



Sudan University of Science and Technology

Collage of graduate Studies

**Impact of the Grassroots Participation on Adoption and
Distribution of Improved Onions Seeds - Jebel Marra Project**

أثر المشاركة القاعدية في تبني وتوزيع البذور المحسنة للبصل بمشروع جبل مره

A thesis submitted for the Fullfilment of the Requirements for Ph.D Degree,
Doctor of Philosophy in Agricultural Extension & Rural Development

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الإستهلال

قوله تعالى: { وَإِذْ قُلْتُمْ يَا مُوسَى لَنْ نَصْبِرَ عَلَىٰ طَعَامٍ وَاحِدٍ فَادْعُ لَنَا رَبَّكَ يُخْرِجْ لَنَا مِمَّا تُثْمِتُ الْأَرْضُ مِنْ بَقْلِهَا وَقِثَائِهَا وَفُومِهَا وَعَدَسِيهَا وَبَصَلِهَا قَالَ أَتَسْتَبْدِلُونَ الَّذِي هُوَ أَدْنَىٰ بِالَّذِي هُوَ خَيْرٌ اهْبِطُوا مِصْرًا فَإِنَّ لَكُمْ مَّا سَأَلْتُمْ وَضُرِبَتْ عَلَيْهِمُ الذِّلَّةُ وَالْمَسْكَنَةُ وَبَاءُوا بِغَضَبٍ مِنَ اللَّهِ ذَلِكَ بِأَنَّهُمْ كَانُوا يَكْفُرُونَ بِآيَاتِ اللَّهِ وَيَقْتُلُونَ النَّبِيِّينَ بِغَيْرِ الْحَقِّ ذَلِكَ بِمَا عَصَوْا وَكَانُوا يَعْتَدُونَ. (سورة البقرة الآية: 61).

Dedication

I'd like to be remembered not just for my academic accomplishments -although I'm happy with those – but, as being someone who left the world a little better than when I came into it. And the fact my main theory, (Diffusion and Adoption of Innovations) was a means of bringing about change. That's very important to me, the fact that my life time put me in the position to help other people, I see just how strong that is. So I'd say my greatest satisfaction is in the relationships that I developed with people and how they lasted over the years, nevertheless this work is dedicated:

- ❖ To my father Soul (Gumaa Kereng)
- ❖ To My mother (Hawa)
- ❖ To My brothers Mohammed, Abduelaziz, Abduelatif and Abduelrazig
- ❖ To Sisters Thuriya and Bahria
- ❖ To My sons Mohammed, Ahamed and Omer
- ❖ To my daughters Tassneem, Tanzeel and Tassabaih
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ABSTRACT

This research is an attempt to assess the impact of grassroots participation on the adoption and diffusion of agricultural innovations packages (**especially improved onions seeds**) at Jebel Marra Rural Development project, Central Darfur State-Sudan. Moreover to assess the effect of personal characteristics: mainly: education and social status on the adoption of innovations, In addition to agricultural extension Services and programme. The Study selected Jebel Marra area and focusing on the area around Zalingei as the head quarter of the project. The presence of the same target community previously settled. But now are internally displaced persons (IDPs), and practice agricultural process by different methods. Number (200) was selected as respondent's farmers. Stratified sample with geographic direction and accidental by individuals 10% from the total studied population, which amounted approximately (2000) farmers in the state level. Furthermore the study area was divided into three sectors as follows: Zalingei, Wadisalih and Jebel Marra. Then the primary information is gathered to fulfill the study requirements through interviews and field visits to farmers' fields, with the use of questionnaire designed and reviewed for that purpose. The secondary information obtained from several sources related to the subject of study. Although statistical methods to analyze the information: statistical packages for social sciences (SPSS) are used, included frequencies and percentages. The study realized that two thirds of the respondents in displacement camps and agricultural lands within the lease systems, limiting the participation of women in agricultural work.

The study also finds out that there is especially: in the area of cultivation of onions agricultural expansion despite, the high cost of the means of production such as “improved seeds, irrigation tools and agriculture mechanisms.

The study also found that farmers are aware and skillful enough to continue the transfer of technologies as Agricultural Knowledge and Information System

(AKIS). This newly acquired knowledge and expertise through their participation in the project activities in the former resettlement sites or origin homeland (villages). The study recommended that: continuous support for Jebel Marra Rural Development Project. Promotion of agricultural extension services to expand the area of coverage, and strive to provide improved seeds locally, as well as providing the means for irrigation aids and pest control. Development of good relationship between local, regional and international funding agencies.

ملخص البحث

البحث هو محاولة للتعرف علي مدي المشاركة القاعديه وأثره علي إنتشار وتبني الحزم والمستحدثات الزراعيه (خاصة البذور المحسنه لمحصول البصل) بمنطقة مشروع جبل مره للتنميه الريفيه - ولاية وسط دارفور. زيادة علي ذلك معرفة أثر الخصائص الشخصية: من تعليم والوضع الإجتماعي علي التبني مع تأثير خدمات وبرامج الإرشاد الزراعي في ذلك. تم إختيار منطقة مشروع جبل مره بالتركيز علي المنطقه المجاوره لمدينة زالنجي بحكم وجود رئاسة المشروع ووجود نفس المجتمعات المستهدفه سابقا الآن في معسكرات النزوح وممارسة مهنة الزراعة بنظم مختلفه. تلي إختيار عدد (200) مزارع كمبحوثين. العينه طبقه بالإتجاهات الجغرافيه وصدفيه بالأفراد بنسبة 10% من جملة مجتمع الدراره والتي بلغت بالتقريب (2000) مزارع. حيث قسمت منطقه الدراره إلي ثلاثه مناطق هي: زالنجي, وادي صالح وجبل مره.

حيث تم تجميع المعلومات الأوليه للدراره عن طريق المقابلات والزيارات الميدانيه لحقول المزارعين, مع إستخدام صحيفه الإستبانه التي صممت وروجعت لذلك الغرض. أما المعلومات الثانويه تم الحصول عليها من عدة مصادر لها العلاقه بموضوع الدراره. كما تم إستخدام الطرق الإحصائيه لتحليل المعلومات بواسطه برنامج الحزم الإحصائيه في العلوم الإجتماعيه, (SPSS) حيث تضمن التحليل الجداول التكراريه والنسب المئويه. خلصت الدراره بأن 3/2 من المبحوثين في معسكرات النزوح والأراضي الزراعيه داخل نظم الإيجار, مما حدّ من مشاركة المرأه في العمل الزراعي حاليا. وكذلك أكدت الدراره بأن هناك توسع زراعي خاصة في مجال زراعة البصل رغم إرتفاع تكاليف وسائل الإنتاج مثل: التقاوي, أليات الريّ والفلاحه

أيضاً الدراسة أفادت بأن المزارعين علي درايه كافيه للإستمرار في نقل التقانات لرفائهم الآخرين. مما إكتسبوه من معارف وخبرات من خلال مشاركتهم في أنشطة المشروع في مواقع إستقرارهم سابقاً بفعاليه فيما يختص بتوصيل المستحدثات الجديده للمزارعين. أوصت الدراسة علي حسب النتائج التي أظهرتها " الإستمرار في إيجاد فرص الدعم لخدمات وأنشطة مشروع جبل مره للتميمه الريفه خاصة توسيع خدمات الإرشاد الزراعي، والسعي علي توفير البذور المحسنه محلياً، وكذلك توفير وسائل الريّ ومعينات مكافحة الآفات الزراعيه. وكذلك السعي لتحسين العلاقه في المساهمات الماديه والعينيّه ما بين المشروع و جهات التمويل الإقليمي والدوليّه.

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List of Abbreviations

AKIS	Agricultural Knowledge and Information System
HTS	Hunting Technical Services
ADS	Area Development Schemes
EEC	European Economic Countries
SFAC	Small Farmers’ Agribusiness Consortium – India
IMF	International Monetary Fund
CDS	Central Darfur State
IDPs	Internally Displaced Persons
GDP	Gross Domestic Products
TDA	Top down Approach
B up A	Bottom up Approach
UN	United Nations
AIP	Agricultural Innovations Packages
JMRDP	Jebel Marra Rural Development Project
RDC	Rural Development Context
BR	Bounded Rationality
EEI	Embodied Exogenous Innovations
PDAMI	Packages of disembodied agronomic & managerial innovations
HYV	High Yield Varieties
GR	Green Revolution
ICT	Information Communication Technology
MDGs	Millennium Development Goals
DoI	Diffusion of Innovations
ID	Instructional Development
ERP	Enterprise Resource planning
FTC	Financial Technology Consortium

EAI Enterprise Application Integration
CBR Community Based rehabilitation
NGOs Non- Governmental organizations
AES Agricultural Experiment Station
SAES State Agricultural Experiment Station
IARCs International Agricultural Research Centers
LDC Least Development Countries
ADB Asian Development Bank
PRSP Poverty Reduction Strategy Papers
DFID Department for International Development
ODA Official Development Assistant (Japan)
BHN Basic Human Needs
UNDP United Nations Development Programme
HDI Human Development Indicator
ILO International Labour Organization
SARD Sustainable Agriculture and Rural Development
CSD Commission on Sustainable Development
FAO Food and Agricultural Organization
RRA Rapid Rural Appraisal
PRA Participatory Rural Appraisal
PAR Participatory Action Research
IPGRI International Plant Genetic Resources Institute
ARC Agricultural Research Corporation
UNFPA United Nations Population Fund
PHC Primary Health Care
WHO World Health Organization
WCARRD World Conference on Agrarian Reform and Rural Development
SPSS Statistical Packages for Social Sciences

CHAPTER ONE

Introduction

1.1 Background:

Rural Development has a broad history in European Countries and it developed in Africa through three stages: community development, Green revolution and integrated rural development, (WB, 1992). Participation by the people in the institutions and systems which govern their lives is basic human right and also essential for realignment of political power infamous of disadvantaged groups and for social and economic development. Rural development strategies can realize their full potentialities only through motivation, active involvement and organizations at grassroots level of people, with special emphasis on the least advantaged, In conceptualizing and designing policies, programmes and creating administrative, social and economic institutions, including cooperative and other voluntary forms of organizations for implementing and evaluating them (FAO, 1977). Rural development has a long history in the Sudan, some research indicated that year 1958 two years after the independence in 1/1/1956. The first development projects started at that time as an example are: Sag Elna'am Project, Jebel Marra Rural Development and Nubba Mountain project, under the policy of top down approach. Jebel Marra Rural Development (1980-96) started and evaluated by Hunting Technical Services (HTS) after sixteen years on operation. That followed by Area Development Schemes, (ADS, and 1990-02). Which covered five areas in the Sudan as follows: Oumkadada, Edelfersan, lower Atbara, Kassala and villages around ELobbied, North Kordofan, through bottom up approach depended on Participation mechanisms and considered that process as a key element to share local communities in all stages of the project like: (planning, implementing, monitoring and evaluation.

1.2 Statement of Research problem:

The delivery of Development was started in the Sudan at about 58/1959, but the western Region which mainly consist Kordofan and Great Darfur, by definition are geographically and developmentally marginalized. Furthermore due to the previous studies the preparatory research which covered the foundation of resources define very good information basement which facilitated and contributed for area foundation which enable the Jebel Marra Rural Development Project started within. The period of time (58/1959) referred as an experimental or trials period, done by the efforts of National Public Research Cooperation (Wadmadani), Ministry of Agriculture - Sudan. *(Act Horticultural Technical Communications of International Society for Horticultural Science Eighth African Symposium on Horticultural Crops Wadmadani, (ISHS) Sudan 20-24 March 1983 No143 April 1984).

All development plans at that time followed the trickledown or top down approach (TDA) that doesn't need to participate the targeted groups or beneficiaries, but the united nations (UN) after world second war (1945), from the year 1995 when (50) years was passed the (UN) evaluated and reassessed the development policies and strategies, which followed by another system called Bottom up approach (B up A). Implemented and tested on the ground level in great Darfur simultaneously consist: Oumkadada and Edelfersan, known as Area development Schemes (ADS). Successfully this policy will be adapted if allow to be adopted by the official institutions and development projects. Because the characteristics of this approach is, started from the grassroots with the community base which can progress its impact on the adoption and diffusion of innovations like improved onion seeds introduced in the area of study consist onion varieties (Bafteam and Amreaki local name).

1.3 Research Problem:

Community Participation is a development approach formulated from the traditional top-down approach that has characterized and plagued so much development work in many developing countries is now being slowly replaced by a bottom up approach which embodies a set of methodologies, attitudes as a way of work with the communities (**Shadia, 2007**).

The problem of the rural poor in the final instance cannot be solved by anyone but themselves, and all solidarity efforts must be aimed at strengthening their own capacity for independent action (**Seth, 1993**). Participation is an essential part of human growth that is the development of self confidence, pride, initiative, responsibility, cooperation, without such a development within the people themselves all efforts to alleviate their poverty will be immensely more difficult, if not impossible. This process, where by people learn to take charge of their own lives and solve their own problems, is the essence of development, the word participation has become a catchword, (Cohen and Up Hoff, 1977).

Jebel Marra Project start at the same time in all its coverage area, but adoption and diffusion of improved Onion seeds, as essential part of Agricultural Innovations Packages (AIP). The project activities started seimilitainously, but not well distributed and disseminated as well as expect. In Zalingei onion practice more than Wadisalih and Nyertete district.

What the challenges and constraints that barrier between the community and innovations provision by the project to be adopted and diffuse similarly.

1.4 Research Importance:

Agriculture is the backbone of the economy of the Sudan as mentioned before it's a world food basket, furthermore above 80% of the Darfur people depends on its practice due to the indigenous and traditional experiences of the community

income either by rain fed or irrigated agricultural practices. So due to the livelihoods and higher in need of life standard and income promotion, on the other hand it's crucial to accept the new technology out comes to increase the nation's Gross Domestic Product contribution / annum (GDP) which encourage the community to adopt and diffuse the Agricultural Innovations Packages or Technology Transfer to empower the relationship between extension workers, government institutions and research centers which benefited the farmers **vice – verses**. Keeping on the continuous progress and succession of knowledge and the technology to be generated based on the local improvements of assets which can be defined and modified as intermediate technology that will be adapt to the local environment and socially encourage their acceptance among the community themselves in addition to encourage the winter season cash crops growers in the area to contribute in the development of their income increased with better life standard and welfare.

1.5 Objectives of Study:

The main aim of this study is:

*To assess the level of grassroots participation on the adoption and diffusion of improved onion seeds in the area of the Jebel Marra Rural Development project and discover the reasons that affects the practices of improved onion growing in Zalingei sector more than Wadisalih and Nyertete districts.

The detailed objectives of the study are to:

- * Assess the level of Grassroots participation in the project activities concerning improved onion seeds.
- *Assess the adoption rate of improved onion seeds in (**JMRDP**), to emphasis on how much the participation factor affect the adoption & diffusion of improved onion seeds.

*Identify the factors which affect the process of adoption and diffusion of improved onion seeds in (**JMRDP**) around Zalingei more than other districts.

*Consider participation element from the grassroots community organizations base in (**JMRDP**).

* Come out with recommendations that will develop, encourage and strengthen the rural community participation in the project area to adopt and diffuse the improved onion seeds effectively in (**JMRDP**) area.

1.6 Research Questions as followed:

- ✓ What extent Jebel Marra Rural Development Project followed participation approach to facilitate the adoption and diffusion of improved onion seeds?
- ✓ What extent Jebel Marra Rural Development Project is essentially based on the top down approach mechanism to provide agricultural packages improved onion seeds?
- ✓ How much the previous studies and considerations concern the project area foundation completed by HTS, as a preparatory resources identified contributed of the project succession?
- ✓ How much Community participation approach is not accompanied as packages of the project policy regarding adoption and diffusion improved onion seeds at the project area?

How much Extension work mechanism used as a key element for the project contribution to realize its objectives and goals in the field of vegetable cash crops provided mainly potato and improved onion seeds.

1.7 Research Hypothesis:

- ✚ The whole area of the project has the indigenous characteristics that influence the acceptance of the project objectives during its implementation.
- ✚ The indigenous Knowledge among local communities encourage them to participate effectively in onion practices and activities that affect the adoption and diffusion the agricultural innovations packages mainly improved onion seeds.
- ✚ The project ideas were sustained due to its operational aims, and timely implementation process was carried on the exact period of time.

