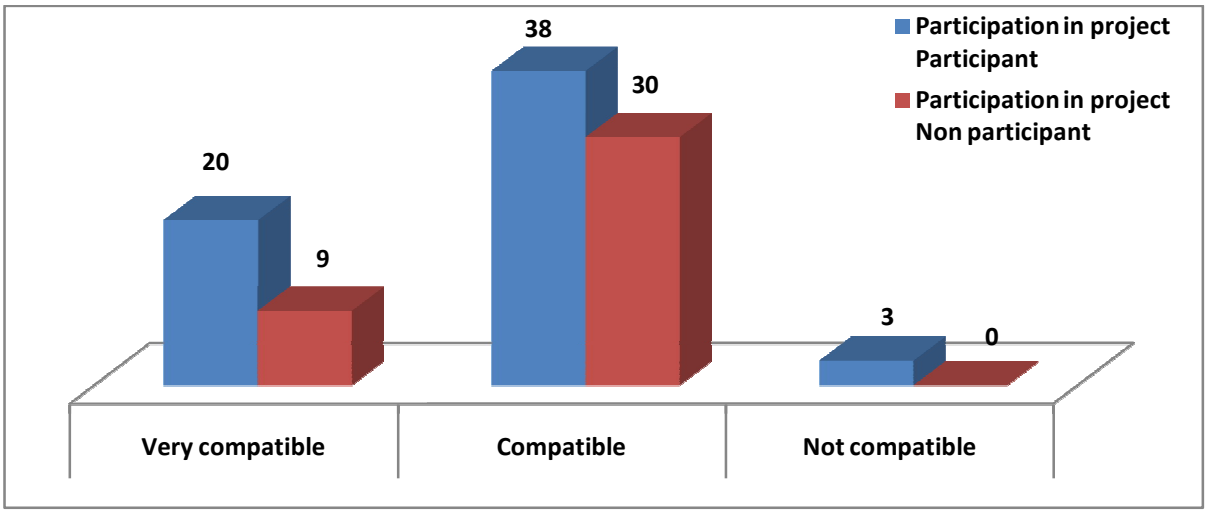

Figure 48 compatibility with Agricultural system in study area.

Table (4-1-49) Frequency Distribution and Percentage of respondents By the adoption of seed dressing.

Adoption of seed dressing for three crops	Participation in project		Total	Percentage
	Participant	Non participant		%
Adopted	15	14	29	29%
Did not adopt	46	25	71	71%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-49) the result of household heads respondents by adoption of seed dressing for three rain-fed cultivated crops,which are Sorghum,Millet and Ground nut , shows that 71% of the respondents (46 participants +25 non-participant) they did not adopt . This may be due to weakness of Agricultural extension and also may attribute to relatively limit of credit services.

Clarify: Seed dressing, is chemical liquid mixture, or powder, which is added to seeds before sowing or to put seeds on the ground, so that plants will grow healthy and free from diseases.

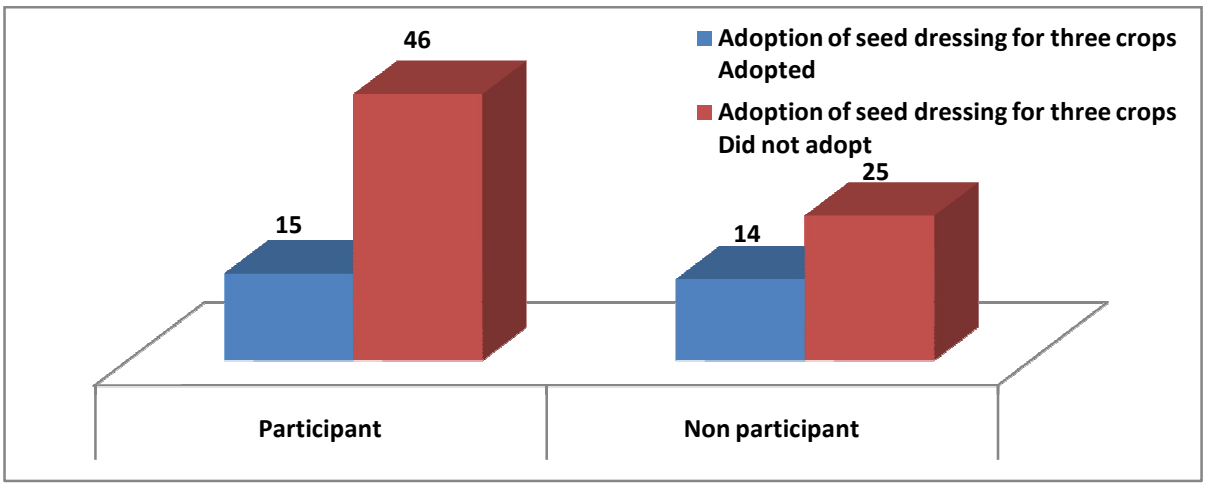

Figure 49 participant &non–participant by adoption of seed dressing

Table (4-1-50) Frequency Distribution and Percentages of respondents by Availability of pesticide

Availability of pesticide	Participation in project		Total	Percentage
	Participant	Non participant		%
Available	21	16	37	37%
Not Available	40	23	63	63%
Total	61	39	100	100%

Study Survey 2011.

Table (4-1-50) the result of respondents by availability of pesticice, shows that, 63% of the respondents (40 participants +23 non-participant), reported that, it was not available.

Note: pesticice is a chemical substance used to kill harmful insects, small animals, wild plants and other unwanted organisms. The pesticides that farmers spray on their crops kill pests but they can also damage people's health.

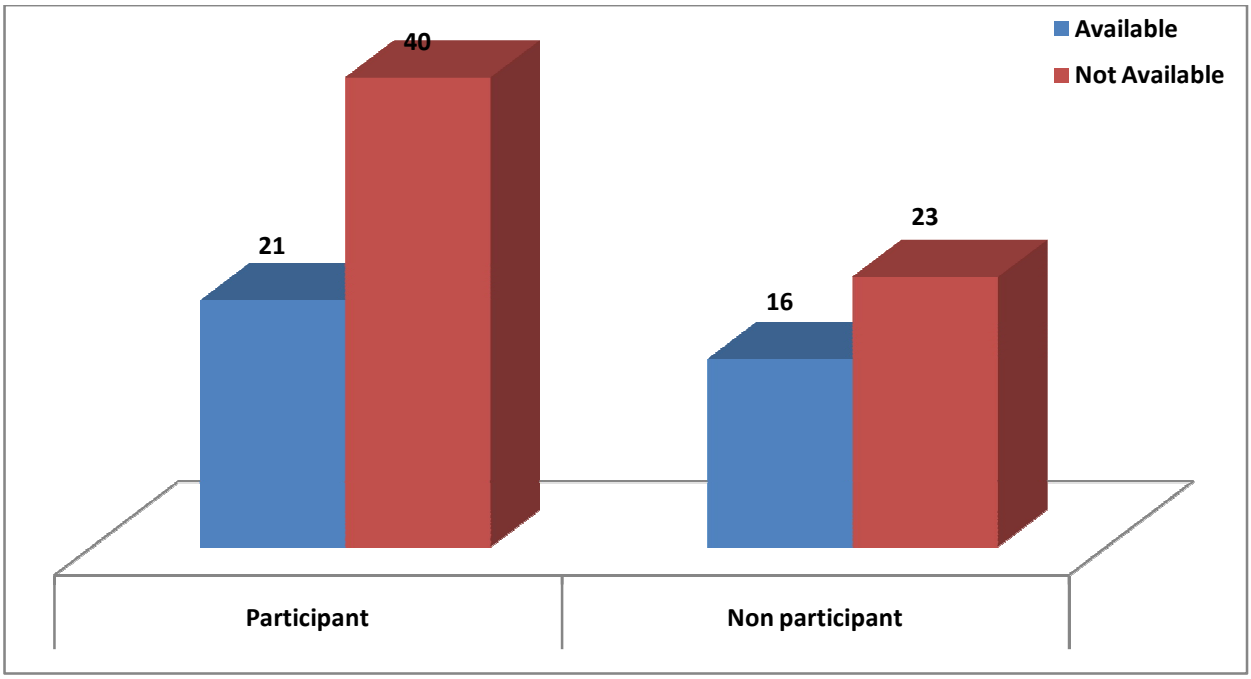

Figure 50 participant &non-participant by availability of pesticide.

Table (4-1-51) Frequency Distribution and Percentages of respondents by Availability of insecticide.

Availability of insecticide	Participation in project		Total	Percentage %
	Participant	Non- participant		
Avalalibale	28	11	39	39%
Not available	33	28	61	61%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-51) the result of household heads respondents by availablity of insecticide, shows that 39% of the respondents (28 participants +11 non-participants), reported that, insecticide was available, while 61% of the respondents (33 participants +28 non-participants), reported that, it was not available.

Note: insecticides are a chemical substance made and used for killing insects, especially those which eat plants and causing big damage and reduce the quantity and quality of crop production.

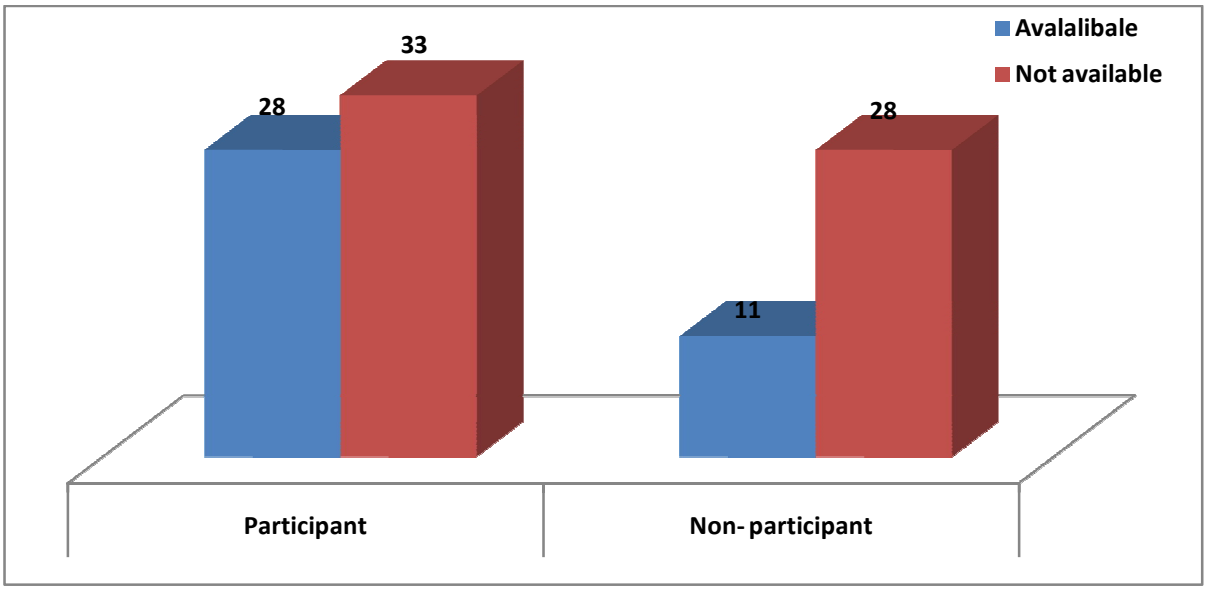

Figure 51 participant &non-participant by availability of insecticide.

Table (4-1-52) Frequency Distribution and Percentages of respondents by availablity of seed dressing.

Availability of seed dressing	Participation in project		Total	Percentage %
	Participant	Non participant		
Available	22	16	38	38%
Not available	39	23	62	62%
Total	61	39	100	100%

Source: Study Survey 2011

Table (4-1-52) the result of respondents by availability 0f seed dressing, shows that 38% of the respondents (22 participants +16 non-participants), reported that, seed dressing was available, while 62% of the respondents (39 participants +23 non-participants) reported it was not available.

Note: Availability, that something can be bought, used or reached, or whether or how much it can. While accessibility able to be reached and easily got.

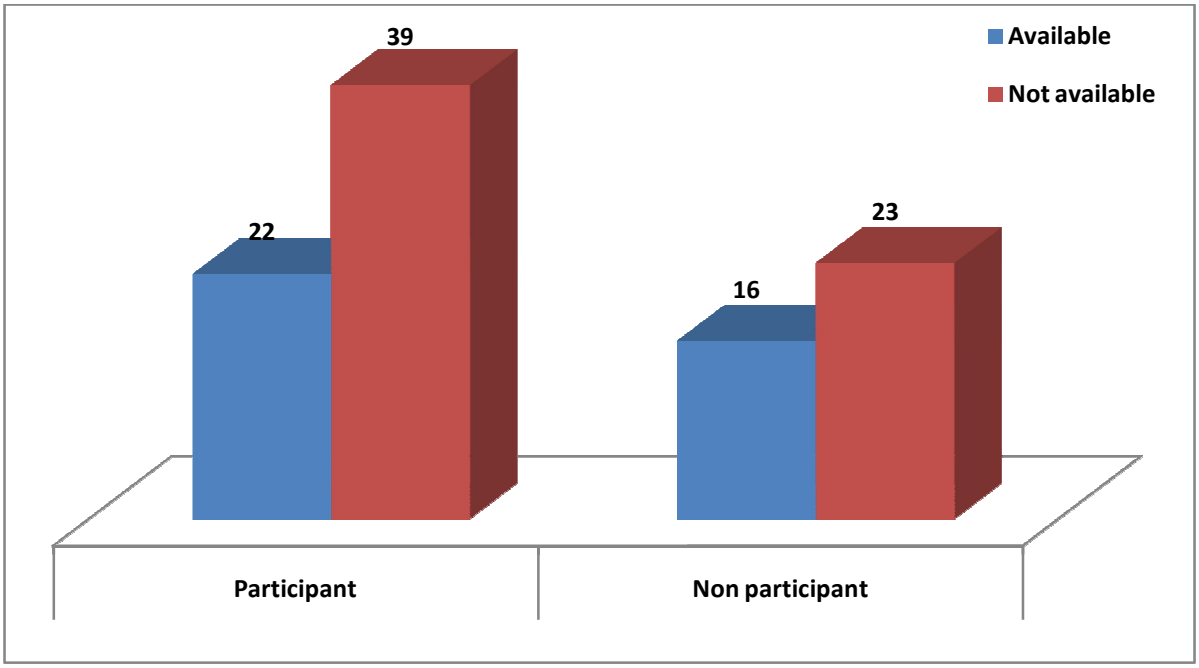

Figure 52 participant &non-participant by availability of seed dressing.

Table (4-1-53) Frequency Distribution and Percentages of respondents by credit &loan availability.

Credit &loan availability	Participation in project		Total	Percentage %
	Participant	Non participant		
available	12	6	18	18%
Not available	49	33	82	82%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-53) the result of respondents by availablity of credit and loan, shows that 18% of the respondents (12 participants +6 non-participants), reported that, credit and loan were available, while 82% of the respondents (49 participants +33 non-participant), reported that, were not available.

Note; credit and loan, an act of borrowing or lending a sum of money which is borrowed, often from a bank, and has to be paid back, usually together with an extra amount of money that you have to pay as a charge for borrowing.

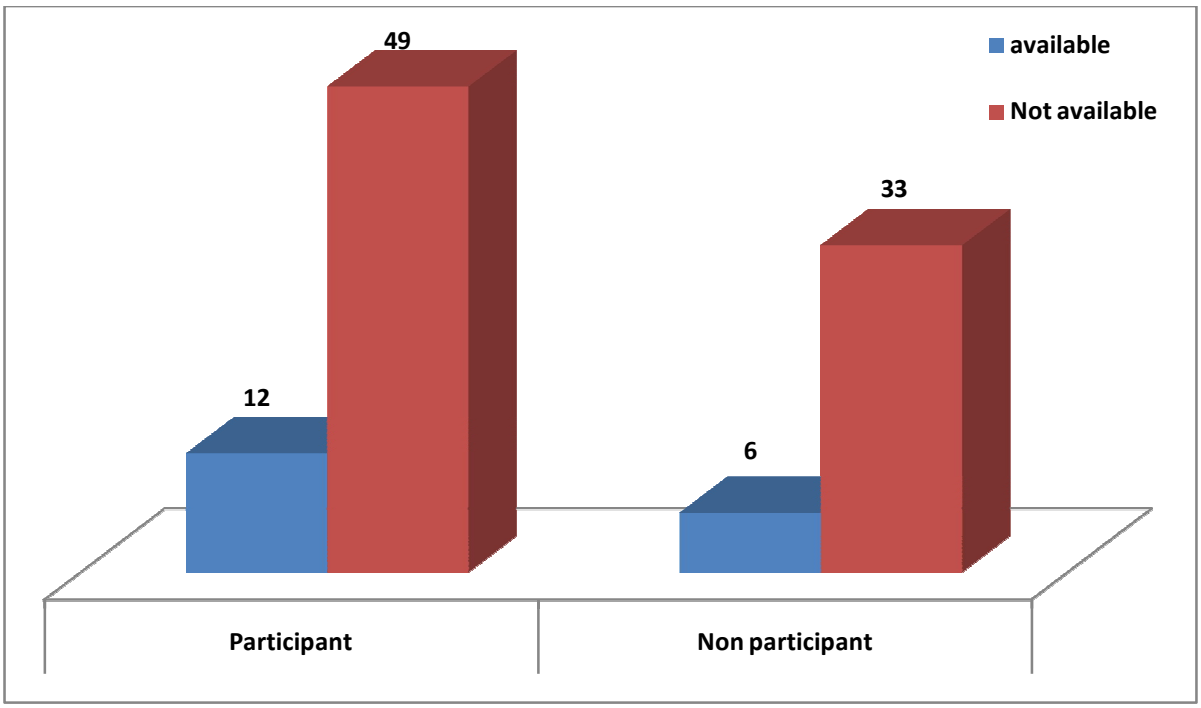

Figure 53 participant &non-participant by availability of credit &loan.

Table (4-1-54) Frequency Distribution and Percentages of respondents by Available of Tools & Equipment.

Available of Tools &Equipment	Participation in project		Total	Percentage
	Participant	Non participant		%
Available	20	17	37	37%
Not Available	41	22	63	63%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-54) the result of respondents by availablity of Tools and equipment shows that, 63% of the respondents (41 participants +22 non-participants), reported that Tools and equipment were not available. It is observed that the majority of the respondents reported that Tools and equipment not available.

Note; the set of necessary tools using in farming practices, land preparation etc. for a particular purpose.

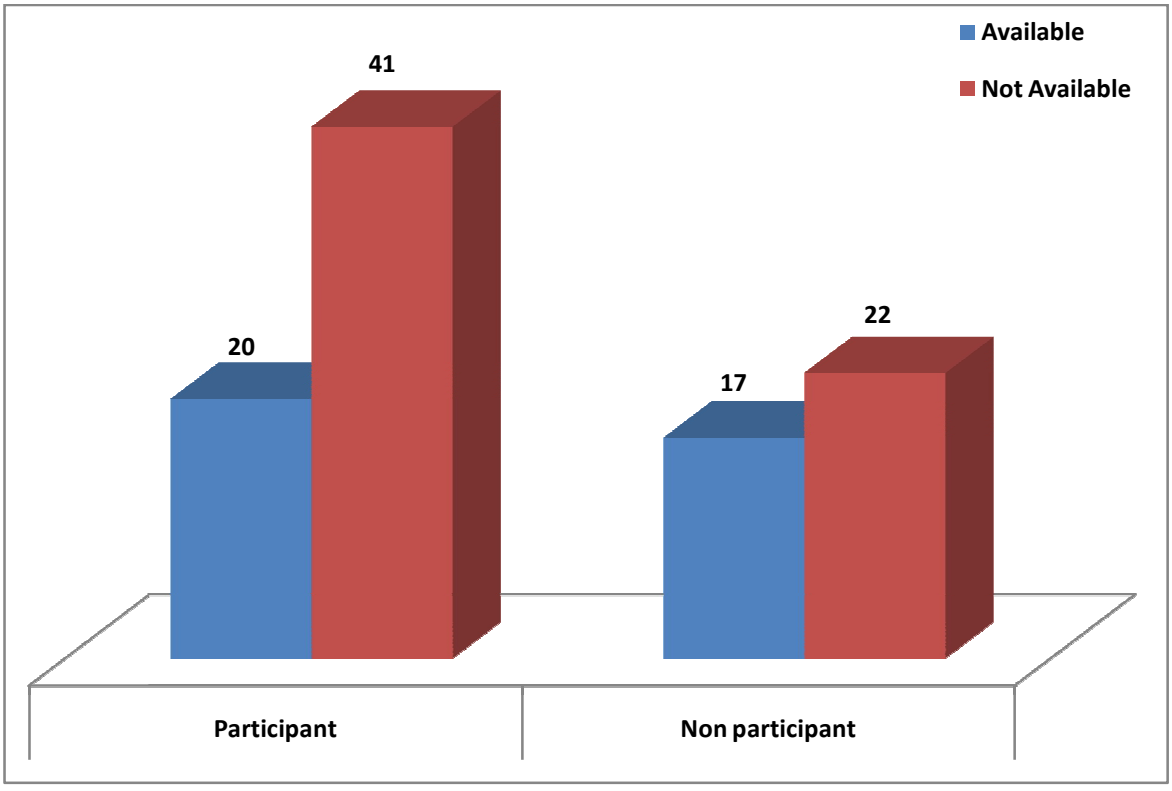

Figure 54 participant &non-participant by Tools& equipment.

Table (4-1-55) Frequency Distribution and Percentages of respondents By the benefit gained from farm visit.

Benefit from farm visit	Participation in project		Total	Percentage
	Participant	Non participant		%
No benefit	21	8	29	29%
little benefit	39	31	70	70%
Big benefit	1	0	1	1%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-55) the result of respondents by extension services (farm visit), shows that 29% of the respondents (21 participants +8 non-participants), reported that, they have had not benefit, while 70% of the respondents (39 participants +31 non-participant) reported that, they have had little benefit.

Note: farm visits is one of the extension method and tool, and it is very important on agriculture, is still largely based on traditional methods in some countries.

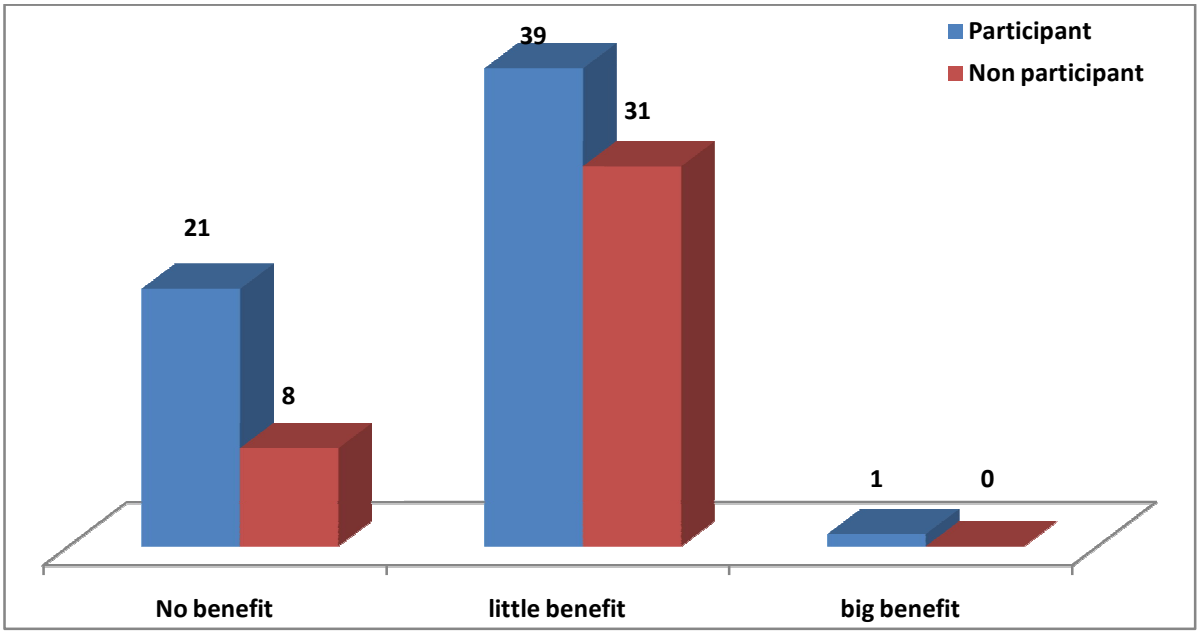

Figure (55) participant &non-participant by Farm visit.