1.8 Variables of Study:

Independents	Dependents
Personal Characteristics:	<ul style="list-style-type: none"> • Innovation packages introduced • Communication Channels used • Training methodologies • Client Selection • Time
• Gender	
• Age	
• Education	
• Social Status	
• Land ownership	
Project Activities:	<ul style="list-style-type: none"> • Agricultural Inputs provided • Community development centers • Define of targeted Community • Ways of Technology Transfer • Monitoring &Evaluation Tools
• Extension Services	
• Income Generating Activities	
• Provision of Social Services	
• Education through Innovation Messages Prepared & delivered	
• Field visits and Demonstration	

1.9 Operational definition of research variables

A/ Independent Variables:

-Gender:

Means, Male or Female which socially plays a complementary role to fulfill their basic needs for the long run of life.

-Age: It means, the duration from the birth date until the present moment you, or person live.

-Education: It's a system either formal, informal, traditional or modern. Which contribute for people learning and build their skills and capacities organized by specialist and official institutions?

- Social status: it is a rank among the community classifying them into certain levels with social relations appearance for both gender to build family nuclear for keeping their life sustainability ongoing. Furthermore holds responsibilities to play positive roles.

- Land owning: it is the personal right to own land either inherits or pay to have social right on without rental for multi-practices.

- Extension Services: One of the packages that needs specialist to deal with, plans, implement, monitor and evaluate under the institution policy.

-Income Generating Activities: programmes that will be structured or organized for the targeted population for their life stander improvement.

-Provision of Social Services: it means the three components (health, water and education services) in addition to security.

- Education through Innovation Massages Prepared & delivered:

It is packages of education methodology prepared for adult education to deliver the new technology transfer.

- **Field visits and Demonstration:** it is regular method of field visits supervised by extension assistant and subject matter specialist. In addition to trials farms that emphasize the innovations knowledge.

B/ Dependent Variables:

***Innovation packages:** All new material and non material introduced for the community as example: knowledge, new agricultural inputs and new cultivation practices in addition to crop protection requirements...etc?

***communication channels:** All material component as an example, Mass media, radio, TV, books, News papers, reports, and written message. In general any accessories contribute to deliver whatever means as a new technology it classifies under communication channels.

* **Training methodologies:** Methods and techniques used to transfer knowledge to community which is adapted to their condition example non formal education system which is suitable for adult education.

***Client Selection:** the targeted people under consideration were clients to be part of plan from the preparatory until end by evaluation.

***Time:** it is duration of time either short or long that followed the projects from start until the end of the period.

* **Agricultural Inputs:** All tools, seeds, insecticides and cultivation machines considered as agricultural asset.

***Community development centers:** centers that established for activities followed to benefit the targeted community.

* **Targeted Community:** the community under coverage of whatever the programme with the agreed objectives known as target community.

***Ways of Technology Transfer:** it is the approaches followed for the delivery of the new technology to the community either, through media, training and workshops or seminars ...etc?

***Monitoring &Evaluation Tools:** it is a system followed either, to build a data base of structured questionnaires form or direct interviews for the beneficiaries in addition to observation by remote sensing methods to consider the impact of whatever the project within certain period of time.

1.10 Organization of Study:

The study consist five chapters, introduced by chapter one introduction, Chapter two literature review, chapter three study methodology, chapter four results and discussion, chapter five summary of results, conclusion and recommendations attached with appendix, references, questionnaire, maps and field pictures.

1.11 Justification of Study:

The Jebel Marra Rural Development Project was a major programme of rural development in Jebel, Zalingei and Wadisalih Districts of what is now Central Darfur State: an area approximately equal 1,020km² (634mi²) and 28687 people. Between 1980and 1996, Government of Sudan and the European Economic Community) shared funding the project with (27% for Sudan Gov and 73% EEC) to carry out agricultural research, build rural infrastructure and provide extension and community development services. With over 60 extension stations established, it had a level of direct contact with the rural community which Darfur had never seen before. Throughout its life, the project's Monitoring and Evaluation Department carried out wide ranging surveys of rural livelihoods to guide the work and assess its impact.

In **Agriculture** a very detailed picture of the skill with which Darfur farmers manage different soils, crops and varieties to make the maximum benefit from the

rains and their own labor. A key lesson is the need to look beyond drought and food security. In some years, pests are a bigger threat and cash crops are a major element in most livelihoods. Darfur livelihoods depend on making the maximum out of a good year more than on defending against a bad one. Varieties that yield a large crop when there is a lot of rain are at least as important as varieties that can survive a drought.

In Land Tenure or used the vast majority of cropped land is owned by the farmers and the rest is borrowed without charge. Renting is almost non-existent. More than half the farmers had fallow land - equivalent to more than 50% of their cropped land. The main reason for not cropping fallow was lack of labor and cash to hire labor.

For those seeking to understand and help Darfur in 2008, this report from 20 years earlier offers an in-sight into how Darfur livelihoods might look during more normal times; especially so as it fell in the relatively short window between the drought and famine of 1984/85 and the first outbreak of serious tribal conflict in 1987 ended with a comprehensive peace agreement in 1989 Elfasher. And due to the Impact of rural development project mainly JMRDP, through its long run during implementation period what had been done is successfully extreme to the aims that they should prioritize for small scale rural famers life improvement.

This project actually faced challenging and constraints, either tribal conflicts or environmental changes characterized with desert and desertification in (1984/85). So for the benefits gain from the project by rural community, either stability and coexisting living. In general this study willing to bring sth back the views of researchers and decision makers to focus positivity to initiation that will improve the project that previously contribute for the settlement of the rural community and socioeconomic development preferable. As well as the recent Darfur crisis since 2003 influence for most of the project activities and infrastructure damaged.

But those farmers whom were farming in the secure areas of the project will follow the same practice rising up their living standards. More efforts from federal and state level institutions is highly requested to encourage rural community for better production. With effective use of agricultural innovations as new technology packages through adoption and diffusion process.

The study fostered and summarized this justifications:

- ✓ What have been done by the JMRDP must be given a chance to sustain and fulfillment the gap of development.
- ✓ The traditional agriculture practice was replaced by the modern one (mechanized) with the expansion of the new area.
- ✓ For the food security reason due to environmental changes and socioeconomic rise up the community change their agricultural practice behavior and attitudes.

1.12 Limitation of the Study:

The initial project established in 1980 a joint venture between the government of Sudan 27% and contribution of the European Economic Community (EEC) by 73%. The total cost equal 40 million dollars for the coverage of the project area which is 35 thousand km². Allocated between latitudes 10.5 and 13.5 north and longitude 22.5 and 24.5 east longitude. Nine Localities are now authorize as well as Central Darfur State boundary consist as whole.

Target crops are :Millet – Dura and fruit, where the second phase during the past 87-1992. Annexation of the project since its inception three council areas in South Darfur province then (South and West Darfur State).

From 2012 the project area is covering the nine localities of Central Darfur State.

The study focused on the project area which is defined as three sectors as (Zalingei, Wadisalib and Nyertete). Through sample selection the area is divided

representatives in three sectors (A, B and C) according to the presence of the IDPs farmers in these localities added with two sub units by each locality. And results generalized for the considered sample of targeted population emerge in one bundle to explain the state level sample.

Chapter Two

Literature Review

Part one: Definitions and concepts:

2.1.1 Grassroots:

It's a minimum basement of everything relevant to the community work that should be under consideration together, if the issues are related with the community priorities or basic needs. They involved starting successfully to be benefited if it's begun with the share of ideas among communities targeted to encourage the integrated development programmes matched from the grassroots level together.

Therefore the researcher emphasis that the community participation has very broad preponderance and role to play in the acceptance of the new technology adoption and diffusion of agricultural innovation packages, if they share the ideas and views about it with benefiting community, (researcher, 2014).

2.1.2 Participation Concept:

The concept of participation in development activities is certainly not a new one. According to Caroline, in rural development, community participation has been recognized as an essential component at least since the early 1950s, (Moser, Caroline O.N.1987).

2.1.3 Principles of rural development programmes

Rural development emerged as a distinct focus of policy and research in the 1960s and gained full momentum in the 1970s, as observers increasingly realized that, whilst economic growth and industrialization were important, rural areas and rural development had important and different roles to play in a country's development.

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, including 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.

2.1.4 Implemented principles for rural development programmes:

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

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 are suitable to the local environment have greater success.

Going forward: Technological aspects of rural development programmes it should help the farmers to take the second step in the development and not demand that, they will take a huge technological leap to jump for the integrity of local situation.

It is better to secure the modest advance which can be sustained than to suggest the substantial advance which is beyond the ability of most of the beneficiaries' siege.

Participation: Always try to consult the local people, seek out their ideas and involve them as much as possible in the programme voluntarily without force.

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.

2.1.5 The value of grassroots participation:

An emphasis on participation has links with the interest of democracy in community organization and in self-help and political incorporation in the community development tradition.

But what is community participation? **Community participation:** In the late 1960s there was a series of debates around 'participation' (see, for example, Pate man 1970). While 'participation' may be a vague term (not clear) its advocates often rely on two key arguments about its value:

It Makes for justice in decision-making - people have some say in, and influence on, collective decisions. It Has an educative value. Through participation people learn (Beet ham 1992).

These interests became formalized in a number of United Nations reports including Popular Participation in Development (1971) and Popular Participation in Decision Making for Development (1975).

According to Medley et al (1986: 23) the notion of popular participation and that of community participation are interlinked. The former is concerned with broad

issues of social development and the creation of opportunities for the involvement of people in the political, economic and social life of nation.

The latter connotes the direct involvement of ordinary people in local affairs'. One United Nations document (1981:5) defined community participation as: The creation of opportunities to enable all members of a community to actively contribute to and influence the development process and to share equitably in the fruits of development. This is a very general definition and raises as many questions as it answers. As with other traditions of community intervention the theoretical base for the work is relatively patchy (see Abbott 1996). There is material around the context and the specific problems within different societies; and there is a longstanding tradition of writing around political theory. However, much of what is written around process remains at the level of 'practice wisdom' and is not worked into a wider ranging framework.

2.1.6 The background of participation and rural development

Historical agricultural development:

Agriculture developed roughly 10,000 years ago at several sites with planned sowing and harvesting of plants, and has rapidly expanded since then. New technologies and crops have been integrated. Long ago developed practices have made great strides in the last centuries. Global exchanges of local crops and breeds have opened new opportunities. By the 1800s yields per area unit were considerably higher than in the middle ages. Mechanization in the 19th and 20th centuries, introduction of inorganic fertilizers and pesticides, often irrigation and the gradual emergence of high yielding varieties of major cereals, have contributed to impressive production increases that matched or exceeded population growth. Production increases were the combined outcome of expansion of cultivated area

and productivity enhancement; the latter often associated with the term the Green Revolution (**GR**).

Growth in yield potential of major cereals and actual productivity increases are now tapering off. Following the great attention to climate change, agricultural price spikes and energy concerns, future global food security has again become an issue of concern. The production increases made possible by the GR are widely credited to have avoided Malthusian hunger scenarios and allowed the world population to grow to current 7 billion. By 2050 crop, livestock and meat production would in value terms have to increase by 66.75 and 85 % respectively compared with 2007/05 (Amplly illustrated in the FAO Expert meeting on How to feed the world in 2050) to meet the growth of demand from higher population (9.1 billion, medium variant, UN 2009) and income. This per se is a challenge, compounded by altered production prospects caused by climate change (higher temperatures, altered precipitation level, and seasonal distribution), competition for land and water, and uncertainties about future energy availability and costs.

Part of the production increase would result from marginal expansion of cultivated area, but with qualifications regarding type of production such areas can sustain. Analyses of how actual productivities of major crops can approach attainable yields, and how potential yields can be further augmented breath a cautious optimism (Fischer et al 2009). However, considerable investments and radically new approaches are required for agriculture to deliver.

2.1.7 What the Development Mean?

Most countries in central and South American have been independent for well over 100 years. It is now over 40 years since India and the other countries of the subcontinent had gained their independence, and 25 years since most of the new countries of sub-Saharan Africa had joined the United Nations as independent countries. By the end of colonialism, expectations were high that the former

colonies had an experience period of rapid economic growth and positive social transformation.

The post-war recovery of Europe with assistance from the U.S. Marshall plan, as well as the Japanese development miracle, had led economists and statesmen to foresee the possibilities of similar progress in third world.

Spurred on by the independence movements throughout Asia, Africa and the Caribbean islands, as well as Cold War maneuvering, development assistance agencies and programmes were established during the 1950s. The decade beginning with 1960 was declared by the UN as the Development Decade: the 1970s became the second Development Decade. Significantly, the 1980s were not declared the third Development Decade (although the women's Decade is over and we are presently nearing the end of the water Decade). However, despite all of these decades, the higher expectations for development and the eradication of poverty have not been fulfilled.

During the 1950s, economists, political scientists and others began directing their attention towards the practical and theoretical problems of development in the third world countries, they called, the underdevelopment countries.

Since then, thousands of scholarly papers, articles and books have been published. Magazines on all aspects of development studies and research have been found, and theories of economic and social development have proliferated, a whole new jargon as well as a jet set here grown up.

Discussions on development are peppered with expressions like; modernization; community development; dependency theory; structural adjustment; eco-development ;appropriate technology; self-reliance; participation; women in development;(now called gender awareness) and vulnerable groups.

2.1.8 Theories of Development:

The field of development studies is a veritable jungle, inhabited by theories, counter- theories, approaches, paradigms and programmes of all sizes, shapes and colors.

Modernization- development through growth:

Development workers living and working in rural areas of the third world, in particular, examines what is meant by human, economic, political and social development as these apply to rural communities.

Development was seen essentially as a question of increasing gross levels of savings and investment (internal and external, private and state) until the economy reached a take-off point in to self- sustaining development.

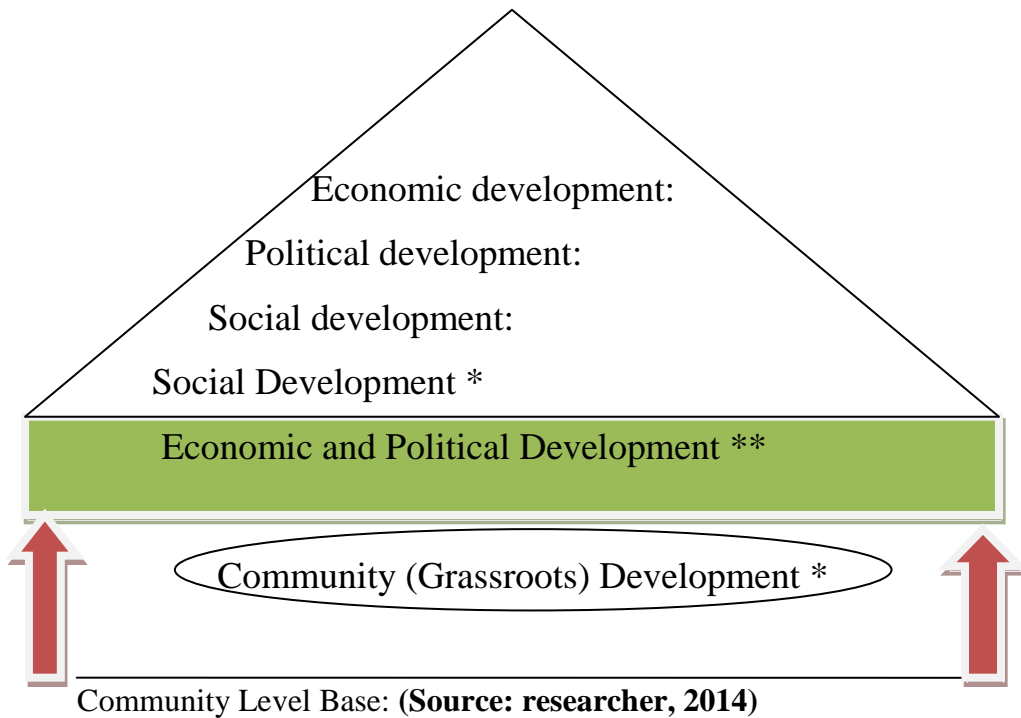
Development from Below- people First:

Development must therefore be seen as a process evolving gradually over time. Development will necessarily involve the use of physical, financial and human resources.

2.1.9 Priorities & strategies for development from below-people First:

*Human (personal) development: is a process by which an individual develops self –respect, and becomes more self- confident, self-reliant; cooperative and tolerant of others through becoming aware of his / her shortcomings as well as his / her potential for positive change. This takes place through working with others, acquiring new skills and knowledge, and active participation in the economic, social and political development of their community.

2.1.1o Community Development Structure simple (HUT) building in rural area



- *Formulation of Participation Approach is needed
- ** Formulation Priorities and Strategies will need to follow these processes on the base of the above participation structure.

The importance of extension: Within the framework presented in this chapter, the concept and practice of the central issue of this guide must now be examined: 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 change and improve the lives of the farmers and their families. Extension, therefore, is of a critical importance. Without it, farmers would lack access to 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: KNOWLEDGE « COMMUNICATION « FARM- FAMILY

Extension is not concerned directly with generating knowledge; that is done in specialized institutions such as agricultural research centers, agricultural colleges and 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 programme and project level, who is in direct contact with farmers and their families. To do this extension work, agents have to be trained in 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 for any agent who wishes to work with farmers.

2.1.11 Community Development Principles:

Community development: Everyone has a valuable contribution to make community members join in at any level. Volunteers and community members are integral to the decision-making, evaluation, provision, participation and direction setting at all levels of the organization.

Community Ownership: Members are actively involved in decision-making and have ownership of the centre's activities. A voluntary management committee comprising elected members who live, work or participate in the local community governs each centre. The*governance model is developmental, working co-

operatively and collaboratively with staff, volunteers, centre participants and the wider community, thus generating a range of community benefits.

Empowerment: A process that respects, values and enhances people's ability to have control over their lives is put into practice. This process encourages people to meet their needs and aspirations in a self-aware and informed way which takes advantage of their skills, experience and potential. Change and growth occurs through informing and empowering individuals and communities.

Lifelong Learning: Learning is integrated into all aspects of centre activities, thus building and supporting the personal skills, knowledge, abilities and resilience of people. They develop the health, wellbeing and connection of people and their families, through formal and informal pathways in education, employment and self-development.

Inclusion: The diverse contributions that people make are valued, no matter what their background or varying abilities. Individual and local needs are acknowledged and addressed, often through informal interaction. Identifying these needs and issues through a range of methods is instrumental to informing the planning and development of activities and programs.

Access and Equity: Centers are accessible and welcoming. They promote a fairer distribution of economic resources and power between people by aiming to improve the social, environmental, economic and cultural infrastructures within their communities.

Social Action: Internal and external factors that impact on the local community are related between individuals, groups and organizations and within the community transformed through collective action.

Advocacy: In meeting individual and group needs, Centers act with, or on behalf of, community members.

Networking: Linking, forming alliances, collaborating and working with individuals, groups, other agencies, government and business are crucial, with interaction between formal and informal methods to achieve connections within the local communities which include women, youth and disabled group.

Self Help: Individuals are supported in coming together in a caring group environment to share information, knowledge, skills and life experience in order that each participant can reach their own personal goals.

2.1.12 The important of participation in development:

Meaning of People Participation: is a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them. Unless the poor are given an opportunity to participate in the development of interventions designed to improve their livelihoods, they will continue to miss the benefits of any intervention.

The need for stakeholder ownership is now well established in the donor community. Ownership of a project by stakeholders involves ensuring the widest possible participation of those who are supposed to be the beneficiaries of the project. The essence of ownership is that the recipients drive the process. That is, they drive the planning, the design, the implementation, the monitoring and the evaluation of the project.

The main tenet of participative approaches to development is that the community and the stakeholders are collaborators in activities at every stage of development process. Thus, participative methods are meant to generate a sense of ownership of decisions and actions. In contrast to the alternative model of development where project conceptualization, objectives and design are imposed on the community by people external to the community who are characterized as experts. Participatory

approaches can also challenge perceptions, leading to a change in attitude and agendas. They can also provide new and sometimes surprising insights.

2.1.13 Development of Participatory Approaches:

The development paradigms of the 1960s and 1970s derived from the legacy of colonial rule, especially the planning systems of the late 1930s and post World War II period. The conception was top down (development was something governments did for or to people), and the language military-bureaucratic. There was little stakeholder involvement of those undergoing "development", a fact which must rank high among the causes of the failures of development to improve the lives of the majority poor of the "developing" world. Participatory development arose. People Participation in Rural Development As a reaction to this realization of failure, popularized particularly, by Gordon Conway and Robert Chambers (1992), and more recently by David Kurten (1996).

Another guiding principle therefore is that research is participatory, a much abused word that encompasses several virtues and vices. As with all methods, its merits vary with the research situation and the practitioner. At its best, the process can be liberating, empowering and educative, a collegial relationship that brings local communities into the policy debate, validating their knowledge. At its the worst, it can degenerate into a process of co-option of local communities into an external agenda, or an exploitative series of empty rituals imposing fresh burdens on the community's time and energy and serving primarily to legitimize the credentials of the implementing agencies, as "grassroots oriented". While participation must be integral to the research process, it must be understood and practiced as a genuine process. Together, many methods of participatory work are now often referred to as Participatory Learning and Action (PLA). Jules Pretty (1995) provides an

excellent overview in his Trainers Manual for Participatory Learning and Action, available from IIED.

Despite a wealth of alternative and often confusing names, participatory research methods can be conveniently classified into four main types, each with a distinctive style and ethos, Example:

- *Participant Observer.

- *Rapid Rural Appraisal (RRA).

- *Participatory Rural Appraisal (PRA).

- *Participatory Action Research (PAR).

2.1.15 Participatory Approaches in Rural Development

Participatory approaches have been used in several settings in development both in rural and urban areas. In particular, participatory approaches allow community **to:**

- *Express and analyze the realities of their lives;

- *Plan them what action to take to change the situation;

- *Monitor and evaluate the results themselves. However, the rationale for using participative methods is a pragmatic one. A problem with non participative methods is that they often impose a commitment on the community to do certain things even though they were not involved in the project.

People Participation in Rural Development involved in a project, they are not equipped to fully understand the nature and rationale of the commitments they are being asked to make. It is futile for the community to give its commitment only for it to be demonstrated that in practice, they are unable to fulfill their commitment.

Conversely, it has been found that where communities have been involved, projects have a better chance of surviving through shocks, as the commitment is there to ensure that the project does not fail.

In the area of activities, it may well be the case that interventions reliant upon behavior, change may fail if the community was not involved in designing. However, when communities are involved, such messages are much better understood. Therefore were taken on board. A secondary benefit is that members of the community will subsequently be better placed to act as change agents. It must be said it is important all stakeholders are involved in the development of projects and not just direct beneficiaries.

Three levels of stakeholder defined to include beneficiaries to be considered:

*Direct beneficiaries (end users, farmers, urban poor etc.)

* Intermediaries (e.g. professionals, advisers, practitioners, consultants, Experts....

*Decision, policy makers (politicians, senior civil servant etc.)

All three groups are important to have represented on the project as stakeholders if the necessary commitment is to be achieved. Care must be taken however to ensure that when a diverse range of stakeholders such as those listed above are engaged in a project, account is taken of the huge differentials in power relationships which could negate the value of a participatory approach. The danger is in a powerful stakeholder group hijacking the entire project with other groups being relegated to passive conspirators at best.

2.1.16 Advantages of Participatory Approaches:

Participatory approaches are particularly useful in providing feedback to policy-makers.

- **Economies of scale** Participatory groups constitute a grassroots "receiving System" that allows development agencies to reduce the unit delivery or transaction costs of their services, thus broadening their impact.

People Participation in Rural Development:

- **Higher productivity** Given access to resources and a guarantee that they will

Share fully in the benefits of their efforts, the poor become more receptive to new Technologies and services, and achieve higher levels of production and income. This helps to build net cash surpluses that strengthen the groups' economic base and contribute to rural capital formation.

- **Reduced costs and increased efficiency** the poor's contribution to project Planning and implementation represent savings that reduce project costs. The poor also contribute their knowledge of local conditions, facilitating the diagnosis of environmental, people and institutional constraints, as well as the search for solutions.

- **Building of democratic organizations** the limited size and informality of small groups is suited to the poor's scarce organizational experience and low literacy levels. Moreover, the small group environment is ideal for the diffusion of collective decision-making and leadership skills, which can be used in the subsequent development of intergroup federations.

- **Sustainability** Participatory development leads to increased self-reliance among the poor and the establishment of a network of self- sustaining rural organizations, this carries important benefits: the greater efficiency of development services stimulates economic growth in rural areas and broadens domestic markets, thus favoring balanced national development; politically, participatory approaches provide opportunities for the poor to contribute constructively to development.

2.1.17 Difficulties in implementing participatory approaches:

There are two potential pitfalls to take into account when implementing participatory approaches:-

Engaging the poor is often a far more difficult task than engaging the more powerful stakeholder groups. It is fairly easy to demonstrate to government officials for instance why their participation in a particular initiative would be

valuable. It is not the same for the poor and therefore different techniques are required to achieve ones? Aim, for this reason, participatory approaches usually involve groups working on the ground or on the paper. Examples of techniques used include: □ maps, flow diagrams, seasonal calendars, matrices etc.....; □ Visual techniques are a good way to engage the poor especially where local Materials are used for preparation of resources.

*Visual techniques also encourage creativity and the exchange of ideas. People Participation in Rural Development were second thing to bear in mind is that for participatory techniques to work effectively, the implementing agency must itself be prepared to change and learn to accept change.

The main changes are:

*Loss of power:- The agency should be prepared to accept a loss of power;

*Learn to listen:- The agency should be prepared to listen actively and not pay lip service.

*Loss of control:- The agency should be prepared to cede control to the community so that they own the project or initiative.

2.1.18 People Participation in Rural Development:

What real voice do people with direct experience of poverty have in research and inquiry into it? This study, by Fran Bennett with Moraine Roberts, gives an overview of important of people participation in rural development through participatory approaches. The Participatory approaches respect the expertise of people with direct experience of poverty and give them more control over the research process and more influence over how findings are used. The researchers examine the issues involved when principle turns into practice. In many of the rural development projects implemented in the past, there was a large gap between plan and implementation. The integrated rural development concept to fill this gap

with the participation of the rural population which, hitherto (until now), has been the mere object of projects. The success of integrated rural development programmes depends on the degree to which a population can be motivated. This again depends on how much their interest, their felt needs are taken into account, and to what extent they are involved in the planning and decision-making process. Thus, the question of motivation leads to the problem of decentralization of planning, i.e. to a discussion which has been going on for years under the slogan of "development from below". In principle, centralized planning, bottom-up planning, involves all groups in the process, this being the prerequisite for the mobilization of local resources. It guarantees that the felt needs of the population, and not those of the planners are taken care of, and the population considers the plans as their own. This altogether increases the efficiency to a crucial point because rural development does not seem to be possible People Participation in Rural Development as long as the rural population considers it to be the governments and not their own task. This is why the concept of integrated rural development attaches so much importance to decentralization and participation. However, there are some problems and limitations. Local planning may easily come into conflict with national planning because the target-setters, their evaluation of the situation, and their priorities may differ. Lack of information on the overall situation, as well as limited competence at the local level, are difficult to deny. (In view of the ignorance of national planners regarding local circumstances, this shortcoming natty be compensated for by similar lacks on the other side). However, local planning is no guarantee for planning in the best interest of the local population. It is not unusual that local participation in reality means participation of the rural upper class, and minorities are easily neglected. Likewise, the disparities among regions can easily grow because the better regions and those in which typical leader personalities are encountered are often preferred to the others.

Finally, we must be aware that decentralization of planning will be opposed by the administration as they dislike participation on the part of the population. Decentralized planning means a reallocation of power and influence, and is bound to meet with the antagonism of groups with vested interests. There is probably no clear answer as to "bottom-up" or "up. Down" planning, but different subjects require different procedures. For instance, target planning, like the planning of agricultural production, is a field for "top-down" planning. Here, the initiative is at the top and, with incentives, planners will induce farmers to implement their concepts. However, resource development planning and planning of people infrastructure are typical fields for "bottom-up" planning, and the task of the national planning agency is merely to coordinate, and to outline the limitations produced by available resources. This indicates that the? Whole question of "up-down" versus "bottom-up" planning is void. Of importance is an optimal mix of central and regional planning activities with a participation of the population in keeping-/with the functions. This is not easy to implement, last but not least, the difference between planning and implementation as far as administration and the .persons involved are concerned plays a great role.

2.1.19 What is Rural Development Mean?

There is no universally accepted definition of rural development. The term is used in different ways in vastly divergent contexts. As a concept, it connotes overall development of rural areas with a view to improve the quality of life for the rural people. As a phenomenon, it is the result of various physical, technological, economic, socio-cultural and institutional factors.

As a discipline, it is multi-disciplinary in nature representing an intersection of agricultural, social, behavioral and management of sciences.

In short, rural development is a process that aims at improving the standard of living of the people living in the rural areas. Rural development may be defined as overall development of rural areas to improve the quality of life of rural people. It is an integrated process, which includes social, economical, political and spiritual development of the poorer sections of the society. Rural development can be defined as, helping rural people set the priorities in their own communities through effective and democratic bodies, by providing the local capacity; investment in basic infrastructure and social services, justice, equity and security, dealing with the injustices of the past and ensuring safety and security of the rural population, especially that of women. According to Robert chambers, rural development is a strategy to enable a specific group of people, poor rural women and men and youth, to gain for themselves, and their children more of what they want and need. It involves helping the poorest among those who seek a livelihood in the rural areas to demand and control more of the benefits of rural development. The group includes small scale farmers, tenants and the landless. Thus, the term rural development may be used to imply any one of the above-mentioned connotations. To avoid ineffective floundering among the myriad definitions, we shall define rural development as A Process leading to sustainable improvement in the quality of life of rural people, especially the poor. But what mentioned without rural community participation it can't be sustain (1945- 2015) al rural development project leaves behind the impact on what they put in goals towards under developing countries.

Development: The term “development” often carries an assumption of growth and expansion. During the industrial era, development was strongly connected to increased speed, volume and size. However, many people are currently questioning the concept of growth for numerous reasons – a realization that more isn’t always better, or an increasing respect for reducing outside dependencies and lowering

levels of consumerism. So while the term “development” may not always mean growth, it always imply change. The community development process takes charge of the conditions and factors that influence a community and changes the quality of life of its members. Community development is a tool for managing change but it is not: A quick fix or a short-term response to a specific issue within a community; a process that seeks to exclude community members from participating; or an initiative that occurs in isolation from other related community activities. Community development is about community building as such, where the process is as important as the results.

One of the primary challenges of community development is to balance the need for long-term solutions with the day-to-day realities that require immediate decision-making and short-term action. (<http://www.hrhc-drhc.gc.ca/community>).

2.1.20 Local Participation In Rural Development:

Even local participation often results in some people doing the planning and some the work and this division reflects the local stratification. Although the difficulties are great, the solution of the problem of local participation and motivation is a key to the success or failure of any integrated rural development programme.

*Reasons for using participatory approaches range from recognizing the Particular expertise of people with experience of poverty in putting forward their own realities - and their right to do so - to increasing the effectiveness of research and deepening understanding of poverty and policy impact.

*Basic building blocks to make participatory approaches work includes: time to allow people to go at their own pace; adequate financial and other support; and opportunities for personal exchange.

* Key factors in getting the most from participation are: clarity about aims, rather than allowing limits of resources to dictate the extent and quality of Participation;

and involving people in poverty in making sense of the information produced, by using their 'insider expertise'. *And adequate funding should be provided to organizations working with people living in poverty.