Table (4-1-56) Frequency Distribution and Percentages of respondents by the benefit gained from Home visit

Home visit	Participation in project		Total	Percentage %
	Participant	Non- participant		
Not benefit	16	11	27	27%
Little benefit	43	28	71	71%
Big benefit	2	0	2	2%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-56) the result of respondents by extension services (Home visit), shows that, 27% of the respondents (16 participants +11 non-participants), reported that, they have had not benefit, 71% of the respondents (43participants +28 non-participant) reported that, they have had little benefit.

Note: Home visits are one of the extension method and tools, and it is very important and well known on agricultural extension.

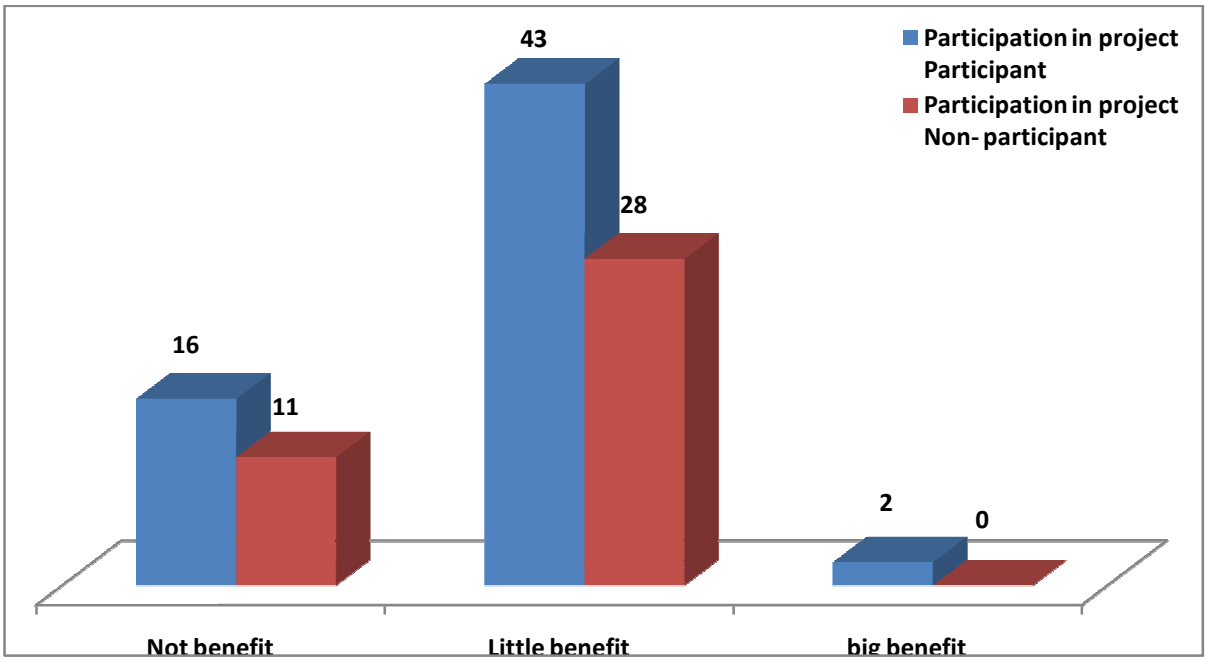

Figure 56 participant &non-participant by home visit.

Table (4-1-57) Frequency Distribution and Percentages of respondents by the benefit gained from Radio message, T.V message.

Radio message, T.V message	Participation in project		Total	Percentage
	Participant	Non participant		%
Not benefit	20	6	26	26%
little benefit	34	23	57	57%
Big benefit	7	10	17	17%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-57) the result of respondents by extension services (Radio , T.V message, shows that 26% of the respondents (20 participants +6 non-participants)reported , they have had not benefit, 57% of respondents (34participants +23 non-participants) reported, they have had little benefit.

Note: A Radio &T.V message are extension method, and is the system of work of broadcasting sound and vision programme for the public to listen and watching to a good programme, to accept new ideas and give more attention to what is happening now in the world.

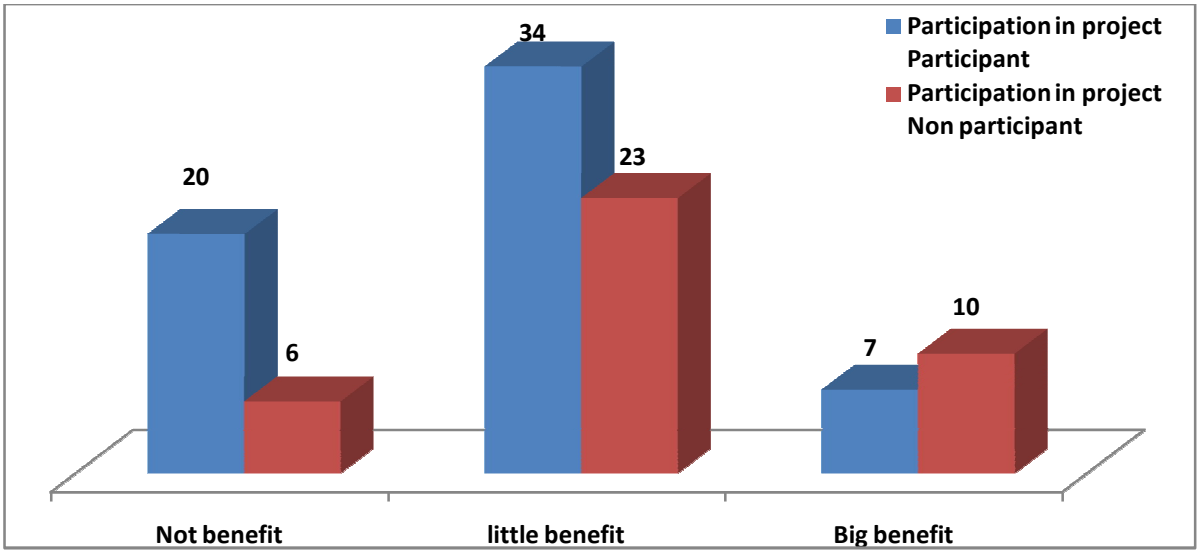

Figure 57 participant &non-participant by Radio &TV message.

Table (4-1-58) Frequency Distribution and Percentages of respondents By the benefit gained from extension approach (Farmer field schools).

Farmer field schools.	Participation in project		Total	Percentage
	Participant	Non participant		%
Not benefit	34	12	46	46%
little benefit	26	25	51	51%
Big benefit	1	2	3	3%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-58) the result of respondents by extension services(farmer field schools), shows that 46% of the respondents (34 participants +12 non-participants), reported they have no benefit, 51% of the respondents (26 participants +25 non-participant) reported, they have had little benefit

Note: Farmer field schools (FFSs), is participatory extension tool, these schools conduct among the farmer fields, and most effective method.

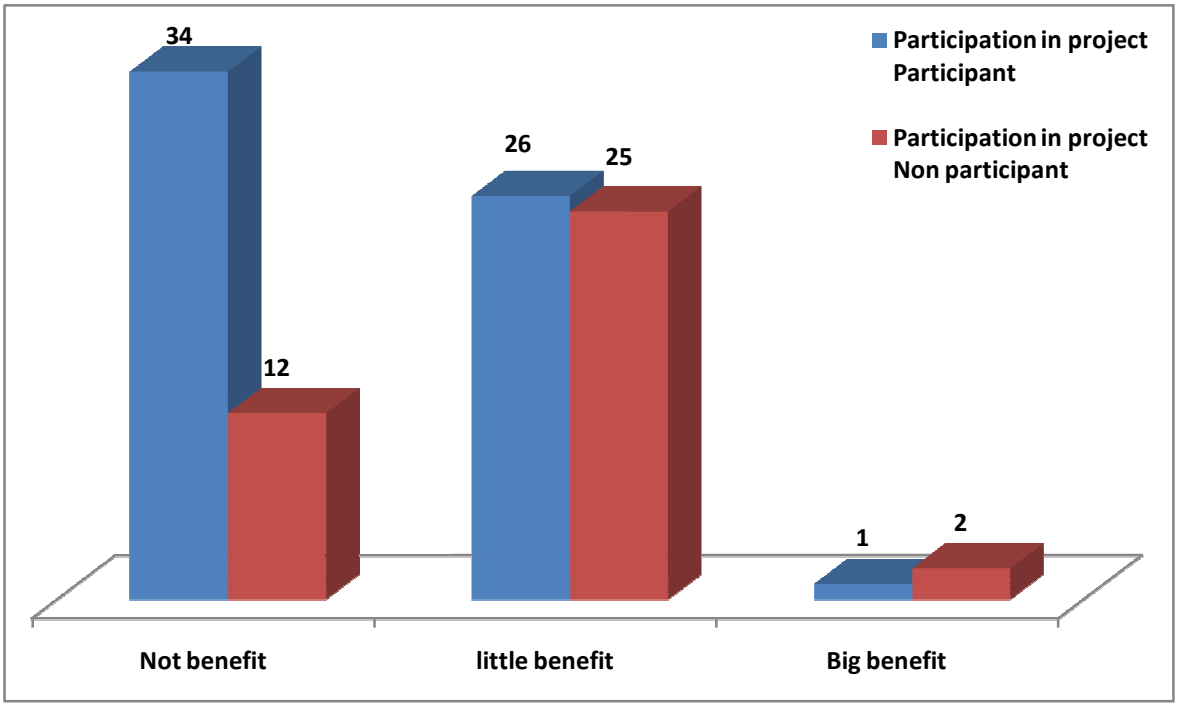

Figure 58 participant &non-participant by other channels.

Table (4-1-59) Frequency Distribution and Percentages of respondents By the benefit gained from Demonstration farms (pilot farm).

Demonstration farm	Participation in project		Total	Percentage %
	Participant	Non participant		
Not benefit	10	7	17	17%
little benefit	50	30	80	80%
Big benefit	1	2	3	3%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-59) the result of respondents by Demonstration farms, shows that, 17% of the respondents (10 participants +7 non-participants), reported that, they have had not benefit, 80% of the respondents (50 participants +30 non-participants) reported that, they have had little benefit.

Note: Demonstration farms, is a scientific farm under control, to show new skills, ideas or make something clear. The findings of this demonstration farm need for further research.

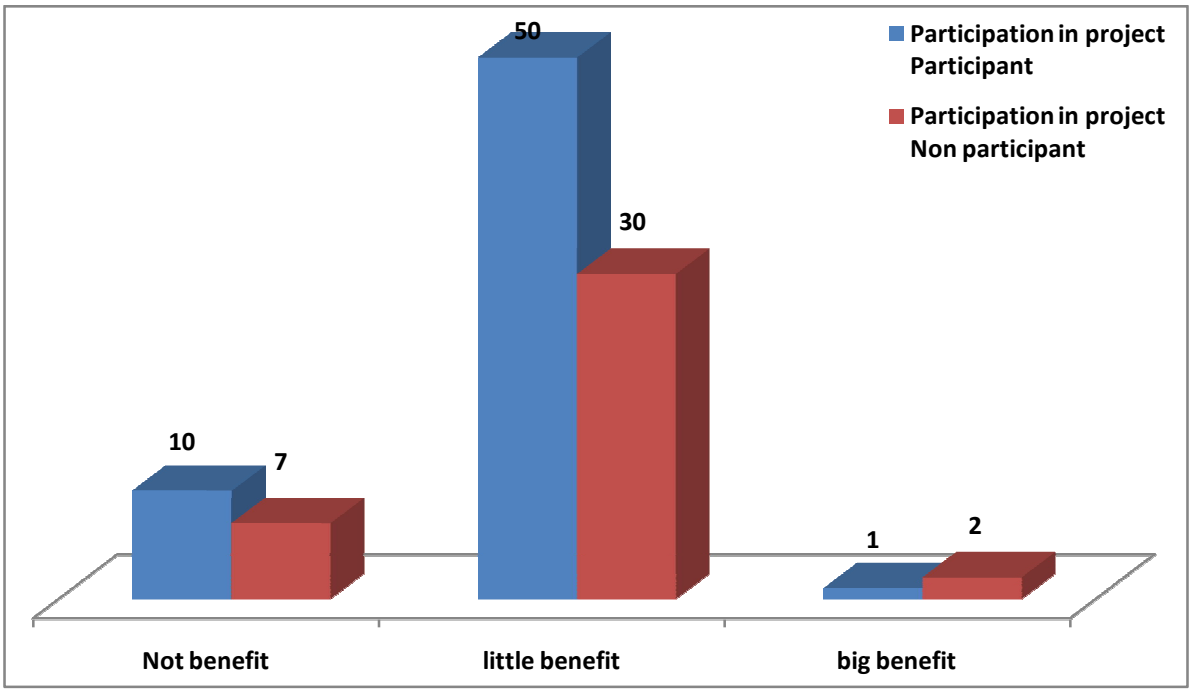

Figure 59 participant &non-participant by Demonstration farm.

Table (4-1-60) Frequency Distribution and Percentages of respondents by seed selection from the field

seed selection	Participation in project		Total	Percentage
	Participant	Non participant		%
Used	34	9	43	43%
Did not use	27	30	57	57%
Total	61	39	100	100%

Source: Study Survey 2011

Table (4-1-60) the result of respondents by seed selection from the field shows that, 57% of respondents (27 participants +30 non-participants) reported that, they did not use this technique.This may be due to weakness of extension in net. **Note**; seed selection from the field, especially use for the local seed, from existing yield from the previous season. Most of the poor farmers depend totally on local seeds, therefore these techniques help them how to selecting a good, healthy, normal shape and strong heads of plant as seeds for next season, these local seeds are well adapting to climatic condition.

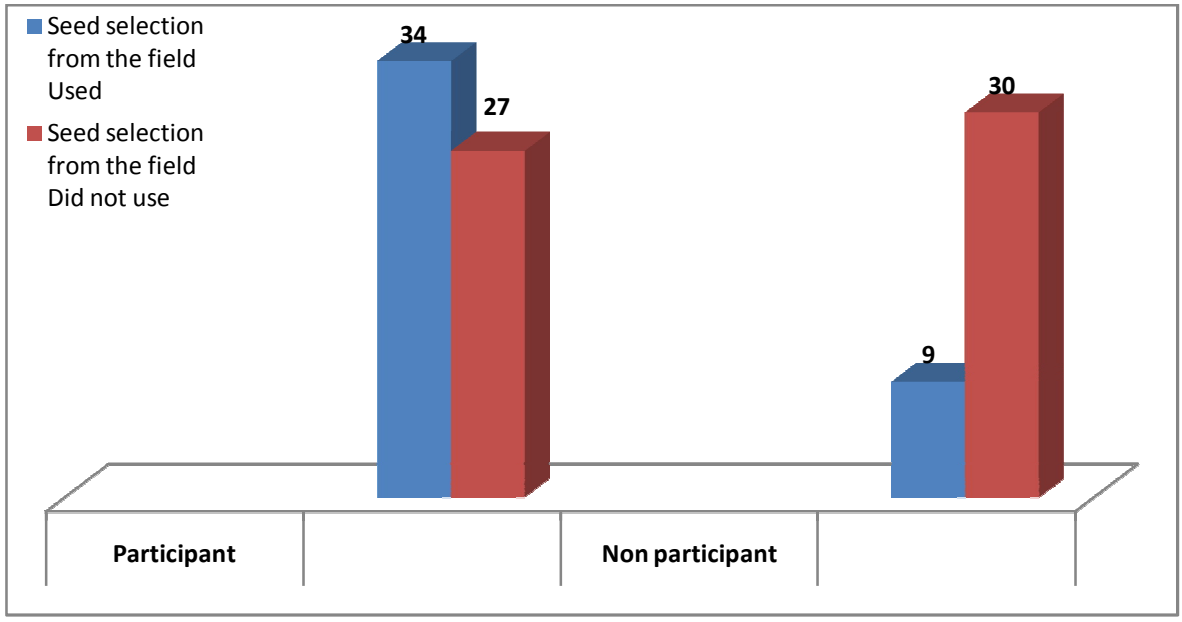

Figure 60 participant &non-participant by seed selection from the field.

Table (4-1-61) Frequency Distribution and Percentages of respondents by using of supplementary irrigation (water harvesting).

Using supplementary irrigation(water harvesting	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	20	6	26	26%
Did Not use	41	33	74	74%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-61) the result of respondents by (adoption) using of supplementary irrigation, shows 74% of the respondents (41 participants +33non-participants) reported, that they did not use this technique. It is observed that, the majority of the respondents did not use supplementary irrigation (water harvesting), during the drought period, and long period when there is little or no rain, this technique is useful and effective; helping plant to complete life cycle.

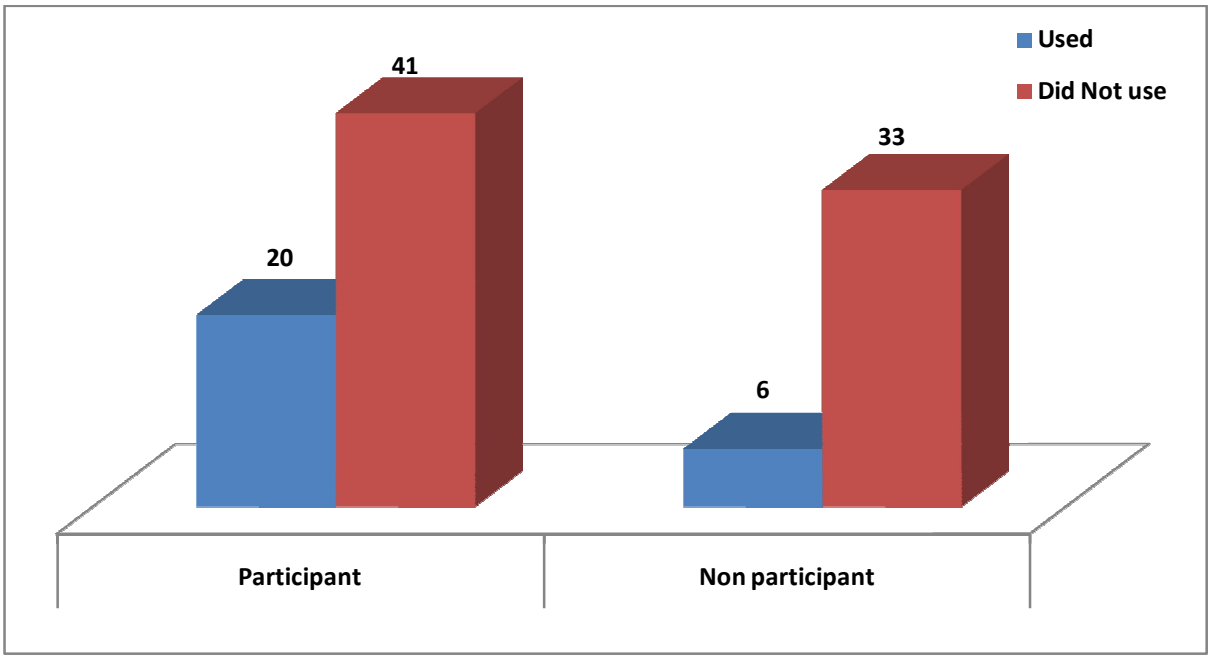

Figure 61 participant &non-participant by supplementary irrigation.

Table (4-1-62) Frequency Distribution and Percentages of respondents by optimum time of harvesting for three crop.

Time of harvesting for three crops	Participation in project		Total	Percentage
	Participant	Non participant		%
Used	30	9	39	39%
Did not use	31	30	61	61%
Total	61	39	100	100%

Source: Study Survey 2011

Table (4-1-62) the result of respondents by Time of harvesting shows that, 61% of the respondents (31 participants +30 non-participant) they did not use optimum harvesting time; this may be due to weakness of extension role.

Note: Optimum harvesting time is the time of year when crops are cut and collected from the fields, or the activity of cutting and collecting them, or the crops which are cut and collected, this time very important for production cycle. The delaying of Optimum harvesting time may cause the loss of crops.

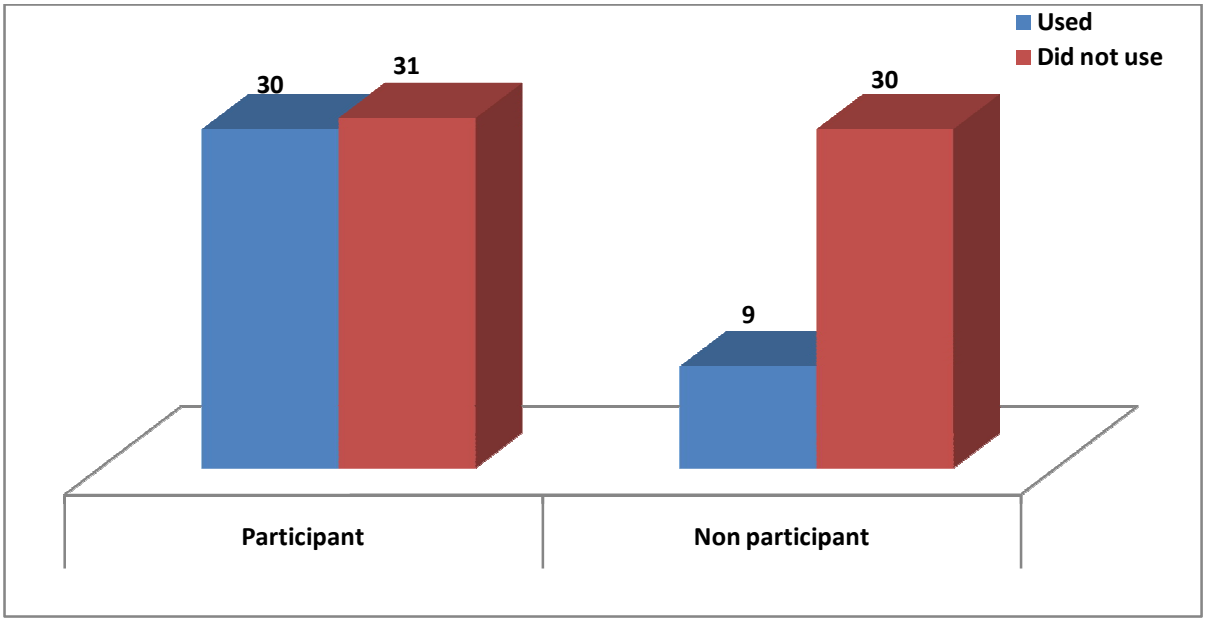

Figure 62 participant &non-participant by harvesting time operation.

Table (4-1-63) Frequency Distribution and Percentages of respondents by using of herbicide for weeding for three crop

using herbicide for weeding	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	7	1	8	8%
Did not use	54	38	92	92%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-63) the result of household heads respondents by using herbicide for weeds control for three crops, shows that 92% of the respondents (54participants +38 non-participants) reported that, they did not use. This result may be indicates weakness of agricultural extension in and low of income.

Clarify: herbicide is a chemical which is used to destroy plants, especially weeds, or any wild plant which grows in an unwanted place, especially in a garden or field where it prevents the cultivated plants from growing freely and use for plant protection.

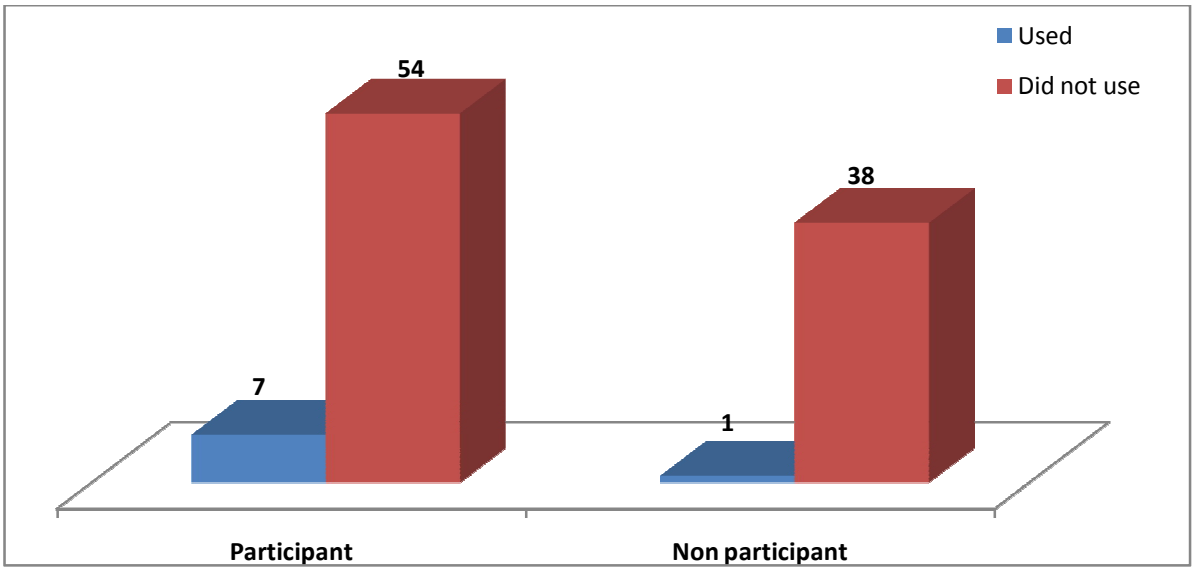

Figure 63 participant &non-participant by using of herbicide/weeding.

Table (4-1-64) Frequency Distribution and Percentages of respondents by adoption of crop rotation for three crops.

using the crop rotation		Participation in project		Total	Percentage %
		Participant	Non-participant		
.	Did not use	61	39	100	100%
	Used	0	0	0	0%
	Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-64) the result of household heads respondents by adoption of crop rotation for three crops , shows that 100% of the respondents (61 participants +39 non-participants), reported that, they did not used the crop rotations, this result may be indicates to weakness of agricultural extension in the study area.

Clarify: crop rotation is a method of farming, where a numbers of different plants are grown one after the other on a field so that, the soil stays healthy and fertile and producing crops.

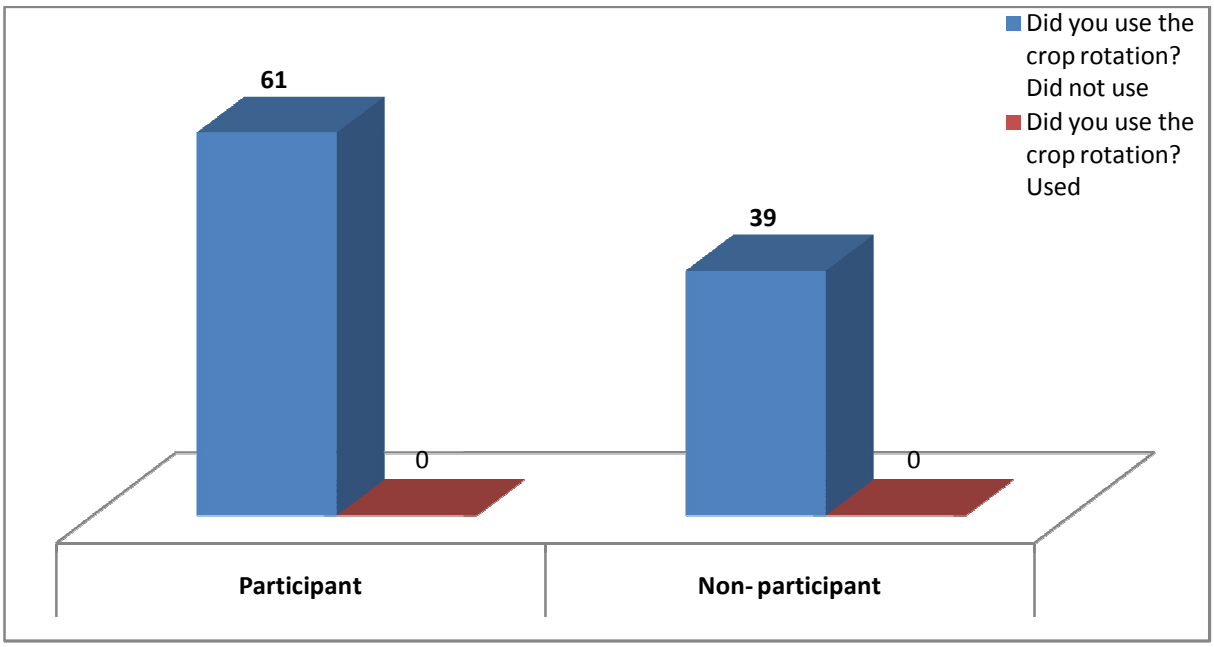

Figure 64 participant &non-participant by using of crop rotation

Table (4-1-65) Frequency Distribution and Percentages of respondents by using of intercropping with three crop and others.

Using of intercropping.	Participation in project		Total	Percentage %
	Participant	Non participant		
Used	11	8	19	19%
Did not use	50	31	81	81%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-65) the result of household heads respondents by using of intercropping with three crops and others, shows that 19% of the respondents (11 participants +8 non-participants), reported that, they used inter cropping with other crops, while 81% of the respondents (50participants +31 non-participants) reported that, they did not use, this result may be indicates weakness of agricultural extension in the study area.

Clarify: intercropping, when two, three or more plant, or a number of different verities of plants are grown in one farm. For example, to grow legume with cereals (Ground nut with millet, Sorghum and maize). This technique increase the fertility of the soil (of land), the quality of producing a large number of good quality crops

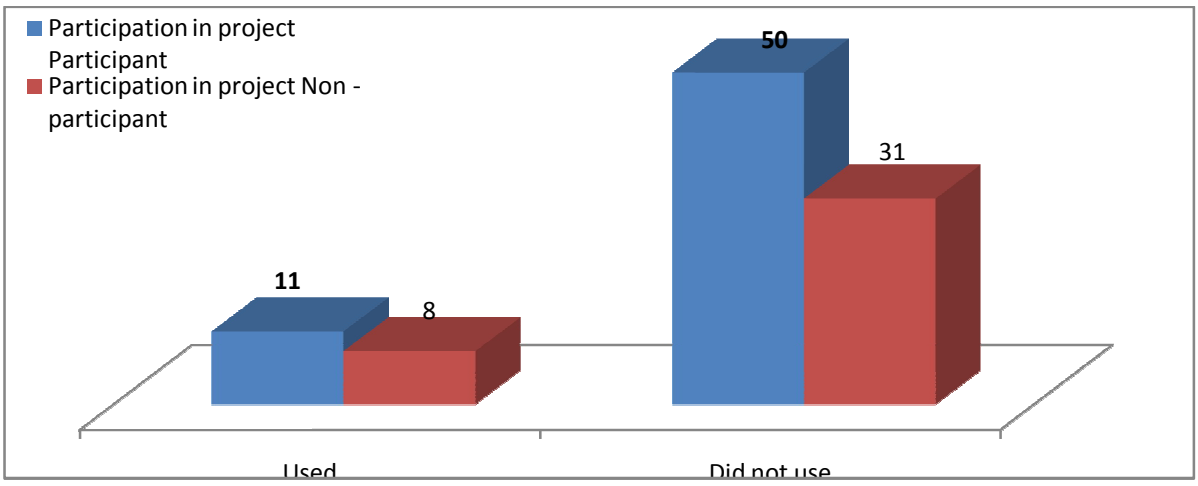

Figure 65 participant &non-participant by intercropping.

Table (4-1-66) Frequency Distribution and Percentages of respondents By their attendance in Pest & disease training.

Pest & diseases control training	Participation in project		Total	Percentage %
	Participant	Non participant		
Attended	26	4	30	30%
Did not attend	35	35	70	70%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-66) the result of respondents by Pest & diseases management training, shows that 30% of the respondents (26 participants +4 non-participants), reported that, they attended, 70% of the respondents (35participants +35 non-participants) reported that, they did not attend.

It is observed that, the majority of the respondents.

Clarify: Training is the process of learning, teaching the skills need to do a particular job and activity, this process increases the farmer knowledge, to be a useful experience that will be helpful when doing a particular thing in the future.

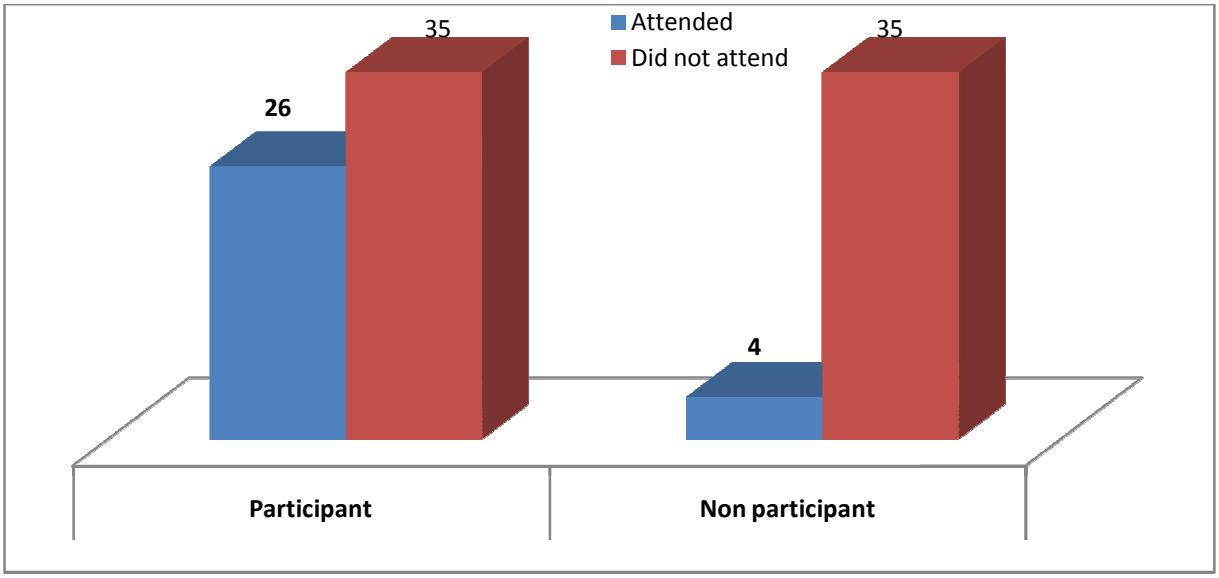

Figure 66 participant &non-participant by training of pest &disease.

Table (4-1-67) Frequency Distribution and Percentages of respondents Bytheir knoweldge of Kinds of recommended seed dressing.

Seed dressing for 3 crops		Participation in project		Total	Percentage
		Participant	Non participant		%
	Knew	15	5	20	20%
	Did not Know	36	44	80	80%
Total		51	49	100	100%

Source: Study Survey 2011.

Table (4-1-67) the result of respondents by knoweldge of kinds &quality of recommended seed dressing, shows that 20% of the respondents (15 participants +5 non-participants), reported that, they knew the kinds& quality of recommended seed dressing, while 80% of the respondents (36participants +44 non-participant) reported that, they did not know.

Clarification; Seed priming is strongly recommended for sorghum, millet &GN under the sandy rain-fed conditions of Western Sudan (Primness (1cc). (Appraisal report, volume IFAD Sudan July1995.PB.).

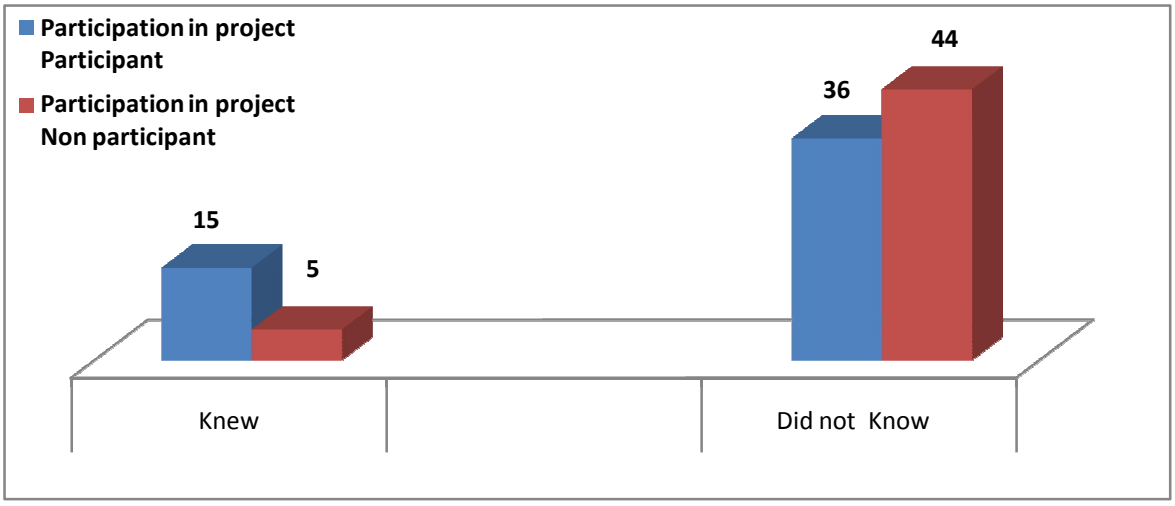

Figure 67 participant &non-participant by Kinds of seed dressing.

Table (4-1-68) Frequency Distribution and Percentages of respondents By their knowledge in recommended seed dressing application.

Recommended Seed dressing application		Participation in project		Total	Percentage
		Participant	Non participant		%
	Knew	15	10	25	25%
	Did not Know	30	45	75	75%
Total		45	55	100	100%

Source: Study Survey 2011.

Table (4-1-68) the result of respondents by recommended seed dressing applications, shows that ,75% of the respondents (30participants +45 non-participants) reported that, they did not know the application method of seed dressing, this may be due to weakness of extension role in study area.

Clarification: recommended seed dressing application for improved seeds are, primness (1cc per 3 kgs of seed), and censept, (1 ccx 1 litter water) per 25kgs.

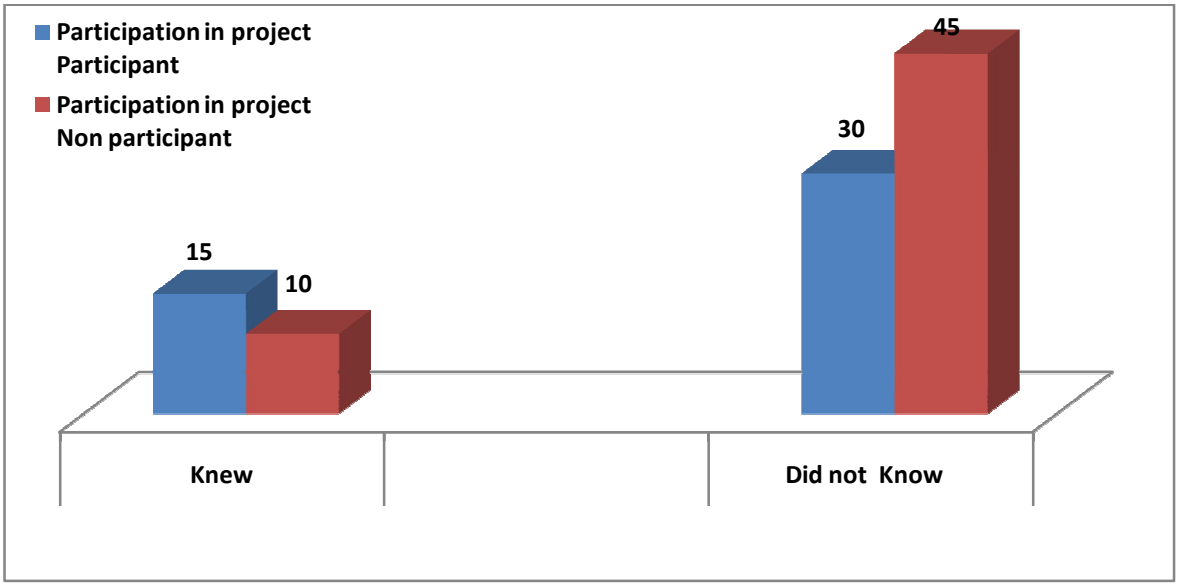

Figure 68 participant &non-participant by seed dressing application.

Table (4-1-69) Frequency Distribution and Percentages of respondents By their knowledg in kinds of recommended herbicide for weeds control.

Kinds recommended Herbicides for weeds control.		Participation in project		Total	Percentage
		Participant	Non participant		%
	Knew	20	7	27	27%
	Did not Know	30	43	73	73%
Total		50	50	100	100%

Source: Study Survey 2011.

Recommended herbicides for weeds control are, Glyphosate& Gesebrium.

Table (4-1-69) the result of respondents by their knowledg in kinds of recommended herbicide for weeds control, shows that 73% of the respondents (30participants +43 non-participants) reported that, they did not know the kinds of herbicides.

Note: knowledg ,awareness and acquaintance, are understanding of information on many different subjects, that collect gradually which a person gets by experience or study, and which is either in a person's mind or known by training, reading or people generally etc…

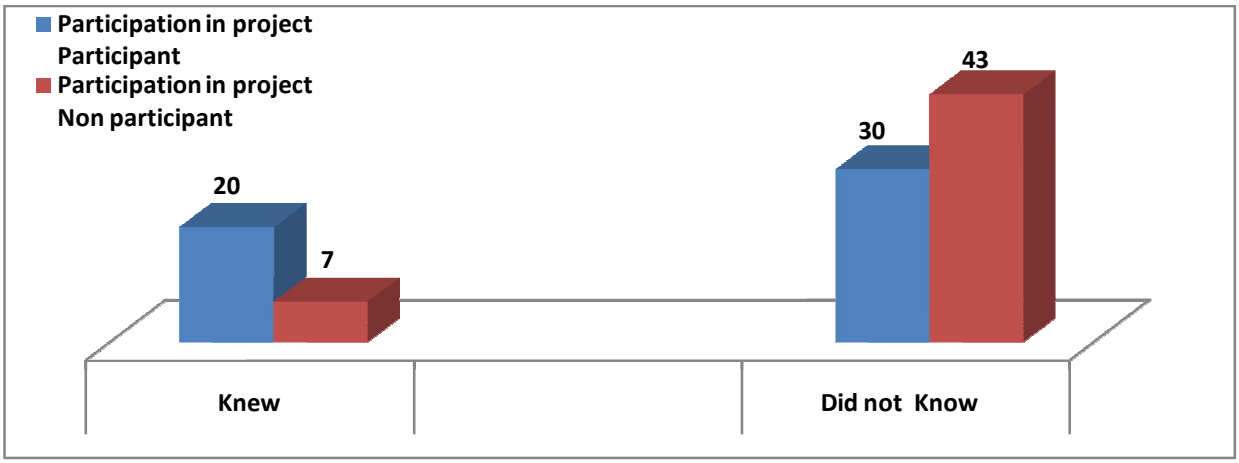

Figure 69 participant &non-participant by kinds of recommended herbicide

Table (4-1-70) Frequency Distribution and Percentages of respondents By their skill in recommended herbicides applications.

Application for recommended Herbicides for weeding		Participation in project		Total	Percentage
		Participant	Non Participant		
	Knew	20	10	30	30%
	Did not Know	25	45	70	70%
Total		45	55	100	100%

Source: Study Survey 2011.

Table (4-1-70) the result of respondents by recommended herbicides applications, shows that 30% of the respondents (20 participants +10 non-participants), reported that, they knew the applications of recommended herbicides, while 70% of the respondents (25participants +45 non-participant) reported that, they did not know the application practices.

Clarification: Application for recommended herbicides for weeds control are, Glyphosate, 1 cc and Gesebrium1/2 cc with 60 liters of water per feddan.

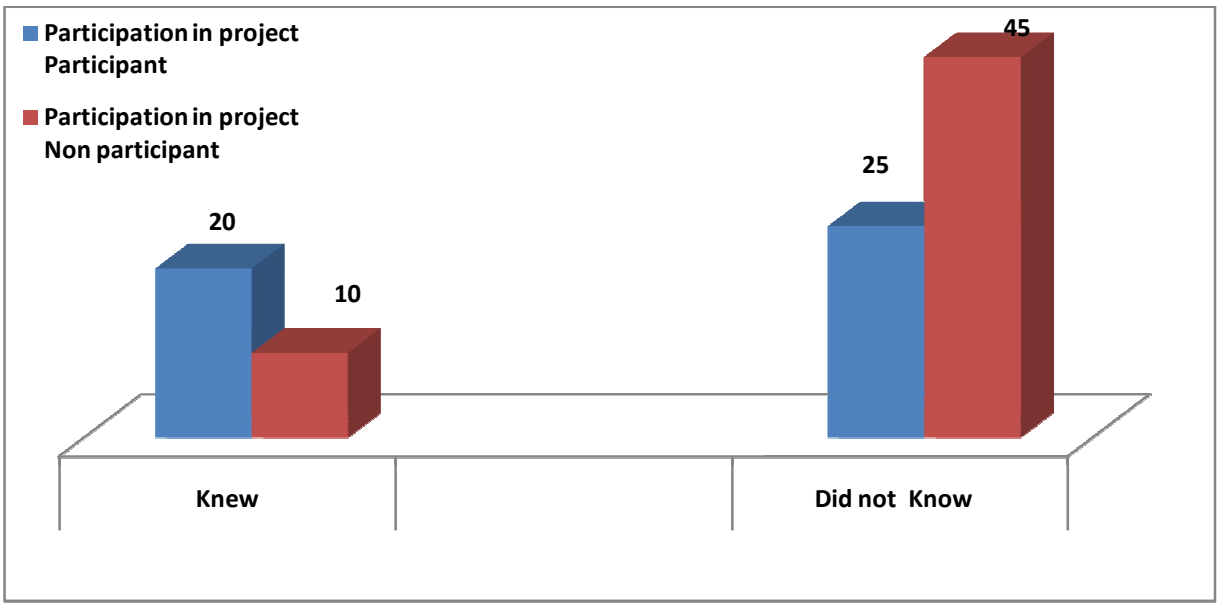

Figure 70 participant &non-participant by herbicides applications

Table (4-1-71) Frequency Distribution and Percentages of respondents by knowledgein kinds of recommended Pesticide & insecticide.

Recommended Pesticide &insecticide.	Participation in project		Total	Percentage
	Participant	Non participant		%
Knew	20	10	30	30%
Did not Know	25	45	70	70%
Total	45	55	100	100%

Source: Study Survey 2011.

Table (4-1-71) the result of respondents by kinds of recommended Pesticide & insecticide, shows that 30% of the respondents (20 participants +10 non-participants), reported that, they knew the kinds of recommended Pesticide & insecticide for crops protection ,while 70% of the respondents (25participants +45 non-participant) reported that, they did not know. These may be due to weakness of extension role in study area.