2.1.21 Participation and it's Affect:

Participation has evolved in several ways. As a collective outcome of behavior that reflects empowerment, it represents a challenging solution to policy implementation strategies that potentially alienate and exclude disenfranchised groups. Unfortunately, there is no agreement on what behavior or activities are actually meant by the term (McDonough, Wheeler, 1998). Keeping this in mind, one may however, concur with the World Bank's working definition of participation as. A process through which stakeholders influence and share control over development initiatives and the decisions and resources that affects them. (Edgerton, McLean, Tikare, Lytle, Robb & Shah, 2000;p.1). Anderson (1998) rationalizes this approach as nothing more than a common sense model since those closest to the action and those with a stake in the enterprise should have a strong voice in decisions and be accountable for them, (p.572). He goes onto explain that participation's obvious applications are not so attainable because. Shared governance structures do not result in significant participation in decisions (Malan & Ogawa, 1988 in Anderson, 1998), but instead, result in contrived collegiality (Hargreaves, 1994 in Anderson, 1998), reinforce privilege (Lip man, 1997, in Anderson, 1998), and even create a tighter iron cage of control for participants. (Anderson & Grin berg, 1998; Barker, 1993, in Anderson 1998) (p.572).

The contentious issues of participation's ideologically driven and contradictory nature (Anderson, 1998) have become the most widely debated topic of current educational reforms that involve civil society (i.e. parents or community).

The importance of this debate is entrenched in issues of efficacy, participatory democratic practices; and even more important its objective. Dudley (1993), Nagle

(1992), and Lane (1995) (In McDonough, s& Wheeler, 1998) all question whether participation is a means, an end, a tool, or a goal.

Supposedly, subscribing to any one of these ideas of participation, immediately changes a project's implementation focus and outcome. No matter the choice, I would tend to agree with Schaeffer who proposes that all the scholarly.

Noise, Surrounding participation is really a re-visitation of the symbiotic relationship historically enjoyed between education and community (1991, in McDonough & Wheeler, 1998). Therefore, In the light of diminishing resources, and governments Acknowledgement of its inability to meet local needs, community participation serves as a bridge that enables the following factors which will be discussed in greater detail: * Devolves some financial responsibility from government. * Strengthens the policy delivery framework. * Creates channels for ongoing dialogue among a cross-section of stakeholders. * Opens up a process of continual negotiation on the political agenda in which the views of the poor are taken into account. * Maintains partnerships.(Robb,1998).

2.1.22 Participation as a Tools of Development:

Participation in housing and urban service management is a process whereby people -as consumers and producers of housing and urban services and as citizens- influence the flow and quality of housing and urban services available to them. Participation is based on voluntary relationships between various actors, which may include government institutions, individual housing and urban services users, community-based organizations, user groups, private enterprises, and non-governmental organizations. (www.ccsenet.org, February 2011). Community participation defined by: Oakley and Marsden (1987) as the process by which individuals, families, or communities assume responsibility for their own welfare and develop a capacity to contribute to their own and the community's development. In the context of development, community participation refers to an

active process whereby beneficiaries influence the direction and execution of development projects rather than merely receive a share of project benefits (Paul, in Bamberger, 1986).

Five objectives to promote community participation contribution:

1. **Sharing project costs:** participants are asked to contribute money or labor (and occasionally goods) during the project's implementation or operational stages.
2. **Increasing project efficiency:** beneficiary consultation during project planning or beneficiary involvement in the management of project implementation or operation.
3. **Increasing project effectiveness:** greater beneficiary involvement to help ensure that the project achieves its objectives and those benefits go to the intended groups.
4. **Building beneficiary capacity:** either through ensuring that participants are actively involved in project planning and implementation or through formal or informal training and consciousness- raising activities.
5. **Increasing empowerment:** defined as seeking to increase the control of the underprivileged sectors of society over the resources and decisions affecting their lives and their participation in the benefits produced by the society in which they live. (Paul's, p. 4–5)

2.1.23 Participation in Development Fields:

The concept of people's participation is not a new phenomenon as far as rural development is concerned; it has been talked and written about since the 1950s or even before (Guijt and Shah, 1998; Nelson and Wright, 1995). In recent years however, there has been a convergence of opinion as to the importance of participation in rural development and there now exists a widely shared set of participatory approaches and methods. Participatory approaches have been widely incorporated into policies of organizations from multilateral agencies like the

World Bank and International Monetary Fund (IMF), bilateral agencies, to the smallest people's organizations (**Blackburn and Holland, 1998; Dalal-Clayton *et al.*, 2003; Holmes, 2001; Kumar, 2002; White, 1996**). Indeed, some observers have argued that, in terms of thinking and practice about development, we are currently in the 'age of participation' and it is the 'paradigm of people' (Morales Dhahran, 2005; Oakley, 1991). Participation plays a major role in people's management of their own affairs. Ownership and control of resources have a profound impact on participation in development projects (Mathbor, 1990b). Emphasized four areas to be worked toward in a participatory coastal resource management program: greater economic and social equality, better access to services for all, greater participation in decision making, and deeper involvement in the organizing process resulting from the empowerment of people, (Ferrier, 1988) UN.

The Jebel Marra Rural Development Project was a major programme of rural development in, Zalingei, Wadialih and Jebel Marra Districts. which are newly authorized with Central Darfur State (CDS, 2012): Covered the total area of some 90,000 sq km between 1981 and 1992, Government of the Sudan and the European Union funded the project 27% by Sudan Gov and 73% EEC to carry out agricultural research, build rural infrastructure and provide extension and community development services. More than 40 extension stations fixed to encourage the community to participate effectively and diffuse the project policies concerned the agricultural innovation packages; it had a level of direct contact with the rural community which Darfur had never seen before. Throughout its life, the project's Monitoring and Evaluation Department carried out wide ranging surveys of rural livelihoods to guide the work and assess its impact. With over 900 households interviewed, in 1988 Post Harvest Survey Report presented here is typical of the breadth and depth of survey coverage. The report is technical, with a focus on the complex strategies Darfur farmers use to mitigate drought and

flooding and fend off the many pests that attack their crops, and on the performance of the Jebel Marra Rural Development Project Extension Service. Nevertheless, it covered much more than that, (Researcher, 2012).

2.1.24 Agriculture improvement through participation tool:

A very detailed picture of the skill with which Darfur farmers manage different soils, crops and varieties to make the maximum benefit from the rains and their own labour. A key lesson is the need to look beyond drought and food security. In some years, pests are a bigger threat and cash crops are a major element in most livelihoods. Darfur livelihoods depend on making the maximum out of a good year more than on defending against a bad one. Varieties that yield large crops when there is a lot of rain are at least as important as varieties that can survive a drought and adapted locally.

Participation: Is a key to the success of this community project has been the participation of community members. Residents participate in various ways, such as attending general assemblies, caucuses (have influence), or for some, being an elected member of Council. Some work for the project full-time or part-time, while others volunteer in specific programs or activities. Many participate by taking part in various events organized by the neighborhood, or by donating some of their time, money, food, clothing, material or other contributions. Participation is voluntary and people choose their frequency of participation. The philosophy of the project is not to tax people with too many expectations. Everyone gives what he or she is capable of giving, which may change as the circumstances of community member's change. Any and all levels of participation by community members in activities offered by the programs is openly appreciated and valued from the membership organized the participation, what motivates people to participate is also interesting to know. First and foremost, it is their community. This sense of ownership reflects the pride they have in continuing to want to live,

work and play in a community which is secure and where people can continue to learn new things and improve their skills. Residents are not only interested in the present state of their community but also with the future that their community holds for their children. They view the Better beginnings, Better Futures project as a body that supports the community and that provides a means to help residents stand up for their rights.

Community: well being Involvement in the affairs of their community has brought major benefits to community members both at the individual and community levels. Changes experienced by members of the community are marked by an increase in self-confidence; acquisition of new skills such as learning how to share in meetings, gaining knowledge on decision-making processes and learning how to become more resourceful in one's own community. Individuals are also better able to interact with different cultural communities within and outside their neighborhoods. In addition, individuals have expressed, in the context of various meetings and community gatherings, the pride they now have in their own community. Overall, the neighborhoods appear to have become more secure and welcoming places; places where residents may be able to enjoy life. Moreover, residents describe having a stronger sense of belonging to the community and feel more organized as well as more resourceful when needing to stand up for their rights. Indeed, many residents have experienced situations where they were able to influence the decisions made by decision-makers. In this way, there is a perception that the voices of residents are heard, (Nabigon, H. (2006).

Community: Often when we think of community, we think in geographic terms. Our community is the city, town or village where we live. When community is defined through physical location, it has precise boundaries that are readily understood and accepted by others. Defining communities in terms of geography, however, is only one way of looking at them. Communities can also be defined by

common cultural heritage, language, and beliefs or shared interests. These are sometimes called communities of interest. Even when community does refer to a geographic location, it doesn't always include everyone within the area. For example, many aboriginal communities are part of a larger non-aboriginal geography. In larger urban centers, communities are often defined in terms of particular neighborhoods. Most of us belong to more than one community, whether we're aware of it or not. For example, an individual can be part of a neighborhood community, a religious community and a community of shared interests all at the same time. Relationships, whether with people or the land, define a community for each individual.

Alnafir process: In Fur Language Define As (Toweizy) which voluntary people participate to work together for themselves and it is a one day full work without payments: It's a social gathering of the community followed by voluntary acceptance from those whom are invited to do something for any community or family member mainly in cultivation and harvesting of crops at wince and within the process technology transfer will occur and although experience will be change between members group in the matter of participation method.

Community development: Is a process where community members come together to take collective action and generate solutions to common problems. Community wellbeing (economic, social, environmental and cultural) often evolves from this type of collective action being taken at a grassroots level. Community development ranges from small initiatives within a small group to large initiatives that involve the broader community. Community development combines the ideas of "community" with "development". We discussed earlier the concept of community – a group of people with a shared identity. Hence, community development relies on interaction between people and joint action, rather than individual activity – what some sociologists call "collective agency" (Flora and Flora, 1993).

“Development” is a process that increases choices. It means new options, diversification, thinking about apparent issues differently and anticipating change (Christenson et.al., 1989). Development involves change, improvement and vitality – a directed attempt to improve participation, flexibility, equity, attitudes, the function of institutions and the quality of life. It is the creation of wealth – wealth meaning the things people value, not just dollars (Shaffer, 1989).

Effective community development should be:

- * A long-term Endeavour or problems defined.
- * Well-planned activities and programmes.
- * Inclusive and equitable to be implemented.
- * Holistic and integrated into the bigger picture.
- * Initiated and supported by community members.
- * Of benefit to the community directly or indirect.
- * grounded in experience that leads to best practices.

2.1.25 Facts on community development:

Is a grassroots process by which communities will? * Become more responsible.* Organize and plan together.* Develop healthy lifestyle options.* Empower themselves. * Reduce poverty and suffering with ideal activities socially accepted. * Create employment and economic opportunities.* Achieve social, economic, cultural and environmental goals. Community development seeks to improve quality of life, effective community development results in mutual benefit and shared responsibility among community members.

Such development recognizes the elements below:

- * The connection between social, cultural, environmental and economic matters.
- * The diversity of interests within a community.
- * Its relationship to building capacity.

Community development helps to build community capacity in order to address issues and take advantage of opportunities, find common ground and balance competing interests. It doesn't just happen – capacity building requires both a conscious and a conscientious effort to do something (or many things) to improve the community.

Adoption Process: Adoption process there are also stages that each individual farmer will go through before he or she will adopt a new technology:

*Awareness. The farmer knows of the existence of the innovation but lacks details.

*Information. The farmer becomes interested and seeks out further information usually from formal sources.

*Evaluation. The farmer takes the information and weighs alternatives regarding land, labor, capital and management needs.

*Trial. Usually farmers will use the innovation on a small-scale basis.

*Adoption. The farmer moves to a full-scale use of the innovation. Other research suggested that this process is not always one-way. In other words, conditions may change, and the farmer may decide to return to the old technology if the new is no longer profitable or efficient (Gensler, S. & Garcia, R. 2011). The classic definition of the term "adoption" is found in Rogers with Shoemaker (1971): "Making full use of a new idea as the best course of action available". This definition is explicitly or implicitly used by virtually all adoption analysts. It is useful to think systematically about three assumptions which underlie this definition, and which must be valid if the concept is to have utility; Rogers & Shoemaker will suggested later that, there are many instances where these assumptions do not hold:

* There is some definable "idea" which has much the same meaning to the people who use it, even in different settings.

* The "uses" to which the idea is put in different settings bear enough resemblance to each other that comparing them is possible.

* Criteria are available for determining that the new idea is in fact the "best" course of action. If these assumptions cannot be made, it is very hard to justify the use of "adoption" as a dependent variable interesting in any policy relevant sense at least. The first two assumptions constitute the basis for generalizing the analysis; the third constitutes the value judgment on which the analysis is based. Generalize ability of findings and clarity of values and purposes are essential to useful policy research. It is the appropriate function and responsibility of the analyst to define the criteria in terms of which he judges the innovation to be a desirable or undesirable result for society. These criteria may describe **outcomes** (future configurations of desirable relationships) or **processes** (suitable methods of achieving outcomes). These are approximately equivalent to Rotech's (1973) elaboration of Dewey's "terminal" and "instrumental" values. When such criteria serve to define the desirability of "adoption", the implicit assumption is that the criteria hold in settings other than the one under immediate consideration. Thus, generalize ability of the value setting is as important as that of the circumstances involved. To say that one must clarify the value context in which an adoption decision is made is not to say that one must accept those values personally. It is to say that one must recognize those values as genuine for those who hold them. For Yin (1976) to speak of "bureaucratic self-interest" or Feller (1977) to describe "conspicuous production" in local governments is not to endorse these value systems as appropriate terminal values for public policy. But adoption modeling is an explicit or implicit decision making approach, and as such must embody values as the basis for such decisions. If the values of the potential adopters are not analyzed explicitly, the values used are likely to be by default those of the analyst. Whether they will provide information useful in helping predict the choices of innovation actors is likely to be a matter of chance.

Part Two: The Adoption Process

2.2.1 An overview of adoption concept:

is a mental process through which an individual passes from first knowledge of an innovation to the decision to adopt or reject and to confirmation of this decision (van den Ban and Hawkins, 1998). According to Feder *et al.* (1985) adoption refers to the decision to use a new technology, method, practice, *etc.* by a firm, farmer or consumer. As indicated by Dasgupta (1989), adoption is not a permanent behavior. An individual may decide to discontinue the use of an innovation for a variety of personal, institutional or social reasons one of which could be the availability of an idea or practices that is better in satisfying his or her Needs. Adoption process is the change that takes place within individual with regards to an innovation from the moment that they first become aware of the innovation to the final decision to use it or not.

However, as emphasized by Ray (2001), adoption does not necessarily follow the suggested stages from awareness to adoption; trial may not always practiced by farmers to adopt new technology. Farmers may adopt the new technology by passing the trial stage. In some cases, particularly with environmental innovations, farmers may hold awareness and knowledge but because of other factors affecting the decision⁹ making process, adoption does not occur. Dasgupta (1989) indicate that, the decision to adopt an innovation is not normally a single instantaneous act, it involves a process. The adoption is a decision-making process, in which an individual goes through a number of mental stages before making a final decision to adopt an innovation. Decision-making process is the process through which an individual passes from first knowledge of an innovation, to forming an attitude toward an innovation, to a decision to adopt or reject, to implementation of new idea, and to confirmation of the decision (Ray, 2001).

The adoption or rejection of an innovation is the consequence of diffusion of an innovation (Ray, 2001). Diffusion is a process by which new ideas are communicated to the members of a social system (Roger and Shoemakers, 1971). An innovation is an idea, method or object which is regarded as a new by an individual, but which is not always the result of recent research (Van den Ban and Hawkins, 1998). Diffusion and adoption are thus closely interrelated even though they are conceptually distinct (Dasgupta, 1989). Not all innovations diffuse at the same rate. The differences in the diffusion rates of innovations in a community can be largely explained by the differences in the traits of innovation, as perceived by potential adopters such as: relative advantage, compatibility, complexity, trial ability and observe ability (Dasgupta, 1989; Ray, 2001).

The adoption pattern to a technological change in agriculture is a complex process. A large number of personal, situational and social characteristics of farmers have been found to be related to their adoption behavior. According to Dasgupta (1989) and Ray (2001), adopters have a high rate of literacy and higher level of formal education, operate large sized holdings, own the land they operate, have a relatively high income and economic status, are commercial in farming operation, have relatively high level of extension contact, and belong to upper socio-economic status categories. On the other hand, non-adopters have a low rate of literacy and level of formal education, operate smallholdings, are mostly small and marginal farmers, belong to low income group, have a low level of socio-economic status categories.