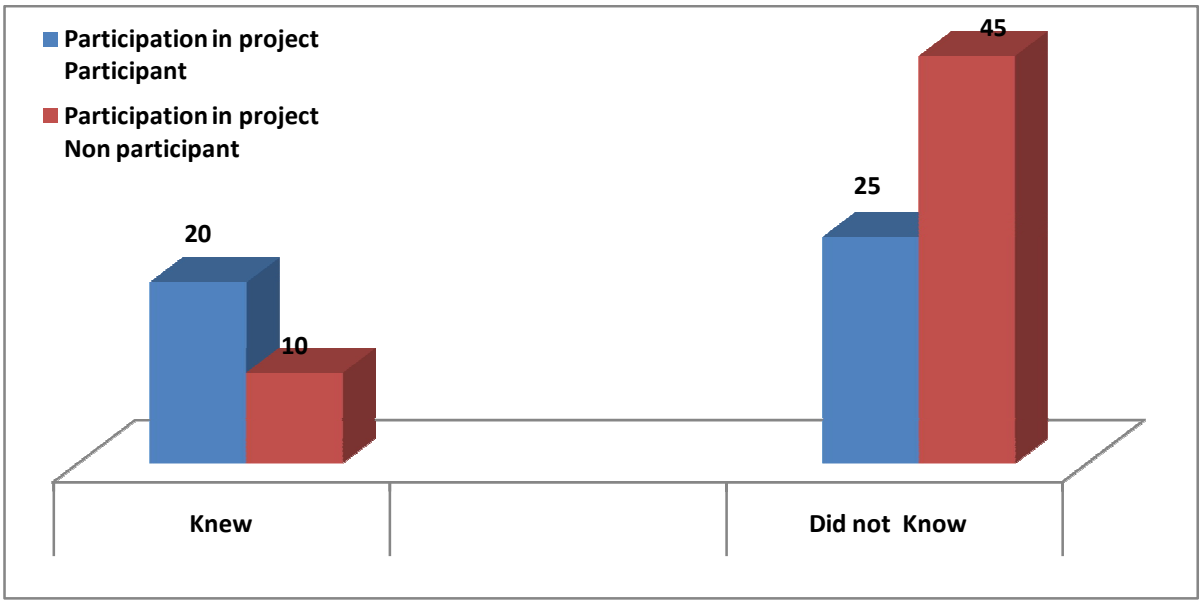

Figure 71 participant &non-participant by kinds of pesticide, insecticide.

Table (4-1-72) Frequency Distribution and Percentages of respondents By their skill in recommended Pesticide & insecticide applications.

Recommended Pesticide &insecticide application		Participation in project		Total	Percentage
		Participant	Non participant		%
	Knew	15	5	20	20%
	Did not Know	36	44	80	80%
Total		51	49	100	100%

Source: Study Survey 2011.

Table (4-1-72) the result of household heads respondents by recommended Pesticide & insecticide application, shows that 20% of the respondents (15 participants +5 non-participants), reported that, they knew, while 80% of the respondents (36participants +44 non-participants) reported that, they did not know. This may be due to weakness of extension role in study area.

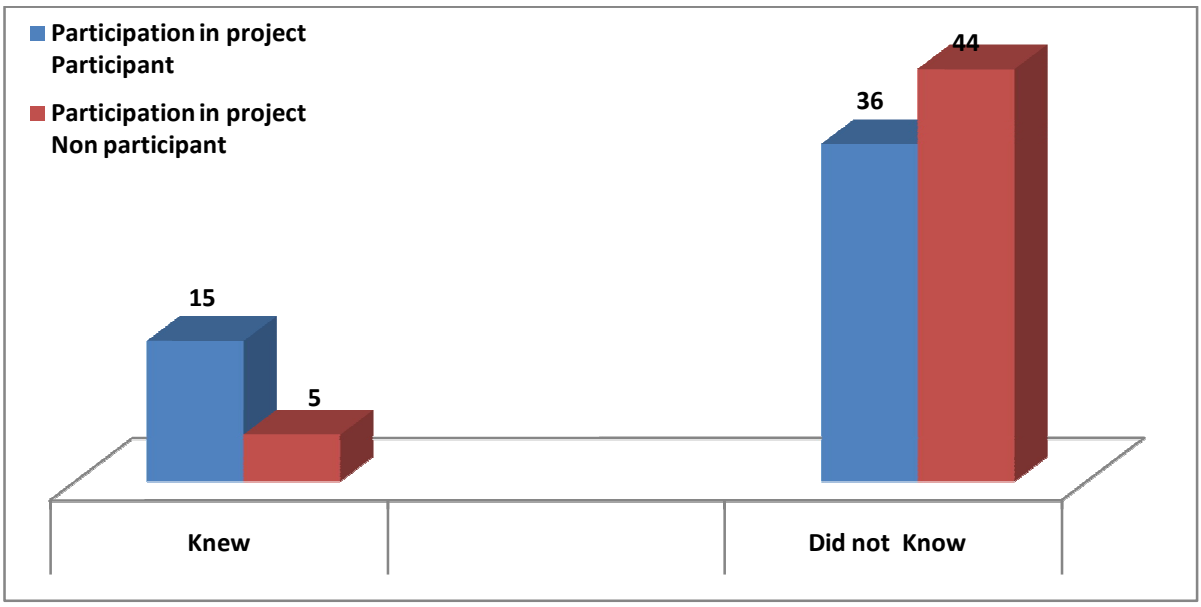

Figure 72 participant &non-participant by pesticide &insecticide application.

Table (4-1-73) Frequency Distribution and Percentages of respondents By their training in crops rotation training.

Crops rotation	Participation in project		Total	Percentage %
	Participant	Non participant		
Trained	26	4	30	3o%
Did not train	35	35	70	70%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-73) the result of respondents by crops rotation training, shows that 30% of the respondents (26 participants +4 non-participants), reported that, they trained in crop rotation, while 70% of the respondents (35participants +35non-participants) reported that, they did not train. This may be due to weakness of agricultural extension role.

Training; is one and very important tools to support and enhances people ability in development process, production and community mobilization.

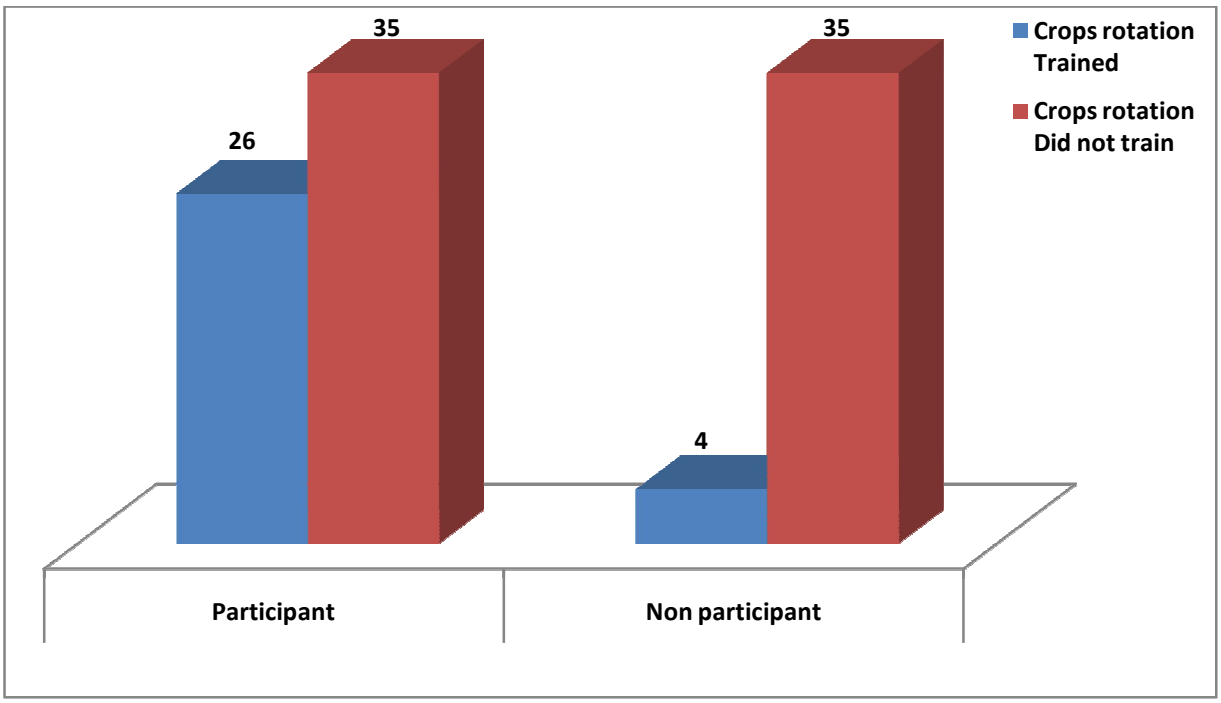

Figure 73 participant &non-participant by crops rotation training.

Table (4-1-74) Frequency Distribution and Percentages of respondents by training in general farm practices.

Training in general farming practices	Participation in project		Total	Percentage %
	Participant	Non participant		
trained	21	13	34	34%
Did not train	40	26	66	66%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-74) the result of respondents by training in general farm practices, shows that, 66% of the respondents (40 participants +26 non-participants) reported that, they did not train.

Note; farm practices related to the land, especially farms and best activities, its ownership, and the activity of working on a farm or organizing the work there,

Also describes many activities using for growing a suitable kinds crops.

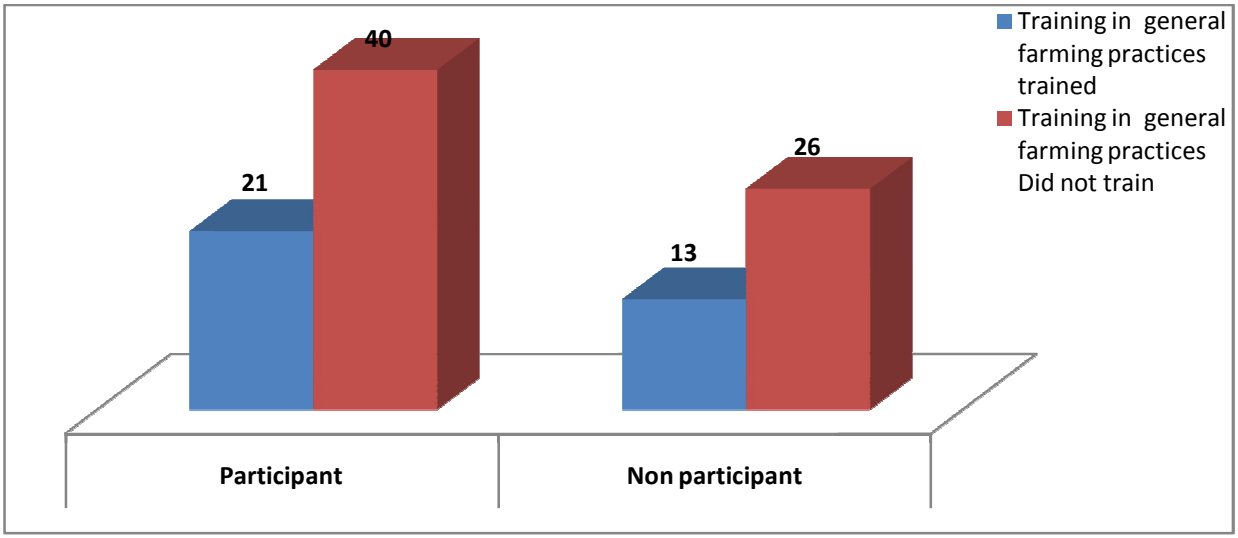

Figure 74 participant &non-participant by training in general farm practices.

Table (4-1-75) Frequency Distribution and Percentages of respondents by Training in supplementary irrigation.

Training in supplementary irrigation		Participation in project		Total	Percentage %
		Participant	Non participant		
	trained	28	11	39	39%
	Not train	33	28	61	61%
	Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-75) the result of respondents by training in supplementary irrigation practices shows 61% of the respondents (33participants +28 non-participants) reported that, they did not train. This may be due to weakness of extension role.

Note: Supplementary irrigation is supply land with water especially during the drought period, so that crops and plants will grow well and healthy.

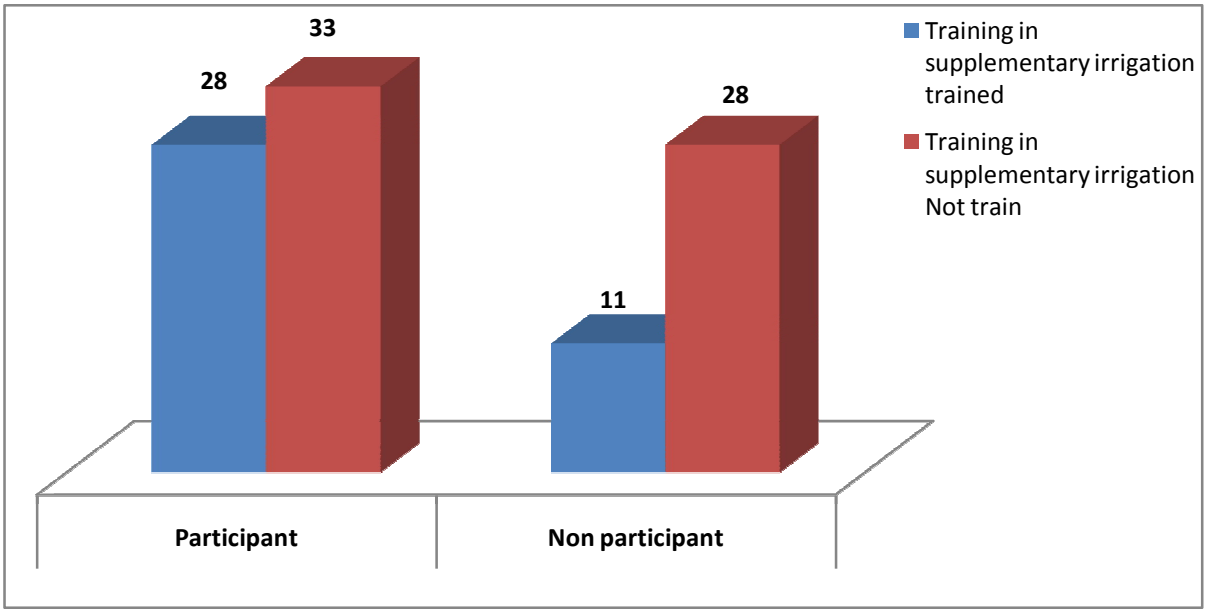

Figure 75 participant &non-participant by training in supplementary irrigation.

Table (4-1-76) Frequency Distribution and Percentages of respondents by training on in herbicides application.

Training on in herbicide application	Participation in project		Total	Percentage %
	Participant	Non participant		
Trained	21	7	28	28%
Did not train	40	32	72	72%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-76) the result of respondents by training in herbicide application, shows that 28% of the respondents (21 participants +7 non-participants), reported that, they trained, while 72% of the respondents (40participants +32 non-participants) reported that, they did not train. This may be due to weakness of extension role in study area.

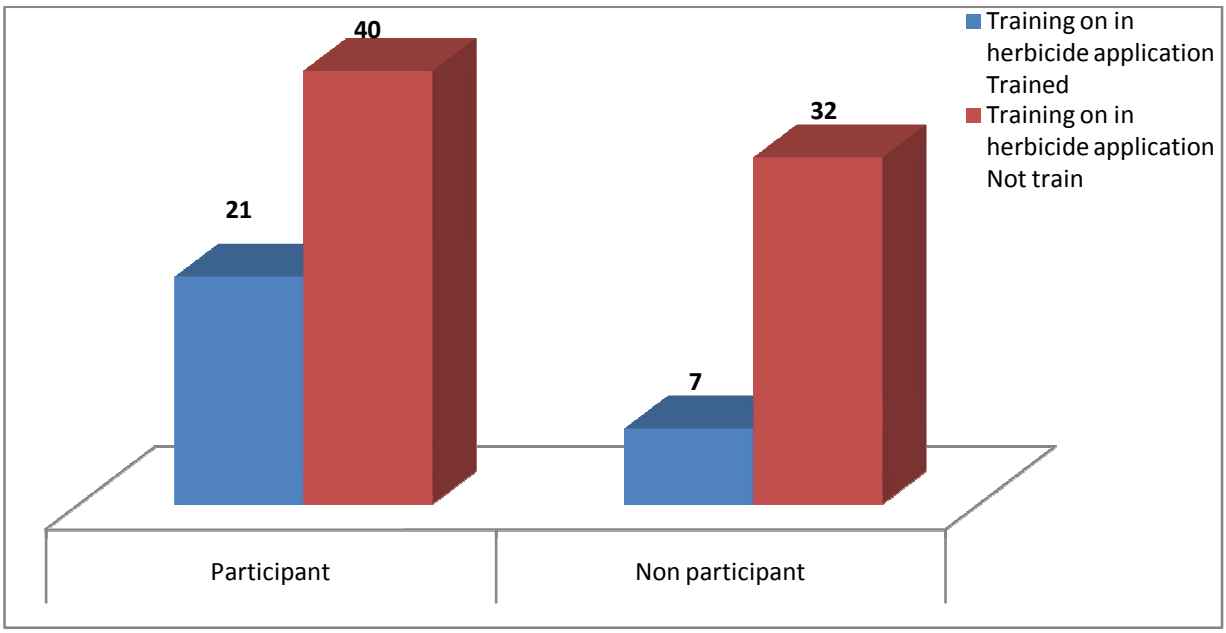

Figure 76 participant &non-participant by training in herbicides application.

Table (4-1-77) Frequency Distribution and percentage of the respondents by training on chemical fertilizer application.

Training in chemical fertilizer	Participation in project		Total	Percentage %
	Participant	Non participant		
Trained	6	2	8	8%
Did not train	55	37	92	92%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-77) the result of respondents by training on chemical fertilizer application shows that, 92% of the respondents (55participants +37 non-participant) reported that, they did not train. This may be due to weakness of extension in study area.

Note: Recommendations use of compound fertilizer NPK (15-15-15 or17-17-17) at a lower rate (0.3g/hole), is recommended for millet, while a higher rate (0.9g/hole) for sorghum. A moderate rate (0,6g/hole), for each Groundnut, cowpea &sesame. (Agricultural research).

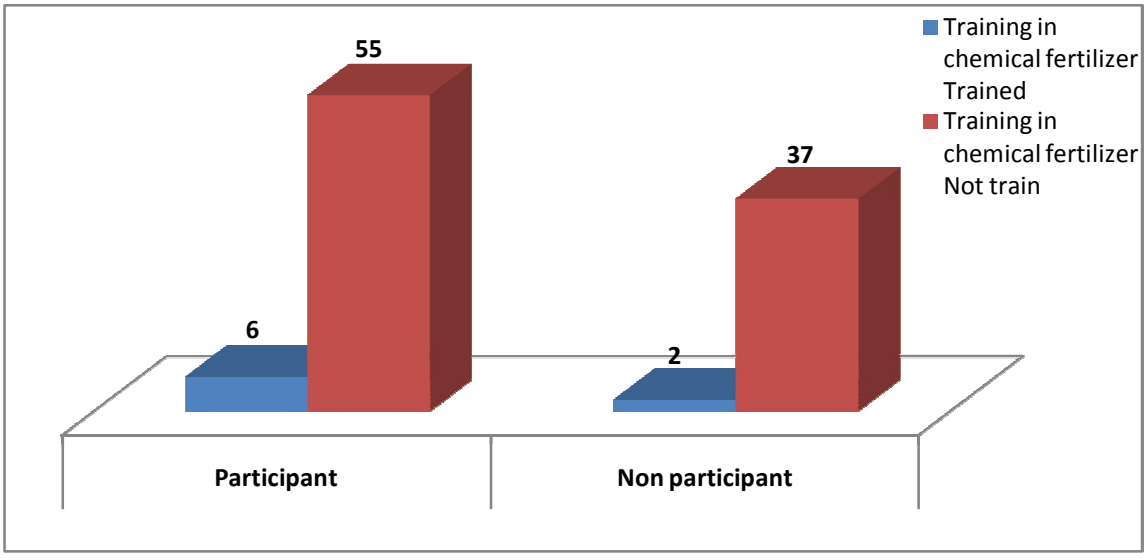

Figure 77 participant &none-participant by training in chemical fertilizer.

Table (4-1-78) Frequency Distribution and Percentages of respondents by Training in intercropping.

Training in intercropping	Participation in project		Total	Percentage %
	Participant	Non participant		
Trained	15	7	22	22%
Not train	46	32	78	78%
Total	61	39	100	100%

Source: Study Survey 2011.

Table (4-1-78) the result of household heads respondents by training in intercropping, shows that 22% of the respondents (15 participants +7 non-participants), reported that, they trained, while 78% of the respondents (46participants +32 non-participants), reported that, they did not train. This may be due to weakness of extension role in study area.

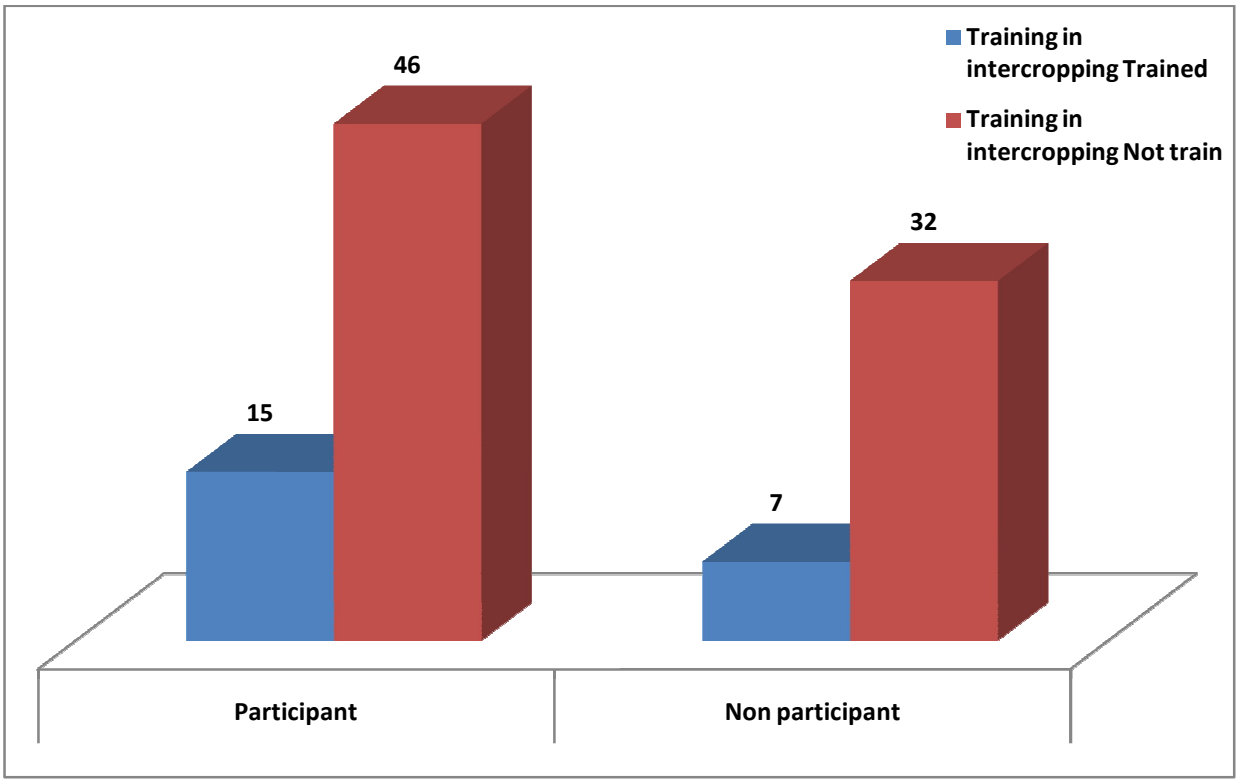

Figure 78 participant &none-participant by training in intercropping.

4-2 Chi-Square test

Chi- square test was employed to test the significant differences between participant and none-participant household and the relationship between the variable in different activities.

4-2-1 Chi-Square test for socio-economic factors on participation in net.

- Chi-Square test for household head participation in the net by age.

Household age	Participation in project		Total
	Participant	Non- participant	
(18-24)	2	4	6
(25-34)	11	10	21
(35-44)	24	12	36
(45-54)	20	9	29
(55 and over)	4	4	8
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig.
Household age by Participation versus	4.253a	4	.373

Source: data analysis. Level of significance 0.05

Chi-square = 4.253a,

Df= 4

Sig. (2-sided) = .373.

Results, there is no significant association of household heads age on participation in Net at .373 level.

- Age did not influence on participation in the net.

-Chi-Square test for household head participation in the net by family size.

Family size	Participation in project		Total
	Participant	Non- participant	
(3-5)	16	9	25
(6-9)	17	14	31
(10-12)	14	11	25
(13-15)	5	2	7
(16 and over)	9	3	12
Total	61	39	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp.Sig.
Participation versus by family size	2.161[a]	4	.706

Source: data analysis**.** Level of significance 0.05

Chi-square = **2.161[a]**

Df= 4

Sig. (2-sided). = .706

Results, there is no significant association of respondent family size on participation in the net at 0.706 level.

- Family size did not influence on participation in the net.

- **Chi-Square test for participation in the net by household heads Gender.**

Gender	Participation in project		Total
	Participant	Non- participant	
Male	47	25	72
Female	14	14	28
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by gender	1.978[a]	1	.160

Source: data analysis. Level of significance 0.05

Chi-square = 1.978[a]

Df= 1

Sig. (2-sided).= 160

Results, there is no significant association of household head gender on participation in net, at .160 level.

- Gender did not influence on participation in the net.

- **Chi-Square test of household education level on participation in the Net.**

Education level	Participation in project		Total
	Participant	Non participant	
Illiterate	12	9	21
khalwa	25	12	37
Formal school years	22	18	40
University &post graduate.	2	0	2
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig.
Participation versus by education level.	2.686[a]	**3**	. 443

Source: Data analysis. Level of significance 0.05

Chi-square = 2.686[a]

Df= 3

Sig. (2-sided). = . 443

Results, there is no significant association of respondent education level on participation in net, at level .443.

- Education did not influence on participation in the net.

Chi-Square test of household marital status on **participation in Net.**

Marital status	Participation in project		Total
	Participant	Non participant	
Single	1	1	2
Married	58	36	94
Divorced	0	2	2
Widow	2	0	2
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by Marital status.	4.528[a]	**3**	.210

Source: Data analysis Level of significance 0.05

Chi-square = 4.528[a]

Df= 3

Sig. (2-sided). = 210

Results, there is no significant association of respondent marital status on participation in the net at level .210.

- Marital status did not influence on participation in the net.

Chi-Square test of respondent occupation on participation in Net.

Occupation	Participation in project		Total
	Participant	Non participant	
Salaried employment	10	1	11
Casual workers	6	6	12
Business	0	3	3
Farmer	45	29	74
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by occupation.	9.440[a]	3	.024

Source: Data analysis. Level of significance 0.05

Chi-square = 9.440[a]

Df= 3

Sig. (2-sided) = .024

Results, there is significant association of the respondent occupation on participation in the net at level .024.

- Occupation influence on participation in the net.

- **Chi-Square test of respondent household** average family income participation in the Net.

Average family income .	Participation in project		Total
	Participant	Non participant	
less than 500SDG	43	17	60
500 -900SDG	11	19	30
901 - 1200	4	3	7
above 1201	3	0	3
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by average family income**.**	12.298[a]	**3**	**.006**

Source: Data analysis. Level of significance 0.05

Chi-square = 12.298[a]

Df= 3

Sig. (2-sided). = .006

Results, there is significant association of respondent by average family income on participation in Net at level .006.

- Average family income influence on participation in Net.

- **Chi-Square test of household by total cultivated area (Farm size) on participation in Net.**

Total cultivated area	Participation in project		Total
	Participant	Non participant	
5-7fadden	13	7	20
8-10fadden	31	19	50
11 -13fadden	13	5	18
more than 13	4	8	12
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by total cultivated area.	4.969[a]	3	.174

Source: Data analysis. Level of significance 0.05

Chi-square = 4.969[a]

DF= 3

Sig. (2-sided). = .174

Results, there is no significant association of respondent by total cultivated area on participation in the Net at level .174.

- Total cultivated area of respondents did not influence on participation in the Net.

Chi-Square test of respondents by land ownership on participation in Net.

Land ownership		Participation in project		Total
		Participant	Non participant	
	Owned	46	29	75
	Rent	13	7	20
	Others	2	3	5
	Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by a land ownership.	1.065[a]	**2**	**.587**

Source: Data analysis. Level of significance 0.05

Chi-square = 1.065[a]

Df= 2

Sig. (2-sided). = .587

Results, there is no significant association of land ownership on participation in the Net at level .587.

- Land ownership did not influence on participation in the Net.

Table (4-2-1) Summary of Chi-Square test of the socio-economic characteristic in study area, on participation in the Net.

Variable	Sig	DF	F	Indicative
House hold heads age	.373	4	4.253	No Significance
Household Family size	.706	4	2.161	No Significance
House hold gender	.160	1	1.978	No Significance
Level of Education	.443	3	2.686	No Significance
Marital status	.210	3	4.528	No Significance
Occupation	.o24	3	9.440	Significance
Average Family income	.006	3	12.298	Significance
Total cultivated area.	.174	3	4.969	No Significance
Land ownership.	.587	2	1.065	No Significances

Source: data analysis

-As shown in table **(4-2-1)** chi-square test result revealed that there is no significant association of socio- economic factors (household Age, family size, gender, education level , marital status, type of land ownership and farm size (total cultivated area)), on participation in the net, at level 0,05level.

-While Chi-square test revealed that, there is significant association by household occupations, and average family income, at .024 and .006 levels.

-This mean there is no significant association of socio-economic factors on participation in the community Based Organization (CBO), except average family income and occupation.

4-2-2 Chi-Square test for participation in net on adoption of recommended technical package (cultural practices).

- Chi-Square test for participation in net by adoption of recommended technical package of improved sorghum variety.

Improved seed for sorghum	Participation in project		Total
	Participant	Non participant	
Use	22	13	35
Did not use	39	26	65
Total	61	39	100

Chi-Square test**.**

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended package of improved sorghum.	. 078[a]	1	.780

Source: Data analysis. Level of significance 0.05

Chi-square = .078[a]

Df= 1

Sig. (2-sided). = .780

Results, there is no significant difference between respondents by adoption of using of recommended improved sorghum variety at 0.780 level.

-Participation did not influence on adoption of using recommended improved sorghum variety.

- **Chi-Square test for participation by adoption recommended sowing date for improved Sorghum.**

sowing date for sorghum	Participation in project		Total
	Participant	Non- participant	
first July	40	19	59
mid July	15	8	23
last July	6	12	18
Total	61	39	100

Chi-Square Test**.**

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended sowing date improved sorghum.	7.109[a]	2	.029

Source: Data analysis. Level of significance 0.05

Chi-square = 7.109[a]

D f = 2

Sig. (2-sided). = .029

Results, there is significant difference between respondents by adoption of recommended sowing date for improved sorghum variety at 0.029 level.

- Participation in net influence on adoption of recommended sowing date for improved sorghum variety.

- **Chi-Square test for participation in net by adoption recommended seed rate for improved Sorghum variety.**

Seed rate	Participation in project		Total
	Participant	Non- participant	
Used	27	13	40
Did not use	34	26	60
Total	61	39	100

Chi-Square Test.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended seed rate for improved sorghum variety.	1.184[a]	1	.277

Source: Data analysis. Level of significance 0.05

Chi-square = 1.184[a]

Df= 1

Sig. (2-sided). = .277

Results, there is no significant differences between respondents, by adoption of recommended seed rate for improved sorghum variety at .277 level.

- Participation in net did not influence on adoption of recommended seed rate for improved sorghum variety.

- **Chi-Square test for participation in net by adoption recommended spacing for improved Sorghum variety.**

Recommended spacing for sorghum /between/ holes/rows.	Participation in project		Total
	Participant	Non participant	
Used	28	13	41
Did not use	33	26	59
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended spacing for improved sorghum.	1.554[a]	1	.213

Source: Data analysis. Level of significance 0.05

Chi-square = 1.554[a]

Df= 1

Sig. (2-sided). = .213

Results, there is no significant differences between respondents by adoption of recommended spacing between rows & holes for improved sorghum at .213 level.

- Participation in net did not influence on adoption of recommended spacing between rows and holes improved sorghum variety.

- **Chi-Square test for respondents by adoption recommended thinning for improved Sorghum variety.**

Thinning	Participation in project		Total
	Participant	Non- participant	
Used	28	16	44
Did not use	33	23	56
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended thinning for improved sorghum.	.230[a]	1	.632

Source: Data analysis. Level of significance 0.05

Chi-square = .230[a]

Df= 1

Sig. (2-sided). = .632

Results, there is no significant differences between the respondents by adoption of recommended thinning for improved sorghum variety at .632 level.

- Participation in net did not influence adoption of recommended thinning improved sorghum variety.

- **Chi-Square test for respondents by adoption recommended weeding for improved Sorghum variety.**

weeding for sorghum crop	Participation in project		Total
	Participant	Non- participant	
Used	26	16	42
Did not use	35	23	58
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended weeding for improved sorghum.	.025[a]	1	.875

Source: Data analysis. Level of significance 0.05

Chi-square = .025[a]

Df= 1

Sig. (2-sided). = .875

Results, there is no significant differences between the respondents by adoption of recommended weeding for improved sorghum variety at .875 level.

- Participation in net did not influence on adoption of recommended weeding for improved sorghum variety.

Chi-Square test for respondents by pest & disease control for Sorghum

Pest & diseases control for improved sorghum	Participation in project		Total
	Participant	Non participant	
used	29	14	43
Did not` use	32	25	57
Total	61	39	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended pest& disease control for improved sorghum variety.	1.316[a]	1	.251

Source: Data analysis. Level of significance 0.05

Chi-square = 1.316[a]

Df= 1

Sig. (2-sided). = .251

Results, there is no significant differences between respondents by adoption recommended pest &disease control for improved sorghum variety at level .251

-Participation in net did not influence on adoption of recommended pest &disease control for improved sorghum variety.

Table (4-2-2) summary of Chi-Square test for participation by adoption of recommended technical packages/ Sorghum variety.

Variable	Sign	Df	F	Indicators
Improved variety	.780	1	.078	No significance
Sowing date for sorghum	.029	2	7.109	Significance
Seed rate for Sorghum	.277	1	1.184	No significance
Spacing between rows &holes	.213	1	1.554	No significance
Thinning for sorghum crop	.632	1	.230	No significance
Weeding for sorghum	.875	1	.025	No significance
Pest &disease control/ sorghum	.174	1	1.316	No significance

Data analysis.

-As shown in table **(4-2-2)** chi-square test result revealed that, there is significant difference between respondents by adoption of recommended sowing date for improved sorghum at level .029.

-While there is no significant differences between respondent by Seed rate, spacing between holes, and rows, thinning, weeding, using of improved seed and pest & disease control for sorghum, at level 0,05.

- Participation in net did not influence on adoption of recommended technical packages for improved Sorghum variety. Except recommended sowing date.

4-2-3 Chi-Square test for the participation in net by adoption recommended technical package of improved Millet variety.

-Chi-Square test for respondents by adoption of recommended using of improved Millet variety.

Improved seed for millet	Participation in project		Total
	Participant	Non- participant	
Used	32	17	49
Did not use	29	22	51
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended using of improved millet.	.749[a]	1	.387

Source: Data analysis. . Level of significance 0.05

Chi-square = .749[a]

Df= 1

Sig. (2-sided). = .387

Results; there is no significant differences between respondents by adoption of using recommended improved variety for Millet at level 0.387.

- Participation in net did not influence on adoption of recommended using for improved millet variety

Chi-Square test for respondents by adoption recommended sowing date for improved Millet variety.

recommended Sowing date for millet	Participation in project		Total
	Participant	Non- participant	
first July	34	17	51
mid July	20	17	37
late July	7	5	12
Total	61	39	100

Chi-SquareTests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended sowing date for improved millet variety.	1.475[a]	1	.478

Source: Data analysis. . Level of significance 0.05

Chi-square = 1.475a

Df= 1

Sig. (2-sided). = .478

Results; there is no significant differences between respondents by adoption of recommended sowing date for improved millet at level 0.478.

- Participation in net did not influence on adoption of recommended sowing date for improved millet variety.

- **Chi-Square test for respondents by adoption of recommended seed rate for improved Millet variety.**

recommended Seed rate for millet		Participation in project		Total
		Participant	Non participant	
	Used	30	16	46
	Did not use	31	23	54
	Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended seed rate for improved millet	.637[a]	1	.425

Source: Data analysis. . Level of significance 0.05

Chi-square = .637[a]

Df= 1

Sig. (2-sided). = .425

Results; there is no significant differences between respondents by adoption of recommended seed rate for improved Millet, at .425 level.

- Participation in net did not influence on adoption of recommended seed rate for improved millet variety.

- Chi-Square test for respondent by adoption recommended spacing between rows, holes for improved Millet variety.

recommended spacing between holes/rows for millet	Participation in project		Total
	Participant	Non- participant	
Used	28	13	41
Did not use	33	26	59
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended spacing between rows and holes for improved millet	1.554[a]	1	.213

Source: Data analysis. . Level of significance 0.05

Chi-square = 1.554[a]

Df= 1

Sig. (2-sided). = .213

Results; there is no significant differences between respondents, by adoption recommended spacing between rows and holes for improved Millet variety at level .213

- Participation in net did not influence on adoption of recommended spacing between rows/holes for improved mille variety

- Chi-Square test for respondents by adoption of recommended thinning for improved Millet variety.

recommended thinning for millet	Participation in project		Total
	Participant	Non- participant	
Used	27	14	41
Did not use	34	25	59
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended thinning for improved millet	.688[a]	1	.407

Source: Data analysis. . Level of significance 0.05

Chi-square = .688[a]

Df= 1

Sig. (2-sided). = .407

Results; there is no significant differences between respondents by adoption recommended thinning for improved Millet variety level at 0.407.

- Participation in net did not influence on adoption of recommended thinning for improved mille variety.

-Chi-Square test for respondents by adoption recommended weeding for improved Millet variety.

recommended weeding time for millet	Participation in project		Total
	Participant	Non- participant	
Used	25	15	40
Did not use	36	24	60
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended weeding improved millet	.063[a]	1	.802

Source: Data analysis. . Level of significance 0.05

Chi-square = .063[a]

Df= 1

Sig. (2-sided). = .802

Results; there is no significant difference between respondents, by adoption recommended weeding for improved Millet variety at level 0.802.

- Participation in net did not influence on adoption of recommended weeding for improved mille variety.

-Chi-Square test for respondents by adoption of recommended pest &disease control for millet.

Pest & diseases control for millet	Participation in project		Total
	Participant	Non- participant	
Used	23	16	39
Did not use	38	23	61
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended pest &disease control for improved millet	.110[a]	1	.450

Source: Data analysis. . Level of significance 0.05

Chi-square = .110[a]

Df= 1

Sig. (2-sided). = .450

Results; there is no significant differences between respondents, by adoption of recommended pest and disease control for improved Mille at level 0.450.

- Participation did not influence on adoption of recommended pest and disease control for improved mille variety.

Table (4-2-3) Summary of Chi-Square test for respondents by adoption of recommended technical packages for millet variety.

Variable	Sign	Df	F	Indicators
Improved variety for millet	.387	1	.749	No Significance
Sowing date for improved millet	.478	1	1.475	No significance
Seed rate for improved millet	.425	1	637	No significance
Distance between rows/holes	.213	1	.1554	No significance
Thinning for millet crop	.407	1	.688	No significance
Weeding for millet	.802	1	.063	No significance
Pest &disease control/ millet	.450	1	.110	No significance

Source: Data analysis.

-As shown in table **(4-2-3)** chi-square test result revealed that there is no significant differences between respondents by adoption of recommended sowing date, seed rate and spacing between holes and rows, thinning, weeding, using of improved seed of millet, and pest & disease control for millet at level 0.05.

- Participation did not influence on adoption of recommended technological package of improved millet variety.

4-2-4 Chi-Square test for respondents by adoption of recommended technical package for improved Ground nut crop.

- Chi-Square test for respondents by adoption of recommended using of improved variety / GN crop

Using of Improved seed for ground nut crop	Participation in project		Total
	Participant	Non participant	
Used	24	21	45
Did not use	37	18	55
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of using recommended improved Groundnut	2.021[a]	1	.155

Source: Data analysis. . Level of significance 0.05

Chi-square = 2.021[a]

Df= 1

Sig. (2-sided). = .155

Results; there is no significant differences between the respondents by using of recommended improved Ground nut crop at level 0.155.

- Participation did not influence on adoption of recommended using for improved mille variety.

Chi-Square test for respondents by recommended sowing date for GN. -

sowing date for groundnut	Participation in project		Total
	Participant	Non participant	
Mid July	30	21	51
last July	22	15	37
First August	9	3	12
Total	61	39	100

Chi-Square test.

Variable tested	**Chi-Square-value**	**d.f**	**Asymp.Sig**
Participation versus by adoption of recommended sowing date for improved millet	1.127[a]	1	.569

Source: Data analysis. . Level of significance 0.05

Chi-square = **1.127a**

Df= 2

Sig. (2-sided). = .569

Results; there is no significant differences between the respondents by adoption of recommended sowing date for improved Ground nut crop at .569 level.

- Participation did not influence on adoption of recommended sowing date for improved mille variety.

Chi-Square test for the respondents by recommended seed rate for improved GN

Recommended Seed rate for ground nut crop	Participation in project		Total
	Participant	Non participant	
Used	24	17	41
Did not use	37	22	59
Total	61	39	100

-Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended seed rate for improved Groundnut	.177[a]	1	.674

Source: Data analysis. . Level of significance 0.05

Chi-square = **1.77a**

Df= 1

Sig. (2-sided). = .674

Results; there is no significant differences between the respondents, by adoption of recommended seed rate for Ground nut crop, at level 0.674

- Participation did not influence on adoption of recommended seed rate for improved mille variety

-Chi-Square test for respondents by adoption recommended spacing between rows &holes for improved GN.

Spacing between rows/holes Groundnut crop		Participation in project		Total
		Participant	Non- participant	
	Used	22	13	35
	Did not use	39	26	65
Total		61	39	100

Chi-Square test**.**

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended spacing between rows and holes for GN	.078[a]	1	.780

Source: Data analysis . Level of significance 0.05

Chi-square = .078[a]

Df= 1

Sig. (2-sided). = .780.

Results; there is no significant differences between the respondents by adoption of recommended spacing between holes/rows for Ground nut crop at level 0.780

- Participation did not influence on adoption of recommended spacing between holes/rows for improved mille variety.

-Chi-Square test for respondent by recommended thinning for improved Groundnut crop

Thinning for improved groundnut.	Participation in project		Total
	Participant	Non- participant	
Used	27	17	44
Did not use	34	22	56
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended thinning	.004[a]	1	.947

Source: Data analysis . Level of significance 0.05

Chi-square = .004[a]

Df= 1

Sig. (2-sided). = .947

Results; there is no significant differences between respondents, by adoption of recommended thinning for Ground nut crop at level 0.947.

- Participation did not influence on adoption of recommended thinning for improved mille variety.

-Chi-Square test for the respondents by recommended weeding for improved Groundnut crop.

Recommended Weeding for ground nut crop	Participation in project		Total
	Participant	Non- participant	
Used	16	18	34
Did not use	45	21	66
Total	61	39	100

Chi-Square test

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by adoption of recommended weeding for improved Ground nut	4.851[a]	2	.088

Source: Data analysis . Level of significance 0.05

Chi-square = 4.851[a]

Df= 1

Sig. (2-sided). = .088

Results; there is no significant differences between respondents, by adoption of recommended weeding for improved Ground nut crop, at level 0.088

- Participation did not influence on adoption of recommended weeding for improved mille variety.

-Chi-Square test for respondents by recommended pest& disease control for Ground Nut crop.

Pest & diseases control	Participation in project		Total
	Participant	Non- participant	
used	30	15	45
Did not use	31	24	55
Total	61	39	100

Chi-Square test**.**

Variable tested	Chi-Square-value	d.f	Asymp.Sig.
Participation versus by adoption of recommended pest &disease control for G/N	1.104[a]	1	.293

Source: Data analysis. . Level of significance 0.05

Chi-square = 1.104[a]

Df= 1

Sig. (2-sided). = .293

Results; there is no significant differences between the respondents, by adoption of recommended pest & disease for improved Ground nut crop, at level 0.293.

- Participation did not influence on adoption of recommended pest & disease control for improved mille variety.

Table (4-2-4) Summary of Chi-Square test for respondents by adoption of recommended/ technical packages for Ground nut improved variety.

Variable	Sign	Df	F	Indicators
Using of improved variety	.155	1	2.021	No significance
Sowing date	.569	2	1.127	No Significance
Seed rate	.472	2	1.503	No significance
Distance between holes	.678	2	.776	No significance
Distance between row	.179	2	3.440	No significance
Thinning for millet crop	.493	2	1.413	No significance
Weeding for millet	.088	2	4.851	No significance
Pest &disease control/ millet	.293	1	1.104	No significance

Source: Data analysis.

-As shown in table **(4-2-4)** chi-square test result revealed that, there are no significant differences between respondents by adoption of recommended, Technical packages for Groundnut variety, which are, using of improved Ground nut variety, sowing date, seed rate and spacing between holes rows, thinning, weeding, and pest & disease control for ground nut at level 0,05.

- Participation did not influence on adoption of recommended technical packages for improved mille variety.

4-2-5 Chi-Square test for respondents by availability of Agricultural input.

- **Chi-Square test for respondents by availability of pesticide.**

Availability of pesticide.		Participation in project		Total
		Participant	Non participant	
	Available	24	10	34
	Not available	37	29	66
Total		61	39	100

Chi-Square Test.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by availability of pesticide	**1**.991[a]	1	.158

Source: Data analysis level of significance 0.05

Cih- square = **1**.991[a]

Df= 1

Sig. (2-sided). = .158

Results; there is no significant differences between respondents by availability of pesticide at level 0.158.

- Participation did not influence on availability of pesticide for crop protection.

- **Chi-Square test for respondent by availability of seed dressing.**

Availability of seed dressing		Participation in project		Total
		Participant	Non- participant	
	Available	19	17	36
	Not available	42	22	64
Total		61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by availability of seed dressing	1.598[a]	1	.206

Sources: Data analysis Level of significance 0.05

Chi-Square: 1.598[a]

Df= 1

Sig. (2-sided). = .206

Results; there is no significant differences between respondents by availability of seed dressing at level 0.206.

- Participation did not influence on availability of seed dressing for crop protection.

Chi-Square test for respondents by availability of improved seed for three crops.

Availability of improved seed for three crops		Participation in project		Total
		Participant	Non participant	
	Available	13	14	27
	Not available	48	25	73
	Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by availability of improved seeds for 3 crops	2.568[a]	1	.109

Source: Data analysis. Level of significance 0.05

Chi-square = 2.568[a]

Df= 1

Sig. (2-sided). = .109

Results; there is no significant differences between respondents by availability of improved seed for three crops at level 0.109.

- Participation did not influence on availability of improved seed for three crops.