Factors Influence for adoption of innovations (Rogers, 1995), including:

- * The innovations itself.
- * The communication channels used to spread information about the innovations.
- * Time.
- * The nature of the society to whom the technology is introduced.

Rogers (1995) explains that there are four major theories that deal with the diffusion of innovations. These are the innovation-decision process theory, the individual innovativeness theory, the rate of adoption theory, and the theory of perceived attributes. There was five major other factors affecting the rate of adoption (Roger,1995) as followed:

Perceived Attributes of Innovation: An innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption. How the adopter perceived characteristics of the innovation has impacts on the process of adoption.

-Relative advantage: the degree to which an innovation is perceived as better than the idea it supersedes. The underlying principle is that the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption,

-Compatibility: the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters,

-Complexity: the degree to which an innovation is perceived as difficult to understand and use,

-Trial ability: the degree to which an innovation may be experimented with on a limited basis. If an innovation is trial able, it results in less uncertainty for adoption

-Observe ability: the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt.

2.4.14 Adoption rate Theory:

The theory of rate of adoption suggests that the adoption of innovations is best represented by an S-curve on a graph (Nutley et al, 2002). The theory holds that adoption of an innovation grows slowly and gradually in the beginning. It will then have a period of rapid growth that will taper off and become stable and eventually

decline (Rogers, 1995). The Bass model suggests other representations (Robert-Ribs' & Wing, 2004). Another aspect of importance is time. Innovations are seen to be communicated across space and through time. Time has been identified as being significant in the diffusion of innovations in three main ways: (Rogers & Scott, 1997).

□ Firstly, the adoption of an innovation is viewed as a mental process that evolves over time starting with initial awareness and initial knowledge about an innovation which evolves into an attitude towards that innovation. This influences the decision of whether to adopt or reject the innovation.

□ Secondly, the rate of adoption amongst individuals differs throughout the social system. This starts off slowly with only a minority of people adopting the innovation increasing over time eventually reaching the rate where enough individuals have adopted the innovation and the rate of adoption becomes self-sustaining.

□ Thirdly, time is involved in the rate of adoption or rather the relative speed that members of a social system adopt innovations. This is often measured as the number of members of the system that adopt the innovation in a given time period.

2.1.17 Perceived attributes Theory:

The theory of perceived attributes is based on the notion that individuals will adopt an innovation if they perceive that the innovation has the following attributes: (Nutley et al 2002). First, the innovation must have some relative advantage over an existing innovation or the status quo. Second, it is important the innovation be compatible with existing values and practices. Third, the innovation cannot be too complex. Fourth, the innovation must have trial ability. This means the innovation can be tested for a limited time without adoption. Fifth, the innovation must offer observable results (Rogers, 1995).

2.2.2 Factors affecting the rate of the adoption

Diffusion of Innovations (Roger ;): Ellsworth (2000) commented that Rogers' Diffusion of Innovations (1995) is an excellent general practitioner's guide. Rogers' framework provides "a standard classification scheme for describing the perceived attributes on innovations in universal terms" (Rogers, 1995). Research in educational change has applied and explored Rogers' model to different contexts. Rogers' model studies diffusion from a change communication framework to examine the effects of all the components involved in the communication process on the rate of adoption. Rogers (1996) identified the differences both in people and in the innovation. The model provides the guidelines for the change agents about what attributes that they can build into the innovation to facilitate its acceptance by the intended adopter.

***Type of Innovation-Decision:**

- Optional: an individual flexibility
- Collective: a balance between maximum efficiency and freedom
- Authority: it yields the high rate of adoption, but produces high resistance.

***Communication Channels**

-Mass Media- * Interpersonal

*Books, news papers, journals and reports (researcher, 2014).

Distinctive Aspects of Diffusion Research

Several distinctive aspects of the diffusion of innovations set it off from other specialized fields of communication study. The study of the diffusion of innovations began during World War II, prior to the establishment of communication study in university schools and departments (Rogers, 2003). So diffusion research was well underway as a research activity before communication scholars entered this research front.

Although most observers agree that the diffusion of innovations is fundamentally a communication process, communication scholars constitute only one of the dozen research traditions presently advancing the diffusion field (along with geography, education, marketing, public health, rural sociology, agricultural economics, general economic, political science, and others). Other communication research areas such as persuasion and attitude change and mass communication effects also began prior to the institutionalization of communication study in university units (Rogers, 1962, 1983, 1995; 2003; Singhal & Dearing, 2006).

Diffusion research is also distinctive in that the communication messages of study are perceived as *new* by the individual receivers. This novelty necessarily means that an individual experiences a high degree of uncertainty in seeking information about, and deciding to adopt and implement an innovation. In the sense of the newness of the message content, the diffusion of innovations is unlike any other communication study except the diffusion of news.

Diffusion of news, however, studies the spread of news events, concentrating mainly on such matters as how we become aware of news. In contrast, research on the diffusion of innovations centers not only on awareness-knowledge, but also on attitude change, decision-making, and implementation of the innovation. The new ideas investigated by scholars of the diffusion of innovations are mainly technological innovations, so the behavior studied is quite different from that investigated in news diffusion studies. Obviously, however, both communication research areas involve a similar diffusion process, and both have been informed by the other (Rogers, 2003). 4. Diffusion research considers time as a variable to a much greater degree than do other fields of communication study. Time is involved in diffusion in (a) the innovation-decision process, the mental process through which an individual passes from first knowledge of a new idea, to adoption and confirmation of the innovation; (b) innovativeness, the degree to which an

individual is relatively earlier in adopting new ideas than other members of a system; and (c) an innovation's rate of adoption, the relative speed with which an innovation is adopted by members of a system (Rogers, 2003).

The diffusion of innovations field emphasizes interpersonal communication networks more than any other type of communication research. From the first diffusion studies conducted about 60 years ago, the nature of diffusion was found to be essentially a social process involving interpersonal communication among similar individuals (Rogers & Kincaid, 1981; Rosen, 2002; Valente, 1995; 2006). A person evaluates a new idea and decides whether or not to adopt it on the basis of discussions with peers who have already adopted or rejected the innovation.

The main function of mass media communication in the diffusion process is to create awareness- knowledge about the innovation.

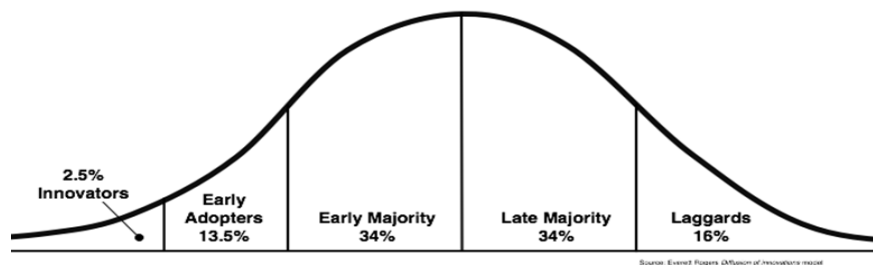
Study of the diffusion of innovations involves both mass communication and interpersonal communication, and thus spans the dichotomy that otherwise divides communication into two sub-disciplines. These dichotomies blur further when diffusion occurs through the Internet, cell phones, and blackberry devices.

2.2.3 Characteristics of the target population:

An adopter's categories while the majority of the general population tends to fall in the middle categories, it is still necessary to understand the characteristics of the target population. When promoting an innovation, there are different strategies used to appeal to the different adopter categories: ***Innovators** - These are people who want to be the first to try the innovation. They are venturesome and interested in new ideas. These people are very willing to take risks, and are often the first to develop new ideas. Very little, if anything, needs to be done to appeal to this population. ***Early Adopters** - These are people who represent opinion leaders. They enjoy leadership roles, and embrace change opportunities. They are already aware of the need to change and so are very comfortable adopting new ideas.

Strategies to appeal to this population include how-to manuals and information sheets on implementation. They do not need information to convince them to change. ***Early Majority** - These people are rarely leaders, but they do adopt new ideas before the average person. That said, they typically need to see evidence that the innovation works before they are willing to adopt it. Strategies to appeal to this population include success stories and evidence of the innovation's effectiveness.

***Late Majority** - These people are skeptical of change, and will only adopt an innovation after it has been tried by the majority. Strategies to appeal to this population include information on how many other people have tried the innovation and have adopted it successfully. ***Laggards** - These people are bound by tradition and very conservative. They are very skeptical of change and are the hardest group to bring on board. Strategies to appeal to this population include statistics, fear appeals, and pressure from people in the other adopter groups.



The stages, by which a person adopts an innovation, and whereby diffusion is accomplished, include awareness of the need for an innovation, decision to adopt (or reject) the innovation, initial use of the innovation to test it, and continued use of the innovation.

There are five main factors that influence adoption of an innovation and each of these factors is at play to a different extent in the five adopter categories:

* **Relative Advantage** - The degree to which an innovation is seen as better than the idea, program, or product it replaces.

- * Compatibility - How consistent the innovation is with the values, experiences, and needs of the potential adopters.
- * Complexity - How difficult the innovation is to understand and / or use.
- * Triability - The extent to which the innovation can be tested or experimented with before a commitment to adopt is made.
- * Observe ability - The extent to which the innovation provides tangible results.

2.2.4 Rural Development and grassroots Participation

Participation is important for improving life situations, particularly for the poor and disadvantaged, including people with disabilities and their families. It begins by noting that the contribution of participation to health development is not easily agreed upon. It then, outlines the reasons for participation in health development and how this has affected the development of community based rehabilitation programmes. Ways of defining and assessing community participation are discussed. The penultimate section identifies critical issues that must be addressed in considering participation as a basis for Community Based Rehabilitation (**CBR**) programme planning, giving examples from the Ugandan context.

The conclusion points to the complexity and challenges that participation presents, for planners and managers of community based health and disability programmes.

There is no agreement among planners and professionals about the contribution of community participation to improving the lives of people, particularly the poor and disadvantaged. Some completely dismiss its value altogether, while others believe that it is the ‘magic bullet’, that will ensure improvements especially in the context of poverty alleviation. Despite this lack of agreement, community participation has continued to be promoted as a key to development. Although advocacy for participation waxes and wanes, today, it is once again seen by many governments, the United Nations agencies and non-governmental organizations (NGOs), as critical to programme planning and poverty alleviation (WorldBank,1996).

In 1991, the Ontario Government announced the Better Beginnings, Better Future project as a 25 year comprehensive, community-based research demonstration project for young children and their families living in eight disadvantaged communities in Ontario, Canada.

The objective of this longitudinal prevention policy research is to provide information on the effectiveness of prevention using an ecological model as a policy for children.

The three goals of Better Beginnings, Better Future are to: **A)** prevent emotional and behavioral problems in children; **B)** promote the optimal emotional, behavioral, social, physical and cognitive development in children; and **C)** strengthen the ability of communities to respond effectively to the social and economic needs of children and their families.

2.2.5 Rural Development in Jebel Marra Project:

The Jebel Marra Rural Development Project was a major programme of rural development in Jebel Marra, Zalingei and Wadialih Districts of what is now West Darfur: an area of some 90,000 sq km. Between 1981 and 1992, Government of Sudan contribute with 27% and the European Union funded contribution was, 73% to the project to carry out an agricultural research, build rural infrastructure and provide extension and community development services. With over 40 extension stations, it had a level of direct contact with the rural community which Darfur had never seen before. Throughout its life, the project's Monitoring and Evaluation Department carried out wide ranging surveys of rural livelihoods to guide the work and assess its impact. With over 900 households interviewed, the 1988 Post Harvest Survey Report presented here is typical of the breadth and depth of survey coverage. The report is technical, with a focus on the complex strategies Darfur farmers use to mitigate drought and flooding and fend off the many pests that attack their crops, and on the performance of the Jebel Marra Project Extension

Service. Nevertheless, it covers much more than that: Agriculture - A very detailed picture of the skill with which Darfur farmers manage different soils, crops and varieties to make the maximum benefit from the rains and their own labour. A key lesson is the need to look beyond drought and food security. In some years, pests are a bigger threat and cash crops are a major element in most livelihoods. Darfur livelihoods depend on making the maximum out of a good year more than on defending against a bad one. Varieties that yield a large crop when there is a lot of rain are at least as important as varieties that can survive a drought.

Gender - How land-holdings, farming and grain consumption differ between male-headed and female headed households.

Education - The contrast between sparse primary education and the 'strong popular tradition' of Islamic Khalwa education.

Water Supply - The dominance of seasonal water sources: watercourses during the rains and temporary wells in the dry season. Immigration - How, in earlier years, communities had welcomed migrants from drought stricken areas to the north, and allocated them farm land without charge; and how the flow slackened after a better harvest in 1986.

Food Security - Grain production and stocks relative to household consumption needs.

Cash Incomes - Over half of households sell crops, over 80% in some areas, and just under half sell livestock. Groundnuts, Tomatoes, Onions and Oranges were all more important than grain crops for cash income.

Land Tenure - The vast majority of cropped land is owned by the farmer and the rest is borrowed without charge. Renting is almost non-existent. More than half the farmers had fallow land - equivalent to more than 50% of their cropped land. The main reason for not cropping fallow was lack of labour and cash to hire labor. For those seeking to understand and help Darfur in 2008, this report from 20 years

earlier offers an insight into how Darfur livelihoods might look during more normal times; especially so as it fell in the relatively short window between the drought and famine of 1984/85 and the first outbreak of serious Tribal conflict in all over the Great Darfur 1989. www.jfmorton.co.uk(James Morton, 2008).

2.2.6 The Concept of Participation

The concept of participation in general and farmer participation in agricultural research in particular initially attained wide-scale use in the 1970's. Its emergence hinged largely on the move towards participation in social science research and the concept of farming systems research (FSR) (Farrington and Martin, 1988). Pierce and Stifle, 1979 defined the concept of participation as; “the organized effort to increase control over resources and regulative institutions in given social situations, on the part of groups and movements of those hitherto excluded from such control.” It is evident from this definition that controlling and influencing decisions that impact ones well-being are critical aspects of participation. An aspect that is not clarified is the process through which participation might be implemented. This is especially critical in the Pierce and Stifle (1979) definition, as this is a research definition. Research definitions are formulated with a research process in mind. They are therefore important for the operational of the components of interest to the research. It is obvious that the concept of participation is difficult to operational and this accounts for inconsistency in the definition.

This operational difficulty has contributed to variability in implementation. Consequently various writers have approached participation differently.

2.2.7 The definitions of rural development:

Recent studies (Biggs and Smith 1998; Hall and Nahdy 1999; Ashby et al. 2000; Chama et al. 2003) show that many organizations, especially publicly funded

agencies dealing with agricultural R&D in developing countries are facing a crisis of confidence among key stakeholders due to:

- Lack of strategic planning that indicates future directions
- Inward looking attitudes
- Poor participation and cooperation of end-users in research activities
- Inadequate monitoring and evaluation systems
- Top-heavy, bureaucratic procedures
- Insufficient resources for effective implementation of priority research
- Lack of effective external linkages and
- Lack of evaluation and performance culture.

This crisis has been found to result in organizational inefficiencies, lack of adequate stakeholder Participation and responsiveness, decreasing investor confidence, inadequate staff motivation and Morale, limited research and service outputs, limited uptake and utilization of research findings and a ‘Brain-drain’ from the public sector.

2.2.8 The Future of Proprietary Rights in Agricultural Development

Biotechnology and Industry:

Two developments in 1980s and 1990s changed the future of agricultural development significantly. The first was the Chakarbarty decision opening the door to the patenting of multi cellular plants and animals in the U. S. Traditional (original) patent protection has been provided to inventors in the chemical, electrical and mechanical fields of invention for many years, but this was expanded to biological innovation in 1980 by a US court decision. In the case of *Diamond vs. Chakarbarty* (447US 303[1980]), the court ruled that multi cellular living plants and animals were not excluded from patent protection.¹⁵ Further, court rulings in *ex parte Hibbard* for plants (227 USPQ 443(1985) and for animals, *ex parte Allen* (2 USPQ 2d 1425) reaffirmed this. This opened the door to patenting of plants,

Animals and of genes and gene constructs.¹⁶ the second and more important development was the advent of bio-technologies which enabled the extension of use restriction strategies biologically.