- **Chi-Square test for respondents by availability of credit & loan.**

Credit &loan availability	Participation in project		Total
	Participant	Non participant	
Available	12	6	18
Not available	49	33	82
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by availability of credit & loan services	.296[a]	1	.586

Source: Data analysis Level of significance 0.05

Chi-square = .296[a]

Df= 1

Sig. (2-sided). = .586.

Results; there is no significant differences between respondents by availability of credit &loan at level 0.586.

- Participation did not influence on availability of credit & loan services.

- **Chi-Square test for respondents by availability of Tools & Equipment.**

Component Tools &Equipment	Participation in project		Total
	Participant	Non participant	
Available	20	17	37
Not Available	41	22	63
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by tools &equipment availability	1.191[a]	1	.275

Source: Data analysis Level of significance 0.05

Chi-square = 1.191a

Df= 1

Sig. (2-sided). = .275

Results; there is no significant differences between respondents by availability of tools &equipments at level 0.275.

- Participation did not influence on availability of tools &equipment.

- **Chi-Square test for respondents by availability of insecticide.**

Component Availability of insecticide	Participation in project		Total
	Participant	Non participant	
Avalalibale	28	11	39
Not available	33	28	61
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by availability of insecticide	5.231[a]	1	.022

Source: Data analysis. Level of significance 0.05

Chi-square = 5.231a

Df= 1

Sig. (2-sided). = .022

Results; there is significant differences between respondents by availability of insecticide at level 0.022.

- Participation influence on availability of insecticide.

Table (4-2-5) Summary of Chi-Square test for the respondents by availability of Agricultural input.

Variable	Sig	Df	F	Result
Availability of pesticide	.158	1	1.991	No Significance
Availability of improve seed	.109	1	2.568	No Significance
Availability of seed dressing	.206	1	1.598	No significance
Availability of tools& Equipment	.275	1	.1.191	No Significance
Availability of insecticide	.022	1	3.231	significance
Availability of credit & loan	586.	1	.296	No significance

Source: Data analysis.

-As shown in table **(4 -2-5**) chi-square test result revealed that, there are no significant difference between respondent by availability of input, which are improve seed, seed dressing, pesticide, tools &equipments, and credit & loans at 0.05.

-The chi-square test result revealed that, there is significant difference between by availability of insecticide, at level 0.022.

- Participation in net did not influence availability of agricultural input, at 0.05 levels, except insecticide availability.

4-2-6 Chi-Square test for respondents by their benefit from extension.

- Chi-Square test for respondents by their benefit from farm visit.

farm visit	Participation in project		Total
	Participant	Non participant	
No benefit	21	8	29
little benefit	39	31	70
Big benefit	1	0	1
Total	61	39	100

Square Test.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by their benefit from farm visit	3.049[a]	2	.218

Source: Data analysis. Level of significance 0.05

Chi-square = 3.049[a]

Df= 2

Sig. (2-sided). = .218

Results; there is no significant differences between respondents by their benefit from farm visit at level 0.218.

- Participation in net did not influence benefit from farm visit.

- Chi- square test for respondent's by their benefit from home visit.

Home visit	Participation in project		Total
	Participant	Non participant	
Not benefit	16	11	27
Benefit	43	28	71
Big benefit	2	0	2
Total	61	39	100

Chi- square test**.**

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by benefit from home visit	1.319[a]	2	.517

Source: Data analysis Level of significance 0.05

Chi-square = 1.319[a]

Df= 2

Sig. (2-sided). = .517

Results; there is no significant differences between respondents by benefit from home visit at level 0.517.

- Participation in net did not influence benefit from home visit.

- Chi- square test for respondents by their benefit from Radio and T.V message.

Radio, T.V message	Participation in project		Total
	Participant	Non participant	
Big benefit	20	6	26
little benefit	34	23	57
Not benefit	7	10	17
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by Radio &T.V	5.623[a]	2	.060

Source: Data analysis Level of significance 0.05

Chi-square = 5.623a

Df= 2

Sig. (2-sided). = .060

Results; there is no significant differences between respondents by their benefit from Radio, T.V message at level 0.060.

- Participation in net did not influence benefit from home visit.

-Chi- square test for respondents by their benefit from farmer field schools.

Farmers field schools.	Participation in project		Total
	Participant	Non participant	
Not benefit	34	12	46
little benefit	26	25	51
big benefit	1	2	3
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by Farmer field schools	6.342[a]	2	.042

Source: Data analysis Level of significance 0.05

Chi-square = 6.342[a]

Df= 2

Sig. (2-sided). = .042

Results; there is significant differences between respondents by their benefit from farmer field schools, at level 0.042.

- Participation in net influence benefit from farmers field schools.

-Chi- square test for respondents by their benefit from demonstration farms.

Demonstration farm	Participation in project		Total
	Participant	Non participant	
Not benefit	10	7	17
little benefit	50	30	80
Big benefit	1	2	3
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by benefit from demonstration farms	1.075[a]	2	.584

Source: Data analysis Level of significance 0.05

Chi-square = 1.075a

Df= 2

Sig. (2-sided). = .584

Results; there is no significant differences between respondents by their benefit from Demonstration farm, at level 0.584.

- Participation in net did not influence benefit from demonstration farm

Table (4-2-6) Summary of Chi-Square test for respondents by benefit gained from extension services in the study area.

Variable	Sig	Df	F	Results
Farm visits	.218	**2**	3.049	No significance
Home visits	.517	**2**	1.319	No significance
Radio & TV messages.	.060	**2**	5.623	No significance
Farmer field schools.	.042	**2**	6.342	Significance
Demonstration farm (pilot farm).	.584	**2**	1.075	No significance

Source: Data analysis**.**

As shown in table **(4 -2-6)** chi-square test result revealed that, there are no significant differences between respondents by benefit gained from extension during farm visits, home visits, Radio & TV messages & pilot farm, at level 0.05.

-While the chi-square test result revealed that, there is a significant difference between respondents by extensions in school field farmer, at .042 levels.

- Participation in net influence did not influence the benefit from the extension services, except extensions in school field farmer.

4-2-7 chi- square test for two groups of respondents by technology used for Three crops in study area.

-Chi- square test for respondents by technology used – seed selection from the field (this technique is especially for local seeds in study area).

Seed selection from the field	Participation in project		Total
	Participant	Non participant	
Used	34	9	43
Did not use	27	30	57
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Participation versus by seed selection from the field.	11.539[a]	2	.003

Source: Data analysis Level of significance 0.05

Chi-square = 11.539a

Df= 2

Sig. (2-sided). = .003

Results; there is significant differences between respondents by using seed selection from the field, at level 0.003.

Participation influences the using of seed selection from the field.

-Chi- square test for respondents by using the optimum harvesting time for crops.

Using optimum harvesting time for three crops.	Participation in project		Total
	Participant	Non participant	
Used	30	9	39
Did not use	31	30	61
Total	61	39	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by optimum harvesting time for three crops.	6.814[a]	1	.009

Source: Data analysis Level of significance 0.05

Chi-square = 6.814[a]

Df= 1

Sig. (2-sided). = .009

Results; there is significant differences between respondents by using optimum harvesting time for three improved crops, at level 0.009.

- Participation influences the using of optimum harvesting time for three crops.

-Chi- square test for respondents by using pest &disease control.

Using of Pest & diseases control	Participation in project		Total
	Participant	Non participant	
Used	26	4	30
Did not use	35	35	70
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by Pest &disease control.	11.868[a]	1	.001

Source: Data analysis Level of significance 0.05

Chi-square = 11.868a

Df= 1

Sig. (2-sided). = .001

Results; there is significant differences between respondents by using pest and diseases control, at level 0.001.

- Participation influences the using of pest and diseases control for three crops.

-Chi- square test for respondents by using supplementary irrigation.

Using of supplementary irrigation	Participation in project		Total
	Participant	Non participant	
Used	20	6	26
Did not use	41	33	74
Total	61	39	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp.Sig
Participation versus by supplementary irrigation	3.745[a]	1	.053

Source: Data analysis Level of significance 0.05

Chi-square = 3.745[a]

Df= 1

Sig. (2-sided). = .053

Results; there is no significant differences between respondents by using supplementary irrigation (water harvesting) at level 0.053.

- Participation did not influence using supplementary irrigation (water harvesting) for three crops.

Table (4-2-7) Summary of chi- square test for respondents by adoption of some technology used for three improved seed varieties and local seeds.

Variable	Sig	Df	F	Result
Seed selection from the field (for local seeds)	.003	2	11.539	Significance
Technical harvesting operation	.009	1	6.814	Significance
Pest& disease management	.001	1	11.421	Significance
Supplementary irrigation (water harvesting)	.053	1	3.745	No significance

Source: Data analysis

-As shown in table (4 -2-7) chi-square test result revealed that, there is significant differences between respondent by adoption of some technology used of, seed selection from the field (this especially for local seeds), optimum harvesting time and pest& disease control at 0.05 levels

-While chi-square test result revealed that, there is no significant difference between respondents by Supplementary irrigation, at levels 0.053.

- Participation influence adoption of some technology used for three improved seed, at 0.05 levels. Except adoption of using supplementary irrigation (water harvesting).

4-2-8 chi- square test of socio-economic factors on adoption of some technical package of recommended improved seed for three crops.

- Chi- square test for adoption of using recommended improved millet Variety, by household heads age**.**

Household age	Using of Improved seed for millet		Total
	Used	Did not use	
(18-24)	3	3	6
(25-34)	9	12	21
(35-44)	17	19	36
(45-54)	14	15	29
(55 and over)	6	2	8
Total	49	51	100

Chi-Square Tests.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
House hold age by seed rate for improved millet variety	2.535[a]	4	.638

Source: Data analysis. Level of significance 0.05

Chi-square = 2.535[a]

Df= 4

Sig. (2-sided). = .638

Results; there is no significant association of house hold age on adoption of using recommended improved millet variety, at level. 0.638.

-Age did not influence adoption of using recommended improved millet variety

-Chi- square test for adoption of recommended seed rate of improved sorghum by household age.

Household age.	seed rate for improved sorghum		Total
	Used	Did not use	
(18-24)	1	5	6
(25-34)	7	14	21
(35-44)	19	17	36
(45-54)	13	16	29
(55 and over)	7	1	8
Total	47	53	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp. Sig
House hold age by adoption recommended seed rate of improved sorghum variety.	9.596[a]	4	.048

Source: Data analysis. Level of significance 0.05

Chi-square = 9.596[a]

Df= 4

Sig. (2-sided). = .048

Results; there is significant association of household age on adoption of recommended seed rate of improved sorghum variety at 0.048 level.

- Age influence adoption recommended seed rate of improved sorghum.

-Chi- square test of adoption of recommended spacing for improved millet seed by household age.

Household age	recommended spacing for millet between holes/rows		Total
	Used	Did not use	
(18-24)	0	6	6
(25-34)	8	13	21
(35-44)	19	17	36
(45-54)	9	20	29
(55 and over)	5	3	8
Total	41	59	100

Chi-Square tests.

Variable tested	Chi-Square-value	d.f	Sump. Sig
House hold age by recommended spacing of improved millet variety	9.026[a]	4	.060

Source: Data analysis. Level of significance 0.05

Chi-square = 9.026[a]

Df= 4

Sig. (2-sided). = .060

Results; there is no significant association of house hold age on adoption recommended spacing between rows and holes at 0.060 level.

- Age did not influence adoption of recommended seed rate for improved millet.

-Chi- square test for adoption of recommended thinning for improved sorghum seed by household age.

Household age	Using recommended thinning of improved sorghum seed		Total
	Used	Did not use	
(18-24)	1	5	6
(25-34)	8	13	21
(35-44)	13	23	36
(45-54)	18	11	29
(55 and over)	4	4	8
Total	44	56	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
House hold age by thinning of improved sorghum	6.985[a]	4	.137

Source: Data analysis. Level of significance 0.05

Chi-square = 6.985a

Df= 4

Sig. (2-sided). = .137

Results; there is no significant association of household age on adoption of recommended thinning for improved sorghum, at level 0.137.

-Age did not influence adoption of recommended thinning for improved sorghum.

-Chi- square test on adoption of recommended weeding for improved seed by household age

Household age	recommended weeding time for improved millet		Total
	Used	Did not use	
(18-24)	0	6	6
(25-34)	9	12	21
(35-44)	14	22	36
(45-54)	13	16	29
(55 and over)	4	4	8
Total	40	60	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
House hold age by weeding of improved millet	4.705[a]	4	.319

Source: Data analysis. Level of significance 0.05

Chi-square = 4.705[a]

Df= 4

Sig. (2-sided). = .319

Results; there is no significant association of household age on adoption of recommended weeding for improved millet at 0.319 level.

-Age did not influence adoption of recommended weeding for improved millet.

-Chi- square test for adoption of recommended pest and disease control for improved seed of three crops by household age.

Household age	Pest & diseases control		Total
	Used	Did not use	
(18-24)	1	5	6
(25-34)	7	14	21
(35-44)	18	18	36
(45-54)	13	16	29
(55 and over)	4	4	8
Total	43	57	100

Chi-Square tests.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
House hold age by pest &disease control of improved varieties.	3.417[a]	4	.491

Source: Data analysis. Level of significance 0.05

Chi-square = 3.417a

Df= 4

Sig. (2-sided). = .491

Results; there is no significant association of household age on adoption of recommended pest &disease control for improved varieties, at level 0.491.

- Age did not influence adoption of recommended pest &disease control for improved varieties.

Table (4-2-8) Summary of chi- square test of adoption recommended of some technical package for improved varieties by age of household.

Variable	Sig	Df	F	Result
Using of improved millet variety	.638	4	2.535	No Significance
Seed rate for improved sorghum	.048	4	9.596	Significance
Spacing for improve millet variety	.060	4	9.026	No Significance
Thinning for improved sorghum variety	.137	4	6.985	No Significance
Weeding for improved millet variety	.319	4	4.705	No Significance
Pest &disease control for improved Groundnut.	.491	4	3.417	No Significance

Source: Data analysis

-As shown in table **(4 -2-8)** chi-square test result revealed that, there is no significant association of household age, on adoption of recommended technical packages of using improved millet variety, Spacing between holes/ rows for improve millet variety, thinning for improved sorghum Weeding for improved millet, and Pest &disease control for improved Groundnut, at levels 0.05.

-While chi-square test result revealed that, there is significant association of household age on adoption of recommended seed rate for improved sorghum, at levels 0.048.

4-2-9 chi-square test for Socio-economic factors on adoption of some recommended technical package for improved variety by household gender.

-Chi- square test for adoption of recommended technical package of weeding for improved seed by household gender.

Household gender		Using improved seed for Sorghum.		Total
		Used	Did not use	
	Male	28	44	72
	Female	7	21	28
	Total	35	65	100

Chi-Square tests.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Households Gender by using improved sorghum variety.	1.709[a]	1	.141

Source: Data analysis. Level of significance 0.05.

Chi-square = 1.709a

Df= 1

Sig. (2-sided). = .141

Results; there is no significant association of gender of house hold on adoption of recommended using for improved sorghum varieties, at level 0.141.

- Gender did not influence adoption of recommended using improved sorghum varieties.

-Chi- square test of adoption of some technical package of recommended seed rate for millet improved variety by hosehold Gender.

Household gender	Using recommended Seed rate for improved millet variety		Total
	Used	Did not use	
Male	33	39	72
Female	13	15	28
Total	46	54	100

Chi-Square test**.**

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Households Gender by seed rate for improved millet variety.	.003[a]	1	.957

Source: Data analysis. Level of significance 0.05

Chi-square = .003[a]

Df= 1

Sig. (2-sided). = .957

Results; there is no significant association of household heads gender on adoption of recommended seed rate for improved millet variety, at level 0.957.

- Gender did not influence adoption of recommended seed rate for improved millet variety.

-Chi- square test of adoption for technical package of recommended Spacing between rows and holes for millet improved by Gender.

Household gender		recommended spacing between holes/rows for millet		Total
		Used	Did not use	
	Male	34	38	72
	Female	7	21	28
	Total	41	59	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Household Gender by spacing between rows and holes for improved millet variety.	4.116[a]	1	.042

Source: Data analysis. Level of significance 0.05

Chi-square = 4.116a

Df= 1

Sig. (2-sided). = .042

Results; there is significant association of gender of household on adoption of recommended spacing between rows and holes for improved millet variety, at level 0.042.

- Gender influence adoption of recommended spacing between rows and hole for improved millet variety.

-Chi- square test of adoption of recommended weeding for improved sorghum variety by gender.

Household gender		Recommended weeding for improves sorghum variety		Total
		Used	Did not use	
	Male	32	40	72
	Female	10	18	28
	Total	42	58	100

Chi-Square tests.

Variable tested	Chi-Square-value	d.f	Sysmp. Sig
House hold gender by weeding for improved sorghum variety	.631[a]	1	.427

Source: Data analysis. Level of significance 0.05

Chi-square: .631[a]

Df= 1

Sig. (2-sided). = .427

Results; there is no significant association of gender household on adoption of recommended weeding for improved sorghum variety at 0.427 level.

- Gender did not influence adoption of recommended weeding for improved sorghum variety.

-Chi- square test of adoption of recommended thinning for improved sorghum variety by gender.

Household gender		Recommended thinning for improved sorghum variety		Total
		Used	Did not use	
	Male	34	38	72
	Female	10	18	28
Total		44	56	100

Source: Data analysis.

Variable tested	**Chi-Square-value**	**d.f**	**Asymp. Sig**
House hold gender by recommended thinning of improved sorghum variety.	1.084[a]	1	.298

Source: Data analysis Level of significance 0.05

Chi-square: 1.084[a]

Df= 1

Sig. (2-sided). = .298

Results; there is no significant association of gender on adoption of recommended thinning for sorghum, at level 0.298.

- Gender did not influence adoption of recommended thinning for improved Sorghum variety.

-Chi- square test for adoption of recommended pest &disease control for improved varieties by household gender.

Household gender		Recommended Pest & diseases control for improved variety		Total
		Used	Did not use	
	Male	30	42	72
	Female	13	15	28
	Total	43	57	100

Chi-Square tests.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
House hold gender by recommended pest & disease control of improved sorghum variety	.187[a]	1	.666

Source: Data analysis Level of significance 0.05

Chi-square: .187[a]

Df= 1

Sig. (2-sided). = .666

Results; there is no significant association of household gender on adoption of recommended pest and disease control for improved sorghum, at level 0.666.

- Gender did not influence adoption of recommended pest and disease control for improved Sorghum variety.

Table (4-2-9) Summary of chi- square test for adoption of some technical package recommended for improved variety by gender of household

Variable	Sig	Df	F	Result
Improved Sorghum variety	.141	1	1.709	No Significance
Seed rate for improved millet	.957	1	.003	No Significance
Spacing between rows / holes for millet	.042	1	4.116	Significance
Weeding for improved millet	.427	1	.631	No significance
Thinning for improved Sorghum	.298	1	1.084	No significance
Pest &diseases control.	.666	1	.187	No significance

Source: Data analysis.

-As shown in table **(4 -2-9)** chi-square test result revealed that, there is no significant association of gender of household on adoption of recommended using Improved sorghum variety, seed rate for improved millet weeding for improved millet, thinning for sorghum and pest &diseases control, at level 0,05.

- While Chi-square test result revealed that, there is significant association of gender of household on adoption of spacing between rows/ holes for improved millet variety, at level 0, 042.

- Gender did not influence adoption of recommended technical package for improved varieties. Except spacing between rows/ holes for improved millet variety.

4-2-10 Chi-square test for adoption of some technical package of recommended improved verities of crops by household education level.

-Chi-square test for adoption of Pest & diseases control of recommended improved verities of by household education level.

Education level		Pest & diseases control		Total
		Adopted	Did not adopt	
	Illiterate	7	14	21
	khalwa	19	18	37
	Formal school years	17	23	40
	University &post	0	2	2
	Total	43	57	100

Chi-square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
House hold education level by pest & disease control	1.084[a]	3	.339

Source: Data analysis. Level of significance 0.05

Chi-square: 1.084[a]

Df= 3

Sig. (2-sided). = .339

Results; there is no significant association of household education level on adoption of recommended pest & disease control, at level .339.

-Education did not influence adoption of recommended pest & disease control

Chi-square test for adoption of seed dressing of improved verities of three crops by household education level.

Education level		Adoption of seed dressing for three crops		Total
		Adopted	Did not adopt	
	Illiterate	10	11	21
	khalwa	8	29	37
	Formal school years	10	30	40
	University &post	1	1	2
	Total	29	71	100

Source: Data analysis.

Chi-square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Adoption of seed dressing by House hold education level	5.253[a]	3	.154

Source: Data analysis. Level of significance 0.05

Chi-square: 5.253[a]

Df= 3

Sig. (2-sided). = .154

Results; there is no significant association of household education level on adoption of seed dressing for three crops, at level 0.154.

-Education did not influence adoption of seed dressing for three crops.

- Chi-**square test for adoption of recommended Supplementary irrigation by education level**.

Education level		Adoption of supplementary irrigation(water harvesting)		Total
		Adopted	Did not adopt	
	Illiterate	4	17	21
	khalwa	13	24	37
	Formal school years	9	31	40
	University &post	0	2	2
Total		26	74	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Adoption of supplementary irrigation by House hold education level	3.090[a]	3	.378

Source: Data analysis. Level of significance 0.05

Chi-square: 3.090[a]

Df= 3

Sig. (2-sided). = .378

Results; there is no significant association of household education level on adoption of supplementary irrigation, at level .378.

-Education did not influence adoption of supplementary irrigation.

-Chi-square test for adoption of recommended inorganic fertilizer for improved verity for three crops by household's education level.

Education level	Adoption of inorganic fertilizer for millet, sorghum GN		Total
	Adopted	Did not adopt	
Illiterate	2	19	21
khalwa	10	27	37
Formal school years	8	32	40
University &post	0	2	2
Total	20	80	100

Chi-Square tests

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Adoption of inorganic fertilizer for millet, sorghum GN by House hold education level	3.082[a]	3	.379

Source: Data analysis. Level of significance 0.05

Chi-square: 3.082[a]

Df= 3

Sig. (2-sided). = .379

Results; there is no significant association of household education level on adoption of inorganic fertilizer for Millet, Sorghum and Groundnut at level.379.

-Education did not influence adoption of inorganic fertilizer for Millet, Sorghum and Groundnut.

-**Chi**-square test for adoption of technical package of recommended crop rotation to improve the production of improved varieties by education level.

Educati on level.	Adoption of recommended crop rotation to improve the production.			Total
	large adoption	Little adoption	Did not adopt	
Illiterate	4	17	0	21
khalwa	11	26	0	37
Formal school years	6	31	3	40
University &post	0	2	0	2
Total	21	76	3	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Adoption of recommended crop rotation to improve the production by House hold education level	7.378[a]	6	.287

Source: Data analysis. Level of significance 0.05

Chi-square= 7.378[a]

Df= 6

Sig. (2-sided). = .287

Results; there is no significant association of household education level on adoption of crop rotation for improved millet, sorghum Groundnut at level.287.

-Education did not influence on adoption of crop rotation for Millet, Sorghum and Groundnut.

Table (4-2-10) Summary of chi- square test for adoption of technical package of recommended improved verities of three crops by household Education level.

Variable	Sig	Df	F	Result
Adoption of seed dressing for improved varieties	.154	3	5.253	No significance
Pest& disease control for improved varieties	.339	3	1.084	No significance
supplementary irrigation for improved varieties	.378	3	3.090	No significance
Using of inorganic fertilizer for three crops	.379	3	3.082	No significance
Adoption of crops rotation for three crops	.287	6	7.378	No Significance

Source: Data analysis

-As shown in table **(4 -2-10)** chi-square test result revealed that, there is no significant association on adoption of seed dressing for improved varieties, pest& disease control, supplementary irrigation for improved varieties, using of inorganic fertilizer for three crops and adoption of crops rotation for three crops, by Household education level, at 0.05leve.