Patents were taken out on forms of genetic alterations that would enable plant breeders to “switch off” any characteristic of a given organism, including its reproductive capacity. This capability would effectively enable the translation of the use restriction strategy inherent within hybrid varieties to all other plant forms. To some extent this technologically based use restriction made the legal form of Protection irrelevant from the outset. The future most likely belongs to genetic use restriction technologies, not legal system-based use restrictions.

Technologically enforced use restriction brings with it an entirely distinct form of R&D system. In effect the future would appear to be one of forecasted “regime change”, in which world agricultural R&D shifts from being primarily public sector-based to being primarily private sector-based. The advent of enforceable proprietary rights in agricultural innovation means that it will now be possible to extend the experience with private R&D in hybrid crops to all other varieties. If the experience is in fact replicated, this does not bode well for those countries furthest off the technological frontier. The hybrid crop case study discussed previously was one in which the private sector failed to invest heavily in diffusion, and also made it more difficult for the public sector to perform that function in its place.

If this “crowding out” is witnessed across agriculture, a relatively higher rate of innovation-based growth will be complemented by a reduced rate of diffusion. The gap between the “haves” and “have not’s” will become broader and more generalized. ¹⁵ Other IPR systems have not fully adapted US practice in this regard, but the WIPO-TRIPs agreement puts pressure on many countries to follow the US lead on this. ¹⁶ The Board of Patent Appeals and Interferences of the US Patent and Trademark Office has interpreted *Diamond v. Chakrabarty* to mean that

any plant can be patented provided that it satisfies the basic standards for patentability, The US Supreme Court in *JEM. Ag Supply vs. Pioneer Hybrid Int. Inc.* (534US124,2001) agreed with this interpretation and ruled that the availability of plant variety protection was not in conflict with patent regulations for plants.

2.2.9 Early Agricultural Rural &Development:

Collection, Classification and Storage” Collections of plants for breeding have been around for much longer even than known breeders. C. Linnaeus developed the modern systems for classifying plants and animals into species, genus, and higher units in 1696. This system of classification remains relevant today⁵. As the classifications efforts proceeded, the interest in preserving species in collection grew. This led to the development of the Botanical Garden. These Botanical Gardens preceded the Agricultural Experiment Stations as research centers for plants. Today 1500 Botanical Gardens are maintained in many countries. 698 Botanical Gardens maintain collections of ornamental plants and other species, 119 of these maintain collections of cultivated species. The research programs of Botanical Gardens have been focused on collection, classification and preservation of species of higher plants. Botanical Gardens generally have few research programs to improve the performance of crop species. As a consequence they have never been effective research organizations.

The 19th Century agricultural innovators were primarily curious and observant farmers. In the west they were usually supplied by their governments and agricultural departments. These governments usually had to acquire the genetic resources from elsewhere. For this reason expeditions to other countries to collect seeds to be evaluated in new conditions have been an important activity in many countries for many years. In the United States, even the Patent office commissioned seed collection missions. In 1819 the Secretary of the Treasury sent requests to U.S. Counsels and naval offices asking them to collect seeds in foreign

locations. In 1827 a second request was sent including complete details on procedures for preservation and shipment of seeds. The navy proved to be particularly cooperative in these missions. Seed distribution was a major activity of the US Department of Agriculture (USDA) from its inception in 1819. For example, in 1849, 60,000 packets of most crop species perform best in temperate zone conditions. It is estimated by some that many species remain unknown and that there are as many as 10 to 20 million species (1.46 million have been classified). This estimate, however, is almost surely wrong because few new species are being discovered. Seeds were distributed to farmers in the United States for use and breeding.

These searches and the resultant relocation of varieties to western agriculturalists were infrequently successful but some important successes did occur. A number of early varieties including Pureplestian wheat and Lancaster wheat were the result of these informal breeding operations. (Huffman and Even son, 2005).

2.2.10 Extension of Early Agricultural Rural & Development

The Development of the Agricultural Experiment Station: The major event in the early development of agricultural R&D was the development of the Agricultural Experiment Station (AES) model. The Rothamsted Experiment Station established in 18436 is generally regarded to be the first modern agricultural experiment station. Other stations established in Saxony at roughly the same time can also lay claim to being among the first experiment stations. The AES model brought the concept of formal experimental science to agricultural research programs. Experimental designs were developed with specific “treatments” and “controls”. Thus, a fertilizer experiment might entail a randomized planting system where different levels of fertilizer (including zero fertilizer) application rates were applied on different plots. As the AES model matured, formal statistical tests were applied to the data generated. This experimental design system and the associated

statistical methods were inherently “scientific”, even though the biological sciences were not well developed at the time⁷. In the U.S. the Hatch Act of 1887 provided funding for a State Agricultural Experiment Station (**SAES**) in every State. However, the United States Department of Agriculture and a number of States had adopted the AES model before the Hatch Act was passed. The combination of USDA research and SAES research served the U. S. well⁸. The same model was then extended to many if not most other countries, where agricultural stations have been supported by government services and development agencies. These agricultural experiment stations became centers of both plant breeding and seed collections, and they were the sources of much of the seed that was used in breeding experimentation throughout the world. For many years it was common practice of these stations to share stored seed with other scientists at other stations, in the interests of a common advancement of agriculture. This public sector based plant breeding existed for many years, resulting in large collections of plant genetic resources and many new and advanced forms of plant varieties. As time passed, and private sector investment in plant breeding burgeoned, the public and private sectors jointly combined to enhance collections and increase breeding. In support of the Green Revolution, several International Agricultural Research Centers (**IARCs**) were established in the postwar era to act as central storage and informational exchanges: examples include the International Rice Research Institute in Manila; CIMMYT for maize in Mexico City; International Food Policy Research Institute in Washington, D.C... These IARCs at the international level are counterparts to the AES at the domestic level. They continue to serve as conduits for the movement of genetic resources and technological changes throughout the latter part of the twentieth century and into the present day. This sharing of information and genetic material at the global level culminated in a golden era of collection-based agricultural development. Gains in both frontier yields and in

yields in most other user countries were achieved through transportation of 6 The Station was privately supported by Sir Bonnet Lowes. 7 R. A. Fisher was the statistician on the Rothamsted Station from 1919 to 1933. He is credited with numerous statistical developments including some relevant to modern day econometrics. 8 It is often thought that Congress showed exceptional insight in passing the Hatch Act in 1887 and before that the Land Grant College Act in 1862. But in both cases considerable experience with Land Grant Colleges and Experiment Stations was available to Congress. Innovations and germplasm throughout the global agricultural research systems, both international and domestic. The outcome of this era of resource and technology-sharing was a diffuse and diverse system of research and development, built initially upon a foundation of public sector collections and farmer based breeding and then later on agricultural experiment stations.

The story of agricultural R&D in the nineteenth and early twentieth century's is one of widespread collections of historically useful germplasm, exchanged relatively freely and incorporated into innovative plant varieties. The commitment to public R&D took the initial form of collection and transport of genetic resources, and then to the broader undertaking of all aspects of agricultural R&D. Initially, the gains were achieved at the technological frontier (Europe and North America). Later the system became globalised, and the benefits of agricultural R&D were diffused more generally in the course of the green revolution.

2.2.11 Definition of Rural Development

The definition of “rural” differs by country, though it is usually used in contrast to “urban”. For instance, this word is defined based on population density in Japan, indicating an area other than “an area with over 5,000 people, which consists of each district with a population density of over 4,000 per square kilometer”. However, we cannot simply apply this definition to other countries. Moreover, due

to the fact that the concept of “rural” varies from Asia to Africa, it is difficult to define it uniformly. Therefore, the use of “rural” (including fishing and mountain villages) as a relative concept to “urban”, based on social, economical, and natural conditions in each country may be most adequate. The term could also be used to describe areas where a majority of the residents are engaged in agriculture in a broad sense (including livestock farming, forestry, and fisheries).

The final beneficiaries of development assistance are local people in both rural and urban areas. However, their livelihoods are based on significantly different social, economic, and natural environments. Most rural residents in many developing countries (especially in the least developed countries, or (LDC) are engaged in and depend on local agriculture, forestry, and fishery resources to make a living. If the local people are final beneficiaries of development assistance, the aim of rural development can be defined as the improvement of sustainable livelihoods (especially impoverished groups), with careful attention paid to local characteristics⁴. Frequently, the concept of rural development is used confusedly with “agricultural development” or “regional development”, however these concepts differ as described in Box 1.4 According to the World Bank (1975), rural development is defined as “a strategy aiming at the improvement of economic and social living conditions, focusing on a specific group of poor people in a rural area. It assists the poorest group among the people living in rural areas to benefit from development”. The scope of “rural” areas differs by country and region. It is a concept relative to “urban”. Goal of rural development: Sustainable improvement of livelihood for rural people.

2.2.13 Effective Approaches for Rural Development

International Trends:

Many assistance organizations emphasize poverty reduction as an important international assistance goal. The number of organizations which focus on rural development as a way to reduce poverty has grown with the realization that most impoverished groups live in rural areas. The major international trends for poverty reduction and rural development are below. The World Summit for Social Development held in Copenhagen in 1995 declared the goal to reduce absolute poverty in the world by half through people-centered social development. As a result of this conference, the goal of reducing the ratio of the poor by half between 1990 to 2015 was adopted at the DAC High Level Meeting of OECD in 1996. In addition, the UN General Assembly (Millennium Summit) in 2000 promoted this effort as one of its Millennium Development Goals (MDGs), with the World Bank and IMF also promoting the target. As a result of these international trends towards poverty reduction, the number of organizations engaging in rural development has increased. For example, the Asian Development Bank (ADB) is shifting its development assistance focus to fighting poverty and the World Bank is developing a new strategy for rural development in addition to the Poverty Reduction Strategy Papers (PRSP). The Department for International Development (DFID) in the United Kingdom adopted the Sustainable Livelihood concept as an alternative development approach to existing rural development and for effective anti-poverty programs.

2.2.14 the difference between rural development & other similar concepts

***Agricultural Development:**

“Agricultural Development” mainly aims at increasing agricultural products such as crops, livestock, fish and etc. Human being, land and capital are simply regarded as production goods and means. On the other hand, “Rural Development” mainly targets on people and institutions. Rural development includes agricultural development activities; however it is one of the means of economic revitalization for active farmers and targeted rural villages.

***Regional Development:**

“Regional” has a wide meaning to describe “area” (i.e. a certain area in country) or “region” (i.e. continent of countries). The Rural Planning Association, for example, considers regional development as a regional plan including rural and urban development. Source: Niki (2002) World Summit for Social Development, 1995 DAC High Level Meeting, 1996 Millennium Development Goals, 2000 Major donor agencies take multi sectoral approaches to rural development.

Approaches for Systematic Planning of Development Projects effective in reducing poverty and have expanded their activities to include remote rural areas such as areas in Southeast Asia.

Community participation has been recognized as an essential asset in the promotion of the independence of local people with many organizations implementing multi-sectoral activities based on local conditions, such as activities in agriculture, forestry, and fisheries as well as in non-agricultural income generation, education, health care and hygiene or infrastructure improvement.

2.2.15 Japan's Assistance in Rural Development

In the past, Japanese assistance focused not on rural development but on agricultural development and the improvement of agricultural productivity.

Therefore, approaches centering on technical transfers such as construction of irrigation facilities and introduction of farming techniques were utilized.

However, the agricultural approach alone was insufficient. As a result, multispectral activities increased. This included non-agricultural income generation, capacity building for farmers, health and hygiene, infrastructure, education, environment, and capacity building. International trends in comprehensive efforts also contributed to this change.

In Japan, **the ODA Charter** of 1992 states that poverty in developing countries should not be overlooked for humanitarian reasons. Also, in its **Medium-term Policy on ODA** in 1999, the Japanese government demonstrated its intention by implementing ODA under the Charter, keeping the objectives of the new 1996 DAC strategy in mind. This policy emphasizes the importance of economic growth and the fair distribution of its benefits and assistance for the poor. In addition, the Japanese government emphasizes the importance of basic education, health care, support for women in developing countries, safe water supply, and the improvement of regional differences through assistance to poor rural areas.

2.2.16 Concept of Assistance for Rural Development

Rural Development Issues:

Rural development issues are often equated with poverty reduction. Although the definition of poverty varies⁵, income poverty is used as a general Mid-term Policy on ODA, 1999 ODA Charter, 1992 Agricultural development had been a major approach in Japanese assistance, but a multi-sect oral approach has recently become more recognized. Rural development = Improvement in livelihood of

people in rural areas (poverty reduction). The World Bank's "World Development Report" (1990) **defined poverty** as having less than US\$370 of annual income per capita, and absolute poverty as less than US\$250. These indicators were calculated based on the idea that human beings require approximately US\$1 a day to obtain minimum nutrition needs. Effective Approaches for Rural Development guideline in defining poverty. In the case that "three-quarters of impoverished groups live in rural areas", "impoverished (poverty)" indicates conditions resulting from income poverty. Improvement of livelihood is a central component of rural development.

There also exists an opinion, which is increasingly become mainstreaming, that living standards cannot be measured by income and consumptions, but required a wider view. For those who support this argument, the satisfaction of **Basic Human Needs (BHN)** is necessary to improve living standards. Also, the United Nations Development Programme (UNDP) has been using the Human Development Indicator (**HDI**), which is based on life expectancy, literacy rate, gross enrollment ratio, and real GDP per capita in its **Human Development Reports** since 1990. In the OECD/DAC Guidelines on Poverty Reduction, poverty is described as the lack of the following five capabilities:

- * **Economic capabilities:** to earn an income, to consume, and to have assets.
- * **Human capabilities:** to have access to health care, educations, sufficient nutrition, clean water, and hygienic living conditions.
- * **Political capabilities:** human rights, to participate in political and policymaking process, and to be able to have an influence on decision-making.
- * **Socio-cultural capabilities:** to participate as a valued member of the community with social status and dignity.
- * **Protective capabilities:** to prevent vulnerability from food insecurity, illness, crime, war, and conflict.

As described above, comprehensive measures are essential for a multidimensional approach to poverty reduction. The number of assistance organizations which view comprehensive rural development as an effective approach in improving the livelihoods of rural people has increased. For example, agricultural development needs an increase of consumers, industrial development, and the improvement of infrastructure, and inhabitant's productivity through expansion, education, health care services has much effect.

In 1970, International Labour Organization (ILO) defined BHN as including food, shelter, clothing, safe water, health and sanitation facilities, access to public services such as education, searching of jobs for a sufficient income, a healthy and humane environment, and people's participation in the decision-making process which influences their lives and freedom. HDI is formulated based on the Amartya Sen.'s definition, "poverty indicates a lack of basic human capabilities (potential selective capability of individuals) and development means enhancement of potential capabilities each individual has." Definition of Poverty in DAC Guidelines on Poverty Reduction Poverty is multidimensional and includes factors other than income (such as education, health, politics, and society, vulnerability etc.). Approaches for Systematic Planning of Development Projects on those conditions Also, it is important to preserve the environment through resource management and natural disaster prevention. Moreover, it is essential that governments assist a variety of activities through a cross-sectional approach. In short, rural development deals with multi-sectoral issues, such as infrastructure, health care and hygiene, education, environment and governance as well as local income generation.

2.2.17 Significance Assistance for Rural Poor:

Rural development aims to improve livelihoods by implementing comprehensive development for rural areas where a majority of people in poverty live. Rural development can also contribute to reduce poverty in urban areas by reducing excessive population influxes from rural areas.

Effective Approaches for Rural Development:

Although the trickle-down theory was based on the belief that an expanded macro economy could improve the living standards of impoverished people, its effectiveness has been questionable. However its failure does not necessarily mean that efforts should be concentrated at the grass-roots level only.

This is because the development of rural areas cannot be achieved without attention to urban areas, which are the main consumers of agricultural products.

If conventional development projects were effective, rural poverty would have improved more significantly. Therefore, it is clear that the traditional rural development approach needs to be improved.

Hitherto, rural development depended on external assistance from foreign countries. However external inputs have been restrained due to donors' current poor financial conditions. As a result, the promotion of rural development requires effective external inputs to generate sufficient results and is capable of engendering further improvements. Development issues must therefore be comprehensively and cross-section ally understood for this to be realized. Maximum use of human and material resources in rural areas is also necessary. Some potential approaches are described as follows below.⁸ Based on statement by Hikaru Niki, JICA Senior Advisor Effective use of external resources and internal resources of rural areas is needed. Rural development contributes to poverty reduction. The concept of development (www.fao.org/docrep/t0060e/t0060e02.htm)

All rural extension work takes place within a process of development, and cannot be considered as an isolated activity. Extension programmes 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 and 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) and 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 and 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 can be concluded that a process of development should contain three main elements. **Economic** the development of the economic or productive base of any society, which will produce the goods and materials required for life. **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.

Human development means to achieve within their participation, 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 and ensure their active participation in the process of development.

2.2.18 Agricultural and rural development worldwide:

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. Agriculture's important role is one of production, both of food for the rural and 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.

2.2.19 Agricultural production:

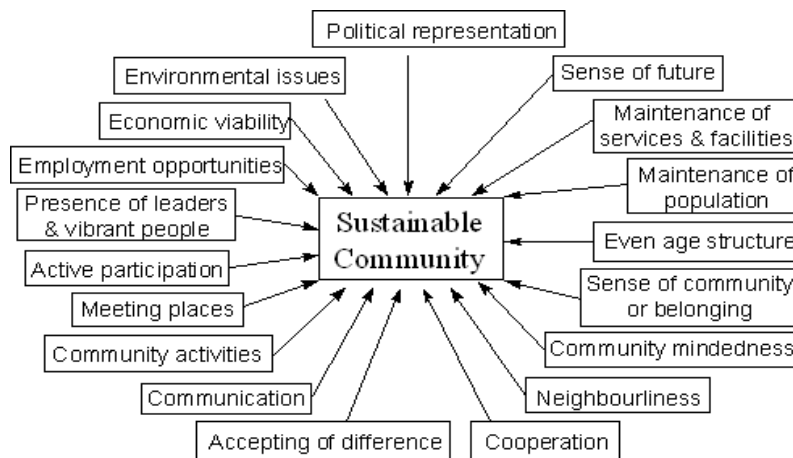
This concern to improve a country's agricultural base, and thus the livelihood of the majority of its inhabitants, is usually expressed in terms of programmes and projects of rural development. However, while agriculture is rightly the most important objective in the development of rural areas, rural 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 but as balanced social and 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 programme or a project which seeks to tackle the problem identified. However, as can be seen from the above statement, the problems those rural developments programmes attempt to solve are not only agricultural; such programmes must also tackle the social or institutional problems found in rural areas. Indeed, if the kinds of problems which rural development programmes confront are considered in very broad terms, they may perhaps be divided into two: 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 programmes can study the nature and extent of the problem and propose a course of action. Not all the problems which farmers face are physical in nature. Some problems are more related to the social and 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.

2.2.20 Main themes identified as important for the social well-being:



2.2.21 Rural Development and land degradation with drought and Desert:

Rural Development Promoting sustainable agriculture and rural development (SARD) The major objective of SARD is to increase food production in a sustainable way and enhance food security. This will involve education initiatives, utilization of economic incentives and the development of appropriate and new technologies, thus ensuring stable supplies of nutritionally adequate food, access to those supplies by vulnerable groups, and production for markets; employment and income generation to alleviate poverty; and natural resource management and environmental protection. The Commission on Sustainable Development (CSD) first reviewed Rural Development at its third session in 1995, when it noted with concern that, even though some progress had been reported, disappointment is widely expressed at the slow progress in moving towards sustainable agriculture

and rural development in many countries. Sustainable agriculture was also considered at the five-year review of implementation of Agenda 21 in 1997, at which time Governments were urged to attach high priority to implementing the commitments agreed at the 1996 World Food Summit, especially the call for at least halving the number of undernourished people in the world by the year 2015. This goal was reinforced by the Millennium Declaration adopted by Heads of State and Government in September 2000, which resolved to halve by 2015 the proportion of the world's people who suffer from hunger. In accordance with its multi-year programme of work, agriculture with a rural development perspective was a major focus of CSD-8 in 2000, along with integrated planning and management of land resources as the sectoral theme. The supporting documentation and the discussions highlighted the linkages between the economic, social and environmental objectives of sustainable agriculture. The Commission adopted decision 8/4 which identified 12 priorities for action. It reaffirmed that the major objectives of SARD are to increase food production and enhance food security in an environmentally sound way so as to contribute to sustainable natural resource management. It noted that food security-although a policy priority for all countries-remains an unfulfilled goal. It also noted that agriculture has a special and important place in society and helps to sustain rural life and land. Rural Development is included as one of the thematic areas along with Agriculture, Land, Drought, Desertification and Africa in the third implementation cycle CSD-16/CSD-17. Wise use of the high potentialities of Jebel Marra Mountains with respect to waters, forests, range and agricultural productivity can contribute in the supply of food, wood and water to lowland. This could provide a conservation system to the mountains or the semi-arid area surrounding the mountains. The history of production of green onion in the high lands of Jebel Marra to supply the demand at Zalingei is well known among the Fur people in the area (**Elnour,**

2007). Before onion practices is mainly did by female until the year 1980 when the Jebel Marra Rural Development Project (JMRDP) introduced the idea of cash crops alternatives the importance of onion appear and took its economical position among other crops grown in the area and gradually compete up to now. Fur people are innovative in agricultural development by inherit years ago **researcher, 2015**). The variety of small sized onion classified as “Falatia” was cultivated in the upper lands of Jebel Marra since the beginning of the twentieth century. In 1936 another variety called “Costi” was introduced these areas. This variety was accepted by Fur farmers for its bigger size, better taste and less irritating materials. The upper lands were the only source of green onion supply, of the two varieties, to the English Governor, the Fur Demiradash and the rich people in Zalingei during the colonial era. The “Falatia” onion variety gradually disappeared. By 1989 JMRDP introduced a new variety presently cultivated in the lowlands and supplied to most of the markets. The Fur people are known to be skillful sedentary agriculturists who acquired their agricultural experience by inheritance from their predecessors. They are always prepared to acquire and adopt technological development to improve their agriculture systems and conserve their environment, welfare of the living standers by socio- economical changes with income increasing towards the positive sides.

2.2.22 Holistic Approach for Sustainable Development

United of efforts generally to develop agriculture seimilitainously within rural development programmes were expected to results in improved of agricultural production; vertical through innovations introduced or horizontal to expand land size “improved” obviously having multiple interpretations. Better technologies have to be generated and put into use. Agricultural scientists by training and tradition want to believe that new technologies drive agricultural development. Research findings are passed through transformative and communicative stages

and finally results improved production and productivity. This default linear model is valid in some cases, and utterly wrong in others. How we perceive adoption and diffusion of agricultural innovations is therefore a key element in our position of agricultural research for development? Chapter 2 as a literature view describes alternative theories and concepts of adoption and diffusion of agricultural innovations, and empirical approaches to study adoption and diffusion. For a private company, high adoption rates and diffusion of its innovations is a sign of success, presuming sound economics. For public agricultural research, adoption is a necessary precondition for assessing if the benefits generated by the innovation were worth the research investment. Benefits range from outcomes at adopter, community, environmental changes, economic and social conditions level to distribution impacts of the new technology outcome. In its decision 8/3 on integrated planning and management of land resources, the Commission on Sustainable Development noted the importance of addressing sustainable development through a holistic approach, such as ecosystem management, in order to meet the priority challenges of desertification and drought, sustainable mountain development, prevention and mitigation of land degradation, coastal zones, deforestation, climate change, rural and urban land use, urban growth and conservation of biological diversity. Such an approach should take into consideration the livelihood opportunities of people living in poverty in rural areas.

2.2.23 Future Work to improve sustainable development:

The Commission identified six priorities for future work, including: *prevention and / or mitigation of land degradation; *access to land and security of tenure; *critical sectors and issues (such as biodiversity, dry lands, rehabilitation of mining areas, wetlands and coastal zones, coral reefs, natural disasters, and rural-urban and land management interactions); *access to information and stakeholder participation; *international cooperation, including that for capacity-building,

information-sharing, and technology transfer; and *Minerals, metals and rehabilitation of land degraded by mining in the context of sustainable development.

2.2.24 The Economic Importance of Onion:

The primary centre of origin of onion is Central Asia with secondary centre in Middle East and the Mediterranean region. From these centers, onion has spread widely too many countries of the world. Onion is different from the other edible species of alliums for its single bulb and is usually propagated by true botanical seed. According to Dahlgren et al. (1985) onion is one of the oldest cultivated vegetables, and has been in cultivation for more than 4000 years.

The earliest records came from Egypt, where it was cultivated at the time of the old kingdom. Carvings of onion can be seen on the walls of pyramids in the 3rd and 4th dynasties. A global review of major vegetables show that onion ranks second to tomatoes in area under cultivation. According to FAO (1999), over 40 million tones of onion were produced worldwide in 1998, covering about 4.5 million hectares. Tropical countries, having about 45% of the world's arable land, grow about 35% of the world's onions (Pathak, 1993). About 8% of the total area was in Africa in 1995. The productivity of tropical onion is around 9.6 tons/ha, which is very low, compared to the average bulb yield in temperate countries, which is about 19.5 tons/ha. The world average yield at present is about 17.3 tons/ha (FAO, 1999). Ethiopia has a great potential to produce onion every year for both local consumption and export with an average yield 13.3 tons/ha (CSA, 2001/02 as cited Taha 2007).

Onion is grown mainly for its bulbs; although the green shoots of salad onion is also an important crop. The onion bulb consists of the swollen bases (sheaths) of bladed leaves surrounding swollen bladeless leaves. Each leaf consists of a blade and sheath; the blade may or may not be distinctive. The sheath develops to encircle the growing point and forms a tube that encloses younger leaves and the

shoot apex. Collectively, the grouping of these sheaths comprises the pseudo-stem. It is used primarily as flavoring agents and its distinctive pungency, which is due to the presence of a volatile oil (allyl propyl disulphide). The mature 7 bulbs contains some starch, appreciable quantities of sugars, some protein, and vitamins **A, B, and C** (Devotee, 2000). Onion yield per hectare of sample households was 13060 quintal. This figure is almost similar to than the national productivity reported by CSA (2002) which is 133.92 qt/ha. Onion was introduced to the agricultural community of Ethiopia in the early 1970s when foreigners brought it in. Though shallots are traditional crop in Ethiopia, onions are becoming more widely grown in recent years. Currently, the crop is produced in different parts of the country for local consumption and for export of flowers to European markets. The average annual sale of dry bulb and cut flowers from Ethiopian Fruit enterprise alone was estimated to be about 6.2 million birr (ETFRUIT, 1992). According to World Bank report (2004), in the year 2001 the crop shared one fourth of the vegetable export quantities and stood third following green beans and peas contributing about 20% of the total vegetable export value which is about 244,000 US dollar of export earnings. In addition to dry bulb, onion cut flower also constitutes significant proportion of foreign export values. In between the years 1999-2001 alone, about 1.75 million birr worth cut flower stems were exported. This indicates that Ethiopia has high potential to benefit from onion production. In recent years the demand for onion increased for its high bulb yield, seed and flower production potential. The establishment of state owned enterprises contributed substantially to the increase in the production and expansion of area under onion in the country with limited amount of seed production experiences. Onion seed production depends on the cultivar, location, growing season and adequate plant protection measures (Lemma and Shameless, 2003:3).

One of the problems of onion production in the tropics is lack of seed which is true to type and of high germination and vigor (Cur rah and Proctor, 1990). Therefore, it is essential to produce and use fresh seeds for bulb production. Onion seed is usually produced in the temperate and subtropical countries. In the countries where high temperature prevails throughout the year, only the easy-bolting types of onion, requiring relatively low-temperature exposure, can produce seed.

Shallots were the traditional vegetative propagated alliaceous crop of the Ethiopian highland, but in the 1980's, Sudanese onion cultivars were selected. To improve onion production, the agricultural research system of the country has made efforts to generate improved varieties. Currently the research system made available the varieties like; Admired, Bombay red, Red Creole, Melkam, Merrimu brown and Nasik red (Dereselegn) to farmers. Bombay Red and Admired are widely grown in Ethiopia. In Ethiopia there is no agency involved in the multiplication and distribution of seed of this cultivar and other cultivars to the farmers. However, seeds of Bombay Red and Admired are being produced on limited scale by research centers and some farmers. Farmers living in the Amhara region produce large amount of onion bulbs every year. For instance, in 2005/06 production year the region contributes 706526 quintals onion bulb with 5338 hectares of land coverage of onion crop. According to the Fogera district office of agriculture in 2005/2006 production season the district contributes 355315 quintal with 3100 hectares. This indicates that the district comprises 49.9 % of the regional onion production.

Onion (Allium cepa) is botanically included in the Alliaceae and species are found across a wide range of latitudes and altitudes in Europe, Asia, N. America and Africa. World onion production has increased by at least 25% over the past 10 years with current production being around 44 million tones making it the second most important horticultural crop after tomatoes. Because of their storage

characteristics and durability for shipping, onions have always been traded more widely than most vegetables. Onions are versatile and are often used as an ingredient in many dishes and are accepted by almost all traditions and cultures. Onion consumption is increasing significantly, particularly in the USA and this is partly because of heavy promotion that links flavor and health. Onions are rich in two chemical groups that have perceived benefits to human health. These are the flavonoids and the alk(en)yl cysteine sulphoxides (ACSOs). Two flavonoid subgroups are found in onion, the anthocyanins, which impart a red/purple color to some varieties and flavones such as quercetin and its derivatives responsible for the yellow and brown skins of many other varieties. The ACSOs are the flavor precursors, which, when cleaved by the enzyme alliinase, generate the characteristic odour and taste of onion. The downstream products are a complex mixture of compounds which include thiosulphinates, thiosulphinates, mono, di- and tri-sulphides. Compounds from onion have been reported to have a range of health benefits which include anti-carcinogenic properties, antiplatelet activity, antithrombotic activity, antiasthmatic and antibiotic effects. Here we review the agronomy of the onion crop, the biochemistry of the health compounds and report on recent clinical data obtained using extracts from this species. Where appropriate we have compared the data with that obtained from garlic (Allium cepa L.) for which more information is widely available. Onions are grown commercially in more than 20 states, literally border-to-border and coast-to-coast. The National Onion Association estimates that less than 1,000 growers produce onions commercially in the United States, including organic. Virtually all onion producers grow other agricultural crops. The word "miracle" aptly describes a seed. Jack Kramer from planting through harvest, onions is unique plants. Let us help you learn more about how they grow through pictures! Check out our "Onions from the Ground up" PowerPoint presentation for more details. Domestic Onion Production

U.S. farmers plant approximately 125,000 acres of onions each year and produce about 6.2 billion pounds a year. This includes organic production, but excludes bulb onions for dehydration. The U.S. has 4.5% of the world's population, accounts for 1.6% of the world onion acreage, and produces about 4% of the world's annual supply. The U.S. dry bulb onion crop value exceeds \$1 billion at farm gate and generates \$5-7 billion dollars at consumer purchase level. The top three onion producing areas are California, Idaho-Eastern Oregon, and Washington.

2.2.25 Sample of U.S. onion acreage and production details

U.S. Planted Onion Acreage Estimates

State	Acres
Washington	22,828
Idaho-Eastern Oregon	21,000
California	17,850
Texas	13,600
Georgia	13,000
New York	8,750
Colorado	8,522
West/Central Oregon	5,825
New Mexico	5,000
Michigan	3,500
Nevada	2,900
Utah	1,750
Wisconsin	1,730
Other (FL, IA, IL, IN, MA, NC, NE, NJ, PA, SC, etc.)	1,050
N. Dakota/S. Dakota/Minn./Ohio	1,018
Arizona	500

U.S. Planted Onion Volume Estimates:

State	Pounds
Idaho-Eastern Oregon	1,470,000,000
Washington	1,453,900,000
California	952,150,000
Texas	431,900,000
West/Central Oregon	362,000,000
Colorado	356,000,000
Georgia	315,900,000
Nevada	229,400,000
New York	226,600,000
New Mexico	212,200,000
Michigan	87,500,000
Utah	61,250,000
Wisconsin	57,950,000
Arizona	35,000,000
Other (FL, IA, IL, IN, MA, NC, NE, NJ, PA, SC, etc.)	33,850,000
N. Dakota/S. Dakota/Minn./Ohio	23,750,000

2.2.26 International Onion Production Standard and Trade:

Approximately 170 countries grow onions for their own domestic use, and many are also involved in international trade. It is estimated that over 9.2 million acres of onions are harvested annually around the World. This production is grown from more than 8 million pounds of seed. Production is in excess of 3.2 billion 50# units according to sources at the United Nations Food and Agricultural Organization in Rome, Italy. Approximately 8 percent of this global onion production is traded internationally. Leading onion production countries are China, India, United States, Turkey, and Pakistan, respectively.