-Education did not influence adoption of technical package of recommended improved verities of three crops.

4-2-11 chi- square test for socio-economic factors on access to information sources by household gender.

Chi- square test for benefit from extension agent, by household gender.

Household gender		benefit from the information sources Extension agent			Total
		No benefit	little benefit	big benefit	
	Male	29	27	16	72
	Female	8	14	6	28
Total		37	41	22	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Benefit from information sources (Extension agent), by household gender	1.521[a]	2	.467

Source: Data analysis. Level of significance 0.05

Chi-square= 1.521[a]

DF= 2

Sig. (2-sided). = .467

Results; there is no significant association of gender of household on benefit from information sources (Extension agent), at level 0.467.

- Gender did not influence access and benefit from information sources.

-Chi- square test for benefit from information sources farm visit, by household gender.

Household gender		Benefit gained from information sources (farm visit).			Total
		No benefit	little benefit	big benefit	
	Male	25	46	1	72
	Female	4	24	0	28
Total		29	70	1	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Benefit gained from information sources (farm visit) by household gender	4.664[a]	2	.097

Source: Data analysis. Level of significance 0.05

Chi-square= 4.664[a]

d f= 2

Sig. (2-sided). = .097

Results; there is no significant association of household gender on benefit from information sources (farm visit), at level 0.097.

- Gender did not influence access and benefit from information sources.

-Chi- square test for benefit gained from information sources (farmer's field school) by household gender.

Household gender		Benefit gained from information sources (farmers field schools)			Total
		Not benefit	Little benefit	big benefit	
	Male	37	33	2	72
	Female	9	18	1	28
	Total	46	51	3	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Benefit gained from information sources (farmers field schools) by household gender	3.012[a]	2	.222

Source: Data analysis. Level of significance 0.05

Chi-square= 3.012[a]

DF= 2

Sig. (2-sided). = .222

Results; there is no significant association of gender of household on benefit gained from information sources (farmer field school), at level 0.222.

- Gender did not influence access and benefit from farmers field school.

-Chi- square test for benefit gained from information sources (Radio &T.V message) by household gender.

Household gender	Benefit gained from Radio T.V message (programmes).			Total
	Big benefit	little benefit	not benefit	
Male	20	40	12	72
Female	6	17	5	28
Total	26	57	17	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig
Benefit gained from information sources (Radio &T.V messages) by household heads gender	.424[a]	2	.809

Source: Data analysis. Level of significance 0.05

Chi-square= .424[a]

DF= 2

Sig. (2-sided). = .809

Results; there is no significant association of gender of household on benefit gained from of information sources (Radio, T.V message), at level 0.809.

- Gender did not influence access and benefit from Radio, T.V messages.

-Chi- square test for benefit gained from information sources (Home visit) by household age.

Household gender	Benefit gained from information sources (Home visit)			Total
	Not benefit	Little benefit	big benefit	
Male	23	47	2	72
Female	4	24	0	28
Total	27	71	2	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (Home visit) by household gender	4.292[a]	2	.117

Source: Data analysis. Level of significance 0.05

Chi-square= .424[a]

DF= 2

Sig. (2-sided). = .117

Results; there is no significant association of gender of household on benefit gained from information sources (home visit) at 0.117 level.

- Gender did not influence benefit from home visit.

-Chi- square test for benefit gained from information sources (demonstration farm) by Household gender.

Household gender	Benefit gained from Demonstration farm (pilot farm).			Total
	Not benefit	little benefit	big benefit	
Male	14	51	7	72
Female	3	20	5	28
Total	17	71	12	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources Demonstration farm by household gender	2.017[a]	2	.365

Source: Data analysis Level of significance 0.05

Chi-square= 2.017[a]

DF= 2

Sig. (2-sided). = .365

Results; there is no significant association of gender of household on benefit gained from demonstration farm (pilot farm), at level 0 .365.

- Gender did not influence benefit from demonstration farm (pilot farm).

Table (4-2-11) Summary of chi- square test for benefit gained from information sources by household heads gender.

Variable	Sig	Df	F	Result
Extension agent	.467	2	1.521	No significance
Farm visit	.097	2	4.664	No significance
Farmer field schools	.222	2	3.012	No significance
Radio &T.V message	.809	2	.424	No significance
Home visit	.177	2	4.292	No significance
Demonstration farm (Pilot farm).	.365	2	2.017	No significance

Source: Data analysis.

-As shown in table (4 -2-11) chi-square test result revealed that, there is no significant association of household gender on benefit gained from information sources, Extension agent, Farm visit, Farmers field schools, Radio &T.V message, Home visit and demonstration farm (pilot farm), at level 0.05.

- Gender did not influence benefit from information sources.

Observation: Farmers Field schools (FFSs), is participatory extension tool considered as one of most effective methods and used as the main extension tools, the main objectives of these schools to promote improved technological packages as well as enhance the capacities and skills of farmer.

4-2-12 chi- square test for benefit gained from information sources for by household age.

-Chi- square test for benefit gained information sources farmer's field schools, by household age

Household age	Benefit gained from the farmers' field school.			Total
	Not benefit	Little benefit	big benefit	
(18-24)	2	4	0	6
(25-34)	5	14	2	21
(35-44)	18	18	0	36
(45-54)	16	12	1	29
(55 and over)	5	3	0	8
Total	46	51	3	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (farmer field school) by household gender	10.204[a]	8	.251

Source: Data analysis Level of significance 0.05

Chi-square= 10.204[a]

Df= 8

Sig. (2-sided). = .251

Results; there is no significant association of age of household on benefit gained from information sources, (farmers field schools, at level 0.251

- Age did not influence benefit from information sources (farmers' field schools).

-Chi- square test for information sources (farm visit), by household heads age

Household age	Benefit gained from farm visit			Total
	No benefit	little benefit	big benefit	
(18-24)	0	6	0	6
(25-34)	3	18	0	21
(35-44)	14	22	0	36
(45-54)	9	19	1	29
(55 and over)	3	5	0	8
Total	29	70	1	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (farm visit) by household gender	9.277[a]	8	.319

Source: Data analysis. Level of significance 0.05

Chi-square= 9.277[a]

DF= 2

Sig. (2-sided). = .319

Results; there is no significant association of age of household heads by benefit gained from information sources (farm visit), at level .319.

-Age did not influence benefit from information sources (farm visit)

-Chi- square test for benefit gained from information sources (Home visit) by household age.

Household age	Benefit gained from Home visit			Total
	Not benefit	Little benefit	big benefit	
(18-24)	2	4	0	6
(25-34)	4	17	0	21
(35-44)	11	25	0	36
(45-54)	7	20	2	29
(55 and over)	3	5	0	8
Total	27	71	2	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from Information sources (Home visit) by household age.	6.480[a]	8	.594

Source: Data analysis. Level of significance 0.05

Chi-square= 6.480[a]

DF= 8

Sig. (2-sided). = .594

Results; there is no significant association of age of household heads by information sources (Home visit), at level 0.594.

-Age did not influence benefit gained from information sources (Home visit).

-Chi- square test for benefit gained from information sources Radio &T.V messages by household age.

Household age	Benefit gained from Radio, T.V message (programmes).			Total
	benefit	little benefit	not benefit	
(18-24)	3	2	1	6
(25-34)	4	10	7	21
(35-44)	9	23	4	36
(45-54)	9	17	3	29
(55 and over)	1	5	2	8
Total	26	57	17	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (Radio &T.V messages) by household gender	8.933[a]	8	.348

Source: Data analysis. Level of significance 0.05

Chi-square= 8.933[a]

DF= 8

Sig. (2-sided). = .348

Results; there is no significant association of age of household by benefit gained from information sources (Radio & T.V messages), at level 0.348.

-Age did not influence benefit from Radio & T.V messages.

-Chi- square test for benefit gained from information sources (pilot farm) by household age.

Household age		Benefit gained from Demonstration farm (pilot farm).			Total
		No benefit	little benefit	big benefit	
	(18-24)	1	4	1	6
	(25-34)	1	16	4	21
	(35-44)	8	26	2	36
	(45-54)	7	19	3	29
	(55 and over)	0	6	2	8
	Total	17	71	12	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (pilot farm) by household gender	8.318[a]	8	.403

Source: Data analysis. Level of significance 0.05

Chi-square= 8.318[a]

DF= 8

Sig. (2-sided). = .403

Results; there is no significant association of age of household heads by benefit gained from information sources /demonstration farm, at level 0.403.

-Age did not influence benefit gained from demonstration farm.

-Chi- square test for Benefit gained from information sources (Extension agent) by household age.

Age of household	Benefit gained from the Extension agent			Total
	No benefit	little benefit	big benefit	
(18-24)	1	4	1	6
(25-34)	8	10	3	21
(35-44)	12	13	11	36
(45-54)	11	12	6	29
(55 and over)	5	2	1	8
Total	37	41	22	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (Extension agent) by household's age.	6.314[a]	8	.612

Source: Data analysis. Level of significance 0.05

Chi-square= 8.314[a]

Df= 8

Sig. (2-sided). = .612

Results; there is no significant association of age of household heads by benefit gained from information sources (Extension agent), at level 0.612.

-Age did not influence benefit gained from Extension agent.

Table (4-2-12) Summary of chi- square test for benefit gained from information sources by household age.

Variable	Sig	Df	F	Result
Field Farmer schools	.251	8	10.204	No significance
Farm visit	.319	8	9.277	No significance
Home visit	.594	8	6.480	No significance
Radio &T.V message	.348	8	8.933	No significance
Pilot farm	.403	8	3.745	No significance
Extension agent	.612	8	6.314	No significance

Source: Data analysis.

-As shown in table **(4 -2-12)** chi-square test result revealed that, there is no significant association of age of household on benefit gained from information sources Extension agent, Farm visit, Farmer field schools, Radio &T.V message, Home visit and pilot farm ,at 0.05level.

-Age did not influence benefit gained from information sources.

4-2-13 chi- square test for benefit gained from information sources by household Education level.

-Chi- square test for benefit gained from information sources (farmer's field schools) by Household Education level.

Household education level		Benefit from the information sources (farmer's field schools).			Total
		Not benefit	Little benefit	big benefit	
	Illiterate	6	15	0	21
	khalwa	25	12	0	37
	Formal school years	15	22	3	40
	University &post	0	2	0	2
	Total	46	51	3	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (farmer school) by household Education level	16.463[a]	6	.011

Source: Data analysis. Level of significance 0.05

Chi-square= 16.463[a]

DF= 6

Sig. (2-sided). = .011

Results; there is significant association of education level of household on benefit gained from farmers field schools, at level 0.011.

-Education influence benefit gained from farmer's field schools.

-Chi- square test for benefit gained from (farm visit) by Household education level.

Education level	Benefit gained from farm visit			Total
	No benefit	little benefit	big benefit	
Illiterate	5	16	0	21
khalwa	16	21	0	37
Formal school years	8	31	1	40
University &post	0	2	0	2
Total	29	70	1	100

Chi-Square Tests

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources ((farm visit) by household education level	7.601[a]	6	.269

Source: Data analysis. Level of significance 0.05

Chi-square= 7.601a

DF= 6

Sig. (2-sided). = .269

Results; there is no significant association of education level of household on benefit gained from information sources (Farm visit), at level 0.269.

- Education did not influence benefit gained from farmer's field schools.

-Chi- square test for benefit gained from formation sources (Home visit) by household education level.

Education level		Benefit gained from Home visit.			Total
		Not benefit	benefit	big benefit	
	Illiterate	5	16	0	21
	khalwa	11	25	1	37
	Formal school years	11	28	1	40
	University &post	0	2	0	2
	Total	27	71	2	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources ((Home visit) by household Education level	1.710[a]	6	.944

Source: Data analysis. Level of significance 0.05

Chi-square= 1.710[a]

DF= 6

Sig. (2-sided). = .944

Results; there is no significant association of education level of household on benefit gained from information sources (Home visit), at level 0.944.

- Education did not influence benefit gained from Home visit.

-Chi- square test for benefit gained from information sources (Radio &T.V messages) by household education level.

Education level		Benefit gained from Radio messages and T.V messages			Total
		Big benefit	little benefit	not benefit	
	Illiterate	3	14	4	21
	khalwa	19	17	1	37
	Formal school years	4	24	12	40
	University &post	0	2	0	2
	Total	26	57	17	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (Radio &T.V messages) by household education level	25.379[a]	6	.000

Source: Data analysis. Level of significance 0.05

Chi-square= 25.379[a]

DF= 6

Sig. (2-sided). = .000

Results; there is high significant association of household education level on benefit gained from information sources (Radio &T.V messages), at level 0.000.

- Education influence benefit gained from Radio &T.V messages.

-Chi- square test for information sources (Pilot farm) recommended improved verities of three crops by household education level.

Education level	Benefit gained from Demonstration farm (pilot farm).			Total
	No benefit	little benefit	big benefit	
Illiterate	5	15	1	21
khalwa	9	25	3	37
Formal school years	3	29	8	40
University &post	0	2	0	2
Total	17	71	12	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources ((Pilot farm) by household Education level	8.273[a]	6	.219

Source: Data analysis. Level of significance 0.05

Chi-square= 8.273[a]

DF= 6

Sig. (2-sided). = .219

Results; there is no significant association of education level of household on benefit gained from information sources (Pilot farm), at level 0.219.

- Education did not influence benefit gained from demonstration farm.

-Chi- square test for benefit gained from information sources (Extension agent) by household education level.

Education level	Benefit gained from the Extension agent			Total
	No benefit	little benefit	big benefit	
Illiterate	5	9	7	21
khalwa	14	16	7	37
Formal school years	18	14	8	40
University &post	0	2	0	2
Total	37	41	22	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Benefit gained from information sources (Extension agent), by household education level	6.437[a]	6	.376

Source: Data analysis. Level of significance 0.05

Chi-square= 6.437[a]

DF= 6

Sig. (2-sided). = .376

Results; there is no significant association of education level of household on benefit gained from information sources (extension agent), at level 0.376.

- Education did not influence benefit gained from extension agent.

Table (4-2-13) Summary of chi- square test for benefit gained from information sources of recommended improved verities by household education level.

Variable	Sig	Df	F	Result
Farmer field schools	.011	6	16.463	Significance
Farm visit	.269	6	7.601	No significance
Home visit	.944	6	1.710	No significance
Radio &T.V message	000	6	25.379	No significance
Pilot farm	.219	6	8.273	Significance
Extension agent	.376	6	6.437	No significance

Source: Data analysis

-As shown in table **(4 -2-13**) chi-square test result revealed that, there is significant association of household education level on benefit gained from information sources, Radio& T. V message, Farmers field school, at 0.011,.000level.

While chi-square test result revealed that, there is no significant association of household education level on benefit gained from information sources, Home visit, demonstration farm (pilot), farm visit and extension agent, at level 0, 05.

4-2-14 chi- square test for family income of respondent household by total cultivated area, kind of ownerships, participation in net, training in general farm practices, types of tools &equipment, kind of crops, pest& disease control, cost of improves seeds, credit and loan.

-Chi- square test for average family income of respondent household by total cultivated area.

Average family income		Total cultivated area in Feddan				Total
		5-6	7-9	10-12	More than 13	
	less than 500SDG	25	14	16	5	60
	500-900SDG	1	14	13	2	30
	901 - 1200	0	3	2	2	7
	above 1201	0	2	1	0	3
	Total	26	33	32	9	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income by total cultivated area	24.051[a]	9	.004

Source: Data analysis. Level of significance 0.05

Chi-square= 24.051[a]

Df= 9

Sig. (2-sided). = .004

Results; there is significant association of average family income on total cultivated area, at level 0.004.

- Income influence on total cultivated area (farm size).

-Chi- square test of average family income of respondent household by training in general farm practices.

Average family income		Training in general farming practices		Total
		trained	Did not train	
	less than 500SDG	27	33	60
	500-900SDG	7	23	30
	901 - 1200	0	7	7
	above 1201	0	3	3
	Total	34	66	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income by Training in general farming practices	9.908[a]	3	.019

Source: Data analysis. Level of significance 0.05

Chi-square= 9.908[a]

DF= 9

Sig. (2-sided). = .019

Results; there is significant association of average family income in study area on training in general farming practices, at level 0.019.

- Income influence training in general farming practices.

-Chi- square test of average family income of respondent household by kind of owner ship in study area.

Average family income		Kind of land ownership in study area.			Total
		Owned	Rent	Others	
	less than 500SDG	47	9	4	60
	500-900SDG	20	9	1	30
	901 - 1200	5	2	0	7
	above 1201	3	0	0	3
	Total	75	20	5	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income by Kind of land ownership in study area	4.736[a]	6	.578

Source: Data analysis. Level of significance 0.05

Chi-square= 4.736[a]

DF= 6

Sig. (2-sided). = . 578

Results; there is no significant association of average family income on kind of land ownership in study area, at level 0.578.

- Income did not influence kind of land ownership in study area.

-Chi- square test of average family income of respondent household by participation in the net in study area.

Average family income		Participation in project		Total
		Participant	Non participant	
	less than 500SDG	43	17	60
	500-900SDG	11	19	30
	901 - 1200	4	3	7
	above 1201	3	0	3
	Total	61	39	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income on Participation in net in study area	12.298[a]	3	.006

Source: Data analysis. Level of significance 0.05

Chi-square= 12.298[a]

DF= 3

Sig. (2-sided). = .006

Results; there is high significant association of average family income on participation in net, at level 0.006.

- Income influence participation in net.

-Chi- square test for Average family income of respondent household by types of tools &Equipments using in study area.

Average family income		Types of Tools &Equipments using		Total
		Did not use	Used	
	less than 500SDG	59	1	60
	500-900SDG	28	2	30
	901 - 1200	7	0	7
	above 1201	1	2	3
	Total	95	5	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income by Types of Tools & Equipments using in study area.	25.965[a]	3	.000

Source: Data analysis. Level of significance 0.05

Chi-square= 25.965[a]

DF= 3

Sig. (2-sided). = .000

Results; there is high significant association of average family income by types of Tools &Equipments using in study area, at level 0.000.

- Income influence types of Tools &Equipments using in study area.

-Chi- square test for Average family income of respondent household by Kind of crop cultivate in study area.

Average family income	Kind of cultivated crops					Total
	Sorghum	Millet	Groundnut	Sesame	Others	
less than 500SDG	29	10	21	0	0	60
500-900SDG	1	8	21	0	0	30
901 - 1200	0	2	4	1	0	7
above 1201	0	0	2	0	1	3
Total	30	20	48	1	1	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income by Kind of crop cultivated study area	69.787[a]	12	.000

Source: Data analysis. Level of significance 0.05

Chi-square= 69.787[a]

DF= 12

Sig. (2-sided). = .000

Results; there is high significant association of average family income on kind of cultivated crop in study area, at level 0.000.

- Income influence kind of cultivated crop in study area.

-Chi- square test for Average family income of respondent household by pest & diseases control in study area.

Average family income	Pest & diseases control for three crops		Total
	used	Did not use	
less than 500SDG	31	29	60
500-900SDG	11	19	30
901 - 1200	3	4	7
above 1201	0	3	3
Total	45	55	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2side)
Average family income by Pest & diseases control crop study area	4.387[a]	3	.223

Source: Data analysis. Level of significance 0.05

Chi-square= 4.387[a]

DF= 3

Sig. (2-sided). = .223

Results; there is no significant association of average family income on pest & diseases control in study area, at level 0.223.

- Income influence on pest & diseases control in study area.

-Chi- square test for Average family income of respondent household by cost of the improved seed in study area.

Average family income		Cost of the improved seed for three crops.			Total
		very expensive	Expensive	suitable	
	less than 500SDG	17	42	1	60
	500-900SDG	6	24	0	30
	901 – 1200	1	6	0	7
	above 1201	0	3	0	3
	Total	24	75	1	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income by cost of the improved seed for three crops crop study area.	2.988[a]	6	.810

Source: Data analysis. Level of significance 0.05

Chi-square= 2.988a

Df= 6

Sig. (2-sided). = .810

Results; there is no significant association of average family income on cost of the improved seed for three crops in study area, at level 0.810.

- Income influence on cost of the improved seed for three crops in study area.

-Chi- square test for Average family income of respondent household by credit or loan services in study area

Average family income		Did you have taken any credit or loan from the Agricultural bank?		Total
		took	Did not take	
	less than 500SDG	7	53	60
	500-900SDG	0	30	30
	901 - 1200	0	7	7
	above 1201	0	3	3
	Total	7	93	100

Chi-Square test.

Variable tested	Chi-Square-value	d.f	Asymp. Sig.(2-sided)
Average family income by credit or loan from the Agricultural bank in study area	5.018[a]	3	.170

Source: Data analysis. Level of significance 0.05

Chi-square= 5.018a

DF= 3

Sig. (2-sided). = .170

Results; there is no significant association of average family income on credit and loan from the Agricultural bank in study area, at level 0.170.

- Income influence on credit and loan from Agricultural bank in study area.

Table (4-2-14) Summary of chi- square test for income by total cultivated area, kind of land ownerships, participation in the Net , training in general farm practices, types of tools &&equipment, kind of cultivated crops, pest and disease control, cost of improves seeds and credit and loan access.

Variable	Sig	Df	F	Result
Family income by total cultivated area	.004	9	24.057	significance
Income by training in farm practices	.019	3	9.908	significance
Income by kind of land owner ship	.578	6	14.456	No significance
Income by participation in Net (CBO).	.006	3	12.298	significance
Income by types of tools &equipment.	.000	3	25.965	Significance
Income by kinds of crops.	.000	12	69.787	Significance
Income by pest &disease control.	.223	3	4.387	No significance
Income by cost of improved seeds for	.810	6	2.988	No significance
crops	.170	3	5.018	No significance
Income by Credit & loan				

Source: Data analysis.

-As shown in table **(4 -2-14)** chi-square test result revealed that, there is significant association of average family income on, total cultivated area, training in general farm practices, participation in Net (CBO), at 0.05level .

-Also chi-square test result revealed that, there is high significant association of average family income on, types of tools &equipment and kinds of crops cultivated in study area, at level 0, 05.

While chi-square test result revealed that, there is no significant association of average family income on, kind of land owner ship, pest &disease control, cost of improved seeds for crops and Credit & loan at level 0, 05.

Chapter Five

Summary of results, conclusion and Recommendations.

5 Summary of results:

The study shows that.

- 72%of the respondents were Male, while 28% were Female.
- 21% of the respondents were illiterate.
- 94% of the respondents were married.
- 74% of the respondents were farmers.
- 61% of the respondents participated in the net, while 39% None-participated in the Net.
- 60% of the respondents their income less than 500SDG.per month.
- The majority of the respondents grew local variety of three crops.
- 51% of the respondents reported that, the main source of local seeds from previous season, while 41%of HH from market and 8% from others.
- 93% of the respondents (57% participant, 36% non-participant) depend on local tools and equipment in land preparations.
- 93% of the respondents (57%participant, 36%non-participant) reported that credit &loan is main problems for them, and were not access to credit information, addition do not have credit guarantee.
- From the study, the results revealed weakness of the Net in the agricultural input provision, Information's sources and weakness in extension services in study area.

The cultural practices:

- 75% of the respondents,(participant and non-participant) reported that, cost of improved seeds very expensive compared to local seed.
- 70% of the respondents (participant and non-participant) reported that, the main source of the technical packages was ministry of agriculture.

- 78% of the respondents (participant and non-participant) reported that, main source of improved seeds, was Ministry of Agriculture.
- 75% of the respondents (participant and non-participant) reported that, they owned their land.
- Total numbers 100% of the respondents (participant / non-participant) reported that, they did not use the crop rotation for the improved varieties.

Cultural practices for improved Sorghum:

- 65% of the respondents (participant and non-participant) reported that, they did not use improved sorghum variety because of high price.
- Majority of the respondents (participant and non-participant) reported that they did not apply all recommended sowing date, seed rate, thinning, weeding, for improved sorghum, while few respondents (participant and non-participant) have had little adoption of recommended innovation.
- 57% of the respondents (participant and non-participant) reported that, they did not use pesticide and insecticide for protection of improved Sorghum because expensive.

Cultural practices for improved Millet.

- 51% of the respondents (participant and non-participant) reported that, they did not use improved Millet variety, because of high price.
- Majority of the respondents (participant and non-participant) reported that, they did not apply recommended sowing date, seed rate, thinning, weeding, for improved Millet, while few respondents (participant and non-participant), have had little adoption of recommended technical packages.
- 61% of the respondents (participant and non-participant) reported that, they did not use pesticide and insecticide for protection of improved Millet, may be due to high prices.

Cultural practices for improved Groundnut:

- 55% of the respondents (participant and non-participant) reported that, they did not use improved Ground nut, because of high prices.
- 55% of the respondents (participant and non-participant) reported that, they did not use recommended pest and diseases control for protection of improved Ground nut crop.
- 48% of the respondents (participant and non-participant) reported that, they found difficulty in adopting innovation for three crops.
- 71% of the respondents (participant and non-participant) reported that, they did not adopt the recommended seed dressing for three crops.
- 58% of the respondents (participant and non-participant) reported that, the improved seed for three crops not available and not accessible for the farmers in study area.
- 63% of the respondents (participant and non-participant) reported that, the pesticide not available and not accessible for the farmer due to low income.
- 61% of the respondents (participant and non-participant) reported that, the insecticide not available and not accessible.
- 62% of the respondents (participant and non-participant) reported that, the seed dressing not available and not accessible.
- 62% of the respondents (participant and non-participant) reported that, the credit and loan not available, farmers have no guarantees.
- 63% of the respondents (participant and non-participant) reported that, the Tools and Equipment not available, not accessible due to high price.
- 70% of the respondents (participant and non-participant) reported that, they have had little benefit from farm visits.
- 71%of the respondents (participant and non-participant) reported that, they have had little benefit from home visits.

- 57% of the respondents (participant and non-participant) reported that, they have had little benefit from Radio and T.V messages.
- 51%of the respondents (participant and none-participant) reported that, they have had little benefit from other communication channel (leaflet).
- 80%of the respondents (participant and non-participant) reported that, they have had little benefit from demonstration farm (pilot farm).
- 57%of the respondents (participant and non-participant) reported that, they did not use seed selection from the field.
- 74% of the respondents (participant and non-participant) reported that, they did not use supplementary irrigation (water harvesting) during the drought period.
- 61% of the respondents (participant and non-participant) reported that, they did not use optimum time for harvesting their crops.
- 70%of the respondents (participant and non-participant) reported that, they did not attend the pest and diseases management training for crops protection.
- 80% of the respondents (participant and non-participant) reported they did not know the kinds and quality of recommended seeds dressing; only 20% knew.
- 75% of the respondents (participant & non-participant) reported that, they did not know recommended time, dose and methods of seed dressing application.
- 73% of the respondents (participant and non-participant) reported that, they did not know the kinds and quality of recommended herbicide for weeds control.
- 70% of the respondents (participant and non-participant) reported that, they did not know the recommended time, dose and methods of herbicide application.

- 70% of the respondents (participant and non-participant) reported that, they did not know the kinds and quality of recommended pesticide and insecticide for crops protection.
- 80% of the respondents (participant and non-participant) reported that, they did not know the recommended time, dose and methods of pesticide &insecticide application.

Test of significance:

- There is no significant association of household age, family size, gender, education level and marital status, on participation in Net, at level o.o5.
- There is significant association of household average income, occupation of household on participation in the Net, at level 0.05.
- There is no significant difference between respondents (participant and non-participant) household heads by adoption of recommended technical packages for improved sorghum crop, by using of improved sorghum variety, sowing date, seed rate thinning, and pest and diseases control at level 0.05.
- There is no significant difference between respondents (participant and non-participant) household heads by adoption of recommended technical packages for improved millet crop, by using of improved variety, sowing date, seed rate, thinning, weeding and pest &diseases control at level 0.05
- There is no significant difference between respondents (participant and non-participant) household heads by adoption of recommended technical packages for improved Ground nut crop, by using of improved sorghum, sowing date, seed rate, thinning, pest &diseases control at level 0.05.
- There is no significant difference between respondents (participant and non-participant) household heads by availability of Agricultural input at level 0.05.

- There is no significant difference between respondents (participant and non participant) household heads, by adoption of some technological innovations of recommended improved seed for three crops, at level 0.05.
- There is no significant association of household heads gender on adoption of recommended technical package of improved variety, at level 0.05**.**
- There is no significant association of household heads age on adoption of use of recommended improved variety, at level0.05.
- There is no significant association of household heads education level, on adoption of recommended technological packages of improved verities of three crops, at level 0.05.
- There is no significant association of household heads age on information sources for adoption of recommended improved varieties of three crops, at levels. 0.05
- There is no significant association of household heads education level on information source for recommended improved verities, at level 0.05.
- There is no significant association of household heads education level on adoption of technology used of seed dressing, pest and disease control, supplementary irrigation (Water harvesting), using of inorganic fertilizer, and adoption of crops rotation for three crops, at level 0, 05.
- There is a significant association of household heads education level on adoption on seed selection (seeds technology)from the field, at level 0,05
- There is significant association of household heads average income on, total cultivated area, training in general farm practices, participation in Net, at level 0.05
- There is high significant association of household heads average income on, use of types of tools &equipment and kinds of cultivated crops, at level 0, 05.

Conclusion:

According to study results, agricultural activities were most dominant practices; majority of respondents were farmers, the agriculture represents the main activity and main source of income and food security for the rural people. The illiteracy very high, family income very low, the respondents dependent totally on local seed, local tools and equipment in cultivating their land, weakness of extension, and Credit and loan services, resulted in low crop production, productivity and average family income, still poverty wide spreading (Poverty zone), among the community in the study area. The rural community suffered a lot of lack of development and security, the majority of the households had no sufficient money to use improved and other inputs for three rain fed cultivated crops, which are Millet, Sorghum and Ground nut, farmers did not use the pesticide and sinsecticide for crops protection, due to high price, also did not use the recommended technical packages for three crops, depended on local tools and equipment for cultivating their land(95%), and absence of the role of credit and loan services in study area, led to low production and low income, to cover their family basic needs and to improve their living standard, which encouraged them to seek another work. Income is an essential element for production and human life; also it is an indicator for measuring of poverty. The deterioration in productivity and unsuitability of current farming system due to variability in climatic condition, land degradation and climatic change. The problem of climatic condition is mainly attributing to the high variability of rainfall in time and space, where land degradation is manifested in decreased soil fertility, low nitrogen and organic matter, enhanced topsoil erosion by water runoff and wind. The Rehaid Elfursan development Net had no significant effect on three crops activities.

Based on findings of the study, the researcher proposed the following:

Recommendations for the Net administration:

- The Net should put higher emphasis on the development of production of three crops, which are, Millet, Sorghum and Groundnut
- To increase the sense of the group work, encouragement of farmers individuals and groups to join social participation, and to organize themselves in units and forming co-operative societies, forming revolving fund and Communities Based Organizations (CBOs).
- To conduct training sessions for farmers to rising awareness, to gain new skills and experiences in various useful activities, by training them in different productive activities, important technical packages, leading to increase production, income & leading to better life.
- Provision farmers with early maturing crops and other agricultural services, it must be reaching and timely available to farmers, to face shortages of food.
- Encouragement of farmers to joint farmers field schools, to visit pilot farm, to attend group's discussions, to listen to Radio &T.V massages
- Attention should be given to women in development programs that enable them to contribute efficiently in improving living standards.

Recommendations for South Darfur state government:

- Increase the institutions of capacity building in rural areas in south Darfur
- Enforcement of legislations that can push and help farmers to gain from credit and loan services and related Banks.
- Coordination between micro-finance services, related Banks such as Agricultural & Farmer Bank to work with farmer under guarantee of Central Bank of the Sudan.
- Encourage farmers to build good relationships between them, Net and Ministry of Agriculture and micro finance institutions.

- Encouraging state government to work in partnership with community Based organization (CBOs), and encourage the whole community to participate in the development activities, therefore in this way there will be wide range of CBOs acting at different projects in different fields.

Recommendations for Ministry of agriculture in South Darfur.

- To promote new and improved technological packages as well as enhance the capacities and skills of farmers to test and assess the technologies implementation on their own farmer .fields, to increase the farmer awareness and understanding of the importance of recommended technological packages
- Establishment of farmer's field schools and demonstration farms (pilot farm), these farms must be among the farmer's field in villages.
- Conduct and organize regular Field days, and series of workshops including key village informants, key official public and private sectors, farmer associations, NGOs, development organization, agricultural extensionists and research institutions, to share experiences and knowledge related to promotion of useful technologies among the farmers field, to exchange views, share experiences with other farmers.
- To increase the farmer awareness and understanding of the importance of recommended technological packages with communication methods.

Recommendations for Credit institution in South Darfur.

- Supporting the Community Based Organization (CBOs), to implement their activities from different sources e.g. micro-financing mechanism
- Coordination between the credit institutions, State Ministry of Agriculture and Net, to conduct extension sessions, provide farmer by extension information.

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Sudan University of science& Technology

College of graduate studies

Questionnaire (1) for the farmer, to be filled by household heads

Household /Farmer identification

1 Village names----------

2 Household head/farmer number ----------

3 Date of interview day ------ month---------- year-----

4 Farmer/household head name ----------

5-Farmer/household head gender Male ( ) Female ( )

6- Farmer/household head age

18-24 ( ) 25-34 ( ) 35-44 ( ) 45 -54 ( ) 55-and over ( )

7 - Farmer/ household head family size.

3-5 ( ), 6-9 ( ), 10 -12 ( ), 13- 15 ( ), 16 & over ( ).

8- Household head Education level.

Illiterate ( ) Khalwa ( ) Formal school years ( ) university or post ( )

9- Household head marital status

Single ( ) Married ( ) Divorced ( ) widow ( ) separated ( )

10- Household head Occupation

Salaried employment ( ) Casual workers ( ) Business ( ) others ( )

11 - Household head Participation in the Net.

Participant Male ( ) Female ( ).

Non- participant Male ( ) Female (

12- Household head/ average monthly income.

Less than 500SDG ( ), 500-900SDG ( ), 901-1200 ( ), More than 1201 ( ).

13 - What is the kind of land ownership?

Owned ( ) Rent ( ) Others ( ).

14- What kind of tools and Equipment do you use for cultivating your farm ?

Local tools ( ) Moderate tools ( )

15 - What are the sources of local seed?

Market ( ) Previous season () Relative ( ) others ( )

16 What are the main sources of improved seed?

Ministry of Agriculture.( ), Agricultural Bank( ), Farmer bank( ),

Net administration ( ), others ( )

17-Do you use the following technical package components for crops?

Improved Sorghum crop.

18- Did you use improved millet variety? Used ( ) Did not use ( ).

19 - What is the best sowing date for improved sorghum crop?

First July ( ) , Mid July ( ), last July ( ).

20 -What is the best time for re- planting for sorghum crop?

After One week ( ), two weeks ( ), Three weeks ( ).

21 -Did you use recommended seed rate- 3-4 kg/Fadden

5-7 seed per hole? Used ( ), did not use ( )

22 - Did you use recommended spacing for sorghum?

Spacing between rows (50cm), and between holes (50 cm)?

Used ( ), did not use ( )

23-Did you use recommended thinning for improved sorghum three seed per hole after two weeks? Used ( ), did not use ( ).

24-Did you use recommended weeding for improved sorghum after 2-3 weeks? Used ( ), did not use ( ).

25-Did you use recommended re-weeding for improved sorghum after4weeks? Used ( ), did not use ( ).

26-Did you use pest and disease control for improved sorghum variety?

Used ( ), did not use ( ).

Improve Millet crop.

27- Did you use recommended improved Millet variety?

Used ( ), did not use ( )

28 -What is best time sowing date for millet crop?

-First July ( ), mid July ( ), last July ( ).

29 -Did you use recommended for re-planting for improved millet crop (a week)? Used ( ), did not use ( ).

30 -Did you use the recommended seed rate 3-4kgs per Fadden and 6-10

Seeds per hole? Used ( ), did not use ( ).

31 - Did you use recommended spacing for improved sorghum75 cm between rows, and 50 cm between holes? Used ( ), did not use ( ).

32-Did you use recommended thinning of improved millet crop 3 seedlings per hole, after 2-3 weeks? Used ( ), did not use ( ).

33-Did you use recommended first weeding for improved millet crop 3-4 weeks? Used ( ), did not use ( ).

34-Did you use recommended re- weeding (second) for improved millet crop?

Used ( ), did not use ( ).

35-Did you use pest and disease control for millet improved variety for protection? Used ( ), did not use ( ).

Improved Ground nut

36-Did you use recommended improved Groundnut variety?

Used ( ), did not use ( ).

37-Do you use recommended sowing date for Ground nut crop?

Used ( ), did not use ( ).

38 -What is recommended sowing date for improved Ground nut crop?

First July ( ), mid July ( ), last July ( ).

39-Did you use re- planting for improved Ground nut crop after one week?

40 -Did you use recommended seed rate for Ground nut, 36 kgs per Fadden and 3-5per hole? Used ( ), Did not use ( ).

41 - Did you use recommended spacing for improved Ground nut, between rows (30 cm), and spacing between holes is (30 cm)?

Used ( ), Did not used ( ).

42 -Did you use recommended thinning of improved Groundnut crop (2-3seedling per hole? Used ( ), Did not use ( ).

43-Did you use recommended first weeding for improved Groundnut crop 2-3 weeks? Used ( ), Did not use ( ).

44-Did you use the re-weeding for improved Groundnut crop after 3-4 after first weeding? Used ( ), Did not use ( ).

45-Did you use pest and disease control for Groundnut improved variety?

Used ( ), did not use ( ).

46- What is the main sources of agricultural technical packages?

1 Ministry of Agriculture----------
2 NGOs ----------
3 .Trained fellow farmers----------
4 Mass media (Radio, newspaper, etc.)
5 Others----------

47- Did you attend training in following components?

A- Pest and diseases control? Trained ( ), did not train ( ).

B- Seed dressing? Trained ( ), did not train ( ).

C- Did you train in Water harvesting (supplementary irrigation?)

Training Trained ( ), did not train ( ).

D- General farm practices? Trained ( ), did not train ( ).

48- Did you adopt the following components for improves varieties (3 crops)?

A - Seed dressing for three crops? Adopted ( ), did not adopt ( ).

B- Crop rotation for three improved crops? Adopted ( ), did not adopt ( ).

49- Do you have got abenefit from the in the following component of information sources?

-Extension agent? Little benefit ( ), no benefit ( ), big benefit ( ).

-Farm visit? Little benefit ( ), no benefit ( ), big benefit ( ).

-Home visit? Little benefit ( ), no benefit ( ), big benefit ( ).

-Pilot farm (Demonstration)? Little benefit ( ), no benefit ( ), big benefit ( )

-Radio &T.V messages? Little benefit ( ), nobenefit ( ), big benefit ( ).

Field Farmer schools? Little benefit ( ),no benefit ( ), big benefit ( ).

50- Did you have taken any credit or loan from Agricultural bank?

Took ( ) did not take ( )

51- What is your total area cultivated in Fadden?

5- 6 ( ) 7 -9 ( ) 10-12 ( ) more than 13 ( ).

52-What kind of crops did you cultivate?

Sorghum ( ), Millet ( ), Groundnut ( ) Sesame ( ) Others ( ).

53-Did you use inorganic fertilizer for three improved crops?

Used ( ), did not use ( ).

54 what is Source of income ?

Agriculture ( ), Agriculture+ small trade ( ), Business ( ).Agric+ other ( ).

55- Availability of seed dressing? Available ( ) , not available ( ).

56- Availability of improved seed? Available ( ) , not available ( ).

57 Did you train on Pest and diseases management training.

Trained ( ) , Did not train ( ).

58- Adoption of recommended packages to improve the production?

Large improvement ( ), little improvement ( ), did not change ( ).

59- Did you use of supplementary irrigation (water harvesting)?

Used ( ), did not use ( ).

60- Did you use re-control for pest and disease for three crops?

Used ( ) , Did not use ( ).

61- Do you know the important of the recommended technical packages for three Crops? Knew ( ) Don`t know ( )

62- What are the major sources of agricultural information ?

Extension agent/ ministry of Agriculture ( ), Extension worker/ net ( ),

Neighbor farmers ( ), Mass media ( ).

63- Do you have benefit from the information sources (Ex agent)?

No benefit ( ), little benefit ( ), Big benefit ( ).

64- Did you use the crop rotation?

Used ( ), did not use ( ).

65- Did you use the crop rotation for three crops?

Used ( ), did not use ( ).

66- Did you use intercropping in your area?

Used ( ), did not use ( ).

67- Complexity of adoption of three crops?

Difficult ( ), easy ( ), very easy ( ).

68- Compatibility of recommended technical packages with agricultural system?

Very compatible ( ), compatible ( ), not compatible ( ).

69- Did you use re-weeding for improved three crops?

Used ( ), did not use ( ).

70- Did you use herbicide for weeding for three crops?

Used ( ) , Did not use ( )

71- Availability of pesticide & insecticide? Available ( ), not available (.)

72- Yield from improved Sorghum?

Very high ( ), High ( ), No difference ( ), Low ( ).

73 Did you know the recommended kinds and quality of seeds dressing?

Knew ( ), did not know ( ).

74 Did you know the recommended time, dose and methods of seeds dressing application? Knew ( ), did not know ( ).

75 Did you know the recommended kinds and quality of herbicide for weeds

control? Knew ( ), did not know ( ).

76 Did you know the recommended time, dose and methods of Herbicide application? Knew ( ), did not know ( ).

77 Did you know the recommended kinds and quality of pesticide & insecticide? Knew ( ), did not know ( ).

78 Did you know the recommended time, dose and methods of pesticide & insecticide? Knew ( ), did not know ( ).

79- Yield from improved Millet?

Very high ( ), High ( ), No difference ( ), Low ( ).

80- Yield from improved Ground Nut?

Very high ( ), High ( ), No difference ( ), Low ( ).

81- Yield from local Sorghum?

High ( ), low ( )

82- Yield from local seed of Millet?

High ( ), low ( ).

83- Yield from local Ground Nut?

High ( ), low ( ).

84 Have confidence in improved seed?

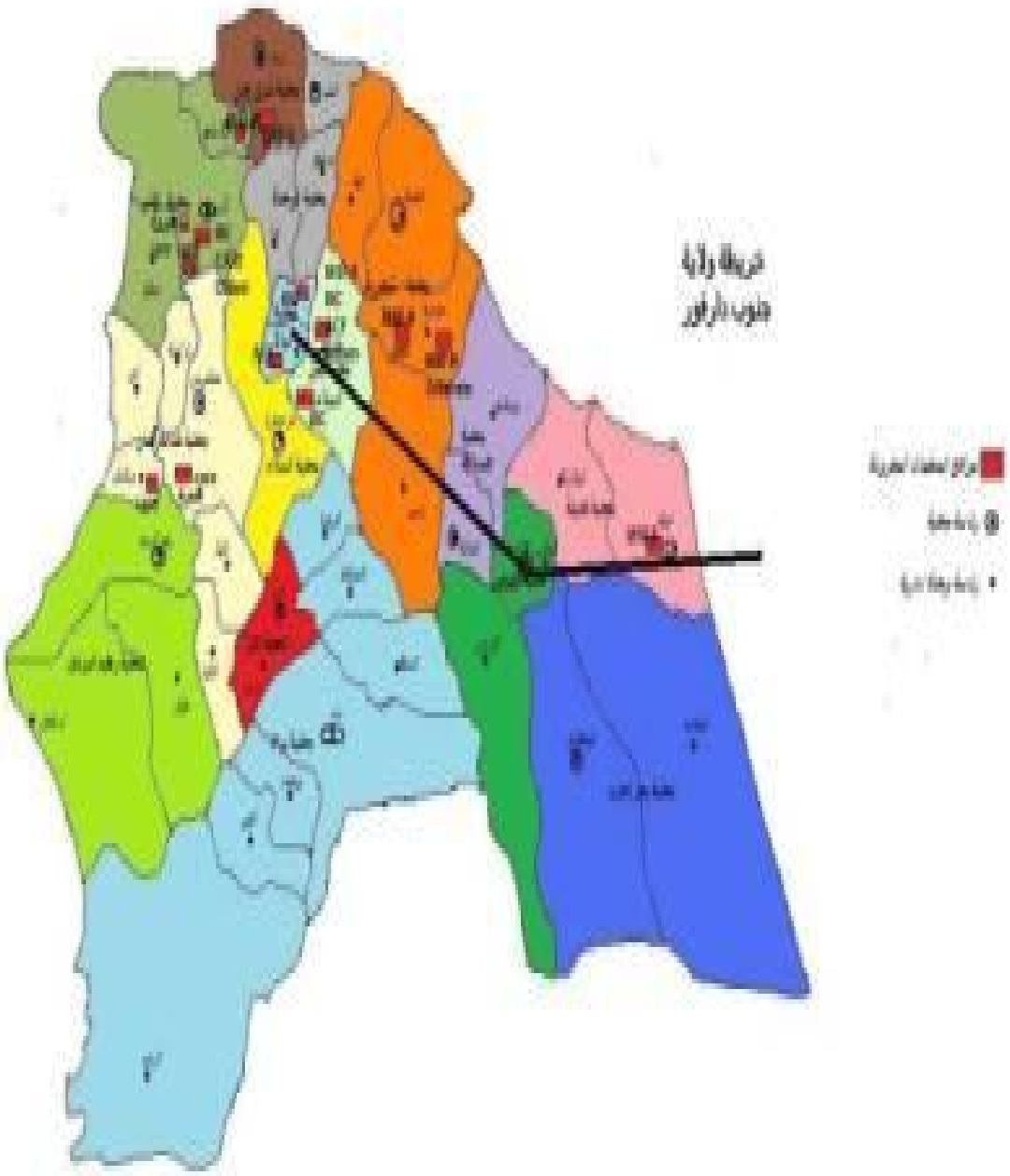
Very high confidence ( ), high confidence ( ),

Confidence ( ), Confidence to some extend ( ).

Sudan map


Northern
Red Sea
Nile
Khartoum
Kassala
Northern Darfur
Northern Kordofan
El Gezira
Gedaref
White Nile
Sennar
Western Darfur
Southern Darfur
Southern Kordofan
Unity

South Darfur state map.

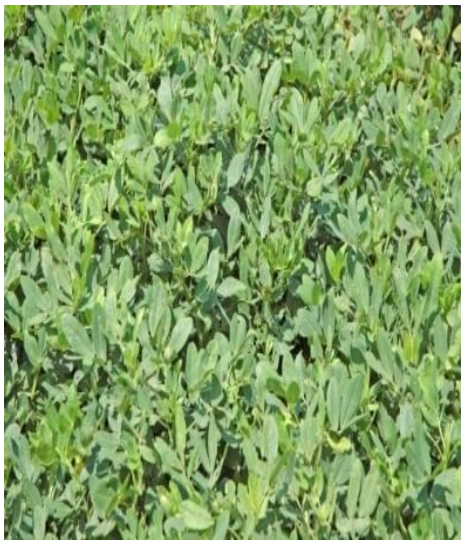


Sorghum plant

sorghum seeds (head)

Millet seeds

Millet plant



Ground nut plant

Ground nut seeds