Onion Exports: U.S. onion exports amount to 11-14 million fifty pound bags per year. Leading export countries for the U.S. are Canada, Mexico, Japan, & Taiwan.

Onion Imports: U.S. onion imports total 12 - 17 million 50 pound bags annually. Leading countries importing into the U.S. are Mexico, Canada, Peru, and Chile.

Food Safety: In 2010, the U.S. onion industry developed voluntary commodity specific food safety guidelines for the dry bulb onion supply chain. This document serves as guidance for growers and shippers to adhere to best practices and regulations governing safe vegetable production. The industry supports government efforts to provide a strong food safety regulatory framework that assures the public appropriate standards are in place and being met by the dry bulb onion supply chain.

2.2.27 Early Agricultural Rural & Development:

Collection, Classification and Storage: of plants for breeding have been around for much longer even than known breeders. C. Linnaeus developed the modern systems for classifying plants and animals into species, genus, and higher units in 1696. This system of classification remains relevant today⁵. As the classifications efforts proceeded, the interest in preserving species in collection grew.

This led to the development of the Botanical Garden. These Botanical Gardens preceded the Agricultural Experiment Stations (see below) as research centers for plants. Today 1500 Botanical Gardens are maintained in many countries. 698 Botanical Gardens maintain collections of ornamental plants and other species, 119 of these maintain collections of cultivated species. The research programs of Botanical Gardens have been focused on collection, classification and preservation of species of higher plants. Botanical Gardens generally have few research programs to improve the performance of crop species. As a consequence they have never been effective research organizations.

The 19th Century agricultural innovators were primarily curious and observant farmers. In the west they were usually supplied by their governments and agricultural departments. These governments usually had to acquire the genetic resources from elsewhere. For this reason expeditions to other countries to collect seeds to be evaluated in new conditions have been an important activity in many countries for many years. In the United States, even the Patent office commissioned seed collection missions. In 1819 the Secretary of the Treasury sent requests to U.S. Counsels and naval offices asking them to collect seeds in foreign locations. In 1827 a second request was sent including complete details on procedures for preservation and shipment of seeds. The navy proved to be particularly cooperative in these missions. Seed distribution was a major activity of the US Department of Agriculture (USDA) from its inception in 1819. For example, in 1849, 60,000 packets of most crop species perform best in temperate zone conditions. It is estimated by some that many species remain unknown and that there are as many as 10 to 20 million species (1.46 million have been classified). This estimate, however, is almost surely wrong because few new species are being discovered. Seeds were distributed to farmers in the United States for use and breeding. These searches and the resultant relocation of varieties

to western agriculturalists were infrequently successful but some important successes did occur. A number of early varieties including Pureplestian wheat and Lancaster wheat were the result of these informal breeding operations.

2.2.28 The nutritive value of some important vegetables – Sudan:

The nutritive value of some of the important vegetables grown in the Sudan” composition in terms of 100-g edible portion

Components	Food (Cal) energy	Moist (g)	Carboy Rates(g)	Protein (g)	Crude Fiber(g)	Ash (g)	Calcium Iron (g)	Phosphorus (g)
Onion Green	34	90.5	7.0	0.5	0.6	0.5	0.5	23
Onion bulb	58	82.4	13.5	1.9	0.1	1.6	0.5	31

Source: National Chemical Lab, (Badry,1984). Ministry of Health, Khartoum -Sudan.

Production statistics for the common cultivated vegetable crops of Sudan.

Crop	Area ('000 ha)	Average yield (t/ha)	Optimum growing season
Onion	40	20	Winter

Onions are produced all over the country, the dry bulbs are used for cooking and direct used with fresh meat in most of Darfur weekly markets. The green bunching onion used as a salad mixed with tomato. There are many local types and landraces, with much variation in skin color, pungency and storability. When the introduced varieties proved not suitable for processing, an improved white variety (Nasi), which is suitable for dehydration, was selected from local material. Three other varieties (Kamlin yellow, Hilu and Saggai improved) have been developed and released to farmers to diffuse and adopt after skills and knowledge transfer under participation imperial and community relationship.

2.2.29 Production of Vegetables in the Sudan:

Vegetables are usually produced by small farmers in rain-fed areas, irrigated private farms or the big government schemes. Compared with cash crops like cotton and with the staple food grains, little attention has been paid so far to vegetable production. Therefore, reliable data on the area and production of

vegetables are difficult to obtain. With respect to regional distribution, the Central State is by far the most important production area, followed by the Northern State. Production in the remote areas of Western and Southern Sudan is subsistence-oriented. Altogether an output of 764 000 t of vegetables can be estimated for 1983, but production has been increasing steadily.

Table 3 presents the area, yield per unit area and season of production of the important vegetables produced in Sudan. With regard to area, onion ranks first, followed by tomatoes. Also widely grown are okra, cucurbits and eggplant. Onion is grown all over the country but is concentrated in the Central and Northern States. It occupies about 25% of the area under vegetable production. The main onion production period is the cooler season, from October to April. Tomato is grown almost all over the country, along the banks of the Nile and other rivers and in the irrigated schemes. Production of tomatoes is concentrated in the cooler winter season. Cucurbits are warm-season crops which are grown almost everywhere in the Sudan. Watermelons and pumpkins are popular in Western Sudan and are extensively grown during the rainy season in Kordofan.

2.2.30 The problems face rural farmers:

Farmers and their families face a whole range of problems. In thinking of rural development, therefore, a whole range of problems which the farmer confronts daily must be considered. Some of these problems will be physical or tangible, and relatively easy to identify. They can quickly be spotted by observation or by means of a survey and once the extent of the problem is understood a relevant course of action can be proposed.

For example, fertilizer can be recommended to improve the production level of a certain crop. However, not all of the problems that farmers face are physical nor can they always easily be seen. Many of these problems derive from the farmer's place in the social and political structure in the rural area. Farmers and their

families are involved in a complex web of relationships with other farmers in the area and often these relationships bring about problems. Dependence upon a money-lender, for example, is a problem facing many farmers in developing countries. Farmers may also have little access to the resources necessary for development, nor any way of getting such resources.

Finally, they may have had very little contact with rural development programmes or other government services, and may not know how to take advantage of such activities. It should be emphasized that the problems a farmer faces are complex and not all of them are physical or tangible. With this in mind, the kinds of strategies which rural development programmes can adopt can be considered. The first point to make is that there is no one strategy which is relevant to the problems of all rural areas. Different areas have different kinds of problems and the strategy must be adapted accordingly.

2.2.31 Rural Development Strategies:

There are three broad rural development strategies to be considered as followed:

Technological: The emphasis is upon technological transformation of different aspects of the rural society, e.g., improved cropping practice or better water supply, by the provision of the inputs and skills required to bring about the transformation.

Reformism: In this strategy, importance is also attached to technological change, but with a corresponding effort to provide the means by which the farmer can play a bigger part in rural development, for example, through organizational development, or participation in rural development programmes.

Structural: This strategy seeks to transform the economic, social and political relationships which exist in rural areas in such a way that those who were previously disadvantaged by such relationships find their position improved. Often this strategy is carried out by means of an agrarian reform programme.

The above strategies are not presented as concrete models to be followed without question. Nor is it suggested that rural development programmes must adopt any one strategy. They are presented to show the range and mixture of strategies which a rural development programmes can follow.

A farmer's problems will probably demand different action at different levels if they are to be tackled in a comprehensive manner.

Part Three: Innovations & Adoption

2.3.1 The Concept of Innovations:

Innovations are new ideas, practices, or products that are successfully introduced into economic or social processes. Innovations can take the form of technologies, organizations, institutions, or policies and involve the extraction of economic, ecological, and social value from knowledge. The process of innovation further involves putting ideas, knowledge, and technology to work in a manner that brings about a significant improvement in performance. It is not just an idea, but a workable idea. In agriculture, innovations can include new knowledge or technologies related to primary production, processing, and commercialization target, which can positively affect the productivity, competitiveness, and livelihoods of farmers and others in rural families in the area as a packages or one unit of bundles (researcher, 2014).

2.3.2 What the innovation Mean?

"Process innovation means the implementation of a new or significantly improved production or delivery method (including significant changes in techniques, equipment and/or software). Minor changes or improvements, an increase in production or service capabilities through the addition of manufacturing or logistical systems which are very similar to those already in use, ceasing to use a process, simple capital replacement or extension, changes resulting purely from changes in factor prices, customization, regular seasonal and other cyclical changes, trading of new or significantly improved products are not considered innovations. 'Community framework for state aid for research and development and innovation' (2006/C 323/01).

Innovation Process: What innovation is at P&G: www.pgconnectdevelop.com it's everything we do that improves the value consumers get from putting their trust in P&G brands.

Innovation ranges from product formulation, package design and consumer communications to supply systems, business models and organizational productivity (Procter & Gamble, 1837), American company.

2.3.3 Agricultural Innovation Packages:

Generally all assistants provide by institutions as material or non material produced from research centers or companies. But it needs to be use as one unit while deliver to the benefit of the community, hence define with package or bundle. e.g.: introduce of new cultivation practices, campaign and any idea that provision for the first time.

Agricultural Packages:

Are set of knowledge or process that reflect as a unit packages must be given to the beneficiaries as one bundle , to impact the product or productivity if they have introduce it effectively as consulted or trained by subject muter specialist in all fields of production requirements (**researcher, 2014**).

Innovation process: Definitions of innovation as there are supposed innovation experts around the world. In the literature, authors have defined the term innovation differently (Freeman 1982; Lund all 1992; Roth well 1992; Metcalfe 1995; Equistar 1997; Drunker 1998; OECD 1997; and EC 1995).

The simplest definition is anything new introduced into an economic or social process (OECD 1997). Innovation, on the other hand, is the commercialization and actual use of the intervention itself. Such innovations are not limited to technological (both product and process) innovations but also include institutional, organizational, managerial, and service delivery innovations. Innovations are new

creations of economic significance. In the context of agricultural research, innovation in its broadest sense covers the activities and processes associated with production, distribution, adaptation, and use of new technical, institutional, organizational, and managerial knowledge and service delivery (Hall, Mycelia, and Oyeyinka, 2005). According to Bennett (2008) research converts money into knowledge and innovation converts knowledge into money. The transformation of knowledge into products and processes does not follow a linear path, but rather is characterized by complicated feedback mechanisms and interactive relations involving science, technology, learning, production, policy, and demand. Taking a brilliant idea on an often painful journey, to become something that is widely used involves more steps and use of resources and problem solving along the way. This also emphasizes the notion that the responsibility of agricultural research organizations does not end with the production of new technology or knowledge only. Success can only be claimed when inventions are being disseminated, adopted and used (Chama, Gilbert, and Rose boom 2001).

Innovations is divided into two broad categories: evolutionary innovations and revolutionary innovations. Evolutionary innovations are brought about by numerous incremental advances in technology or processes. Revolutionary innovations (also called discontinuous innovations) require a good deal of user learning and often disrupt the users' routines and may even require a new behavior pattern. The four basic requirements for innovation are that it (1) is something new to the user, (2) is better than what currently exists, (3) is economically viable (and socially desirable), and (4) has a widespread appeal. Conventionally it has been assumed that the more radical and revolutionary innovations tend to emerge from formal R&D, and the more evolutionary innovations may emerge from practice, but there are many exceptions to each of these trends. According to Arnold and Bell (2001), the dominant activity in innovation is working with and reworking the

existing stock of knowledge in a novel way. The most useful definition of innovation in the Rural Development (RDC) context is given by **Bean and Radford (2002)**, who define invention as the economically successful use of invention; here innovation is defined as a solution to a problem face to the innovators when they work for change. The term invention refers to new concepts/ products / processes derived from individuals or from scientific or other forms of research or a novel combination of existing knowledge.

3.3.4 Acceptance of New Idea by Adoption

The classic definition of the term "adoption" is found in Rogers with Shoemaker (1971): "Making full use of a new idea as the best course of action available". This definition is explicitly (clearly) or implicitly used by virtually all adoption analysts. It is useful to think systematically about three assumptions which underlie this definition, and which must be valid if the concept is to have utility; we will suggest later that there are many instances where these assumptions do not hold: There is some definable "idea" which has much the same meaning to the people who use it, even in different settings?

The "uses" to which the idea is put in different settings bear enough resemblance to each other that comparing them is possible?

Criteria are available for determining that the **new idea** is in fact the" best "course of action? If these assumptions cannot be made, it is very hard to justify the use of "adoption" as a dependent variable interesting in any policy relevant sense at least. The first two assumptions constitute the basis for generalizing the analysis; the third constitutes the value judgment on which the analysis is based.

Generalize ability of findings and clarity of values and purposes are essential to useful policy research.

It is the appropriate function and responsibility of the analyst to define the criteria in terms of which he judges the innovation to be a desirable or undesirable result for society. These criteria may describe **outcomes** (future configurations of desirable relationships) or **processes** (suitable methods of achieving outcomes). These are approximately equivalent to Rotech's (1973) elaboration of Dewey's "terminal" and "instrumental" values.

When such criteria serve to define the desirability of "adoption", the implicit assumption is that the criteria hold in settings other than the one under immediate consideration. Thus, generalize ability of the value setting is as important as that of the circumstances involved. To say that one must clarify the value context in which an adoption decision is made is not to say that one must accept those values personally. It is to say that one must recognize those values as genuine for those who hold them. For Yin (1976) to speak of "bureaucratic self-interest" or Feller (1977) to describe "conspicuous production (attracting)" in local governments is not to endorse these value systems as appropriate terminal values for public policy. But adoption modeling is an explicit or implicit decision making approach, and as such must embody values as the basis for such decisions. If the values of the potential adopters are not analyzed explicitly, the values used are likely to be by default those of the analyst. Whether they will provide information useful in helping predict the choices of innovation actors is likely to be a matter of chance.

The stages of the adoption to transfer new idea: There are several theoretical frameworks one can draw upon to study the adoption process. Extension Theory, Bounded Rationality, Diffusion Theory, the Theory of Reasoned Action and Consumer Behavior Theory were of particular interest to us. In assessing the frameworks we looked for contradictions, and how and whether these frameworks could be used to study the adoption process. By study found that the different

frameworks don't contradict each other and when combined into our conceptual framework they offer very useful constructs for studying the adoption process.

2.3.5 Adoption of innovations theory:

The adoption process—a conceptual framework: For our discussion we approach adoption from a psychological point of view. We view it as a process of decision-making by individuals that requires cognition, i.e. it requires the use of an individual's abilities to perceive, understand, and interact with their environment in an intelligent manner. In that sense the person and their environment play a role in the process. Nutley et al, (2002), Rogers (1995), Clarke (1996) and Wilson et al (undated) described different stages of the adoption or change process. But the term —innovation- is used to refer any concept, technology, practice or system that is new to any individual. The adoption process begins when a person moves from a state of ignorance (called —pre-contemplation|| by Prochaska et al 1992), i.e. being unaware or ignorant, to being aware. Rejection may follow immediately or the adoption decision-making process may continue and the individual will develop and consequently demonstrate an interest in the innovation. Rejection may follow, or the individual may proceed into the next stage of the adoption decision-making process, comparison. During this stage the individual will compare the innovation with what's current. Rejection may result. If the comparison is favorable, the next phase is to test the innovation. During this stage the person will want to test the innovation on small scale, to see if it works for them or not? The individuals will decide to adopt or reject.

2.3.6 Innovation Adoption Curve (Rogers):

Rogers suggested the Innovation adoption curve to describe and classify the adoption of innovation into a number of groups. The basis of this adoption is that different individuals are having various behaviors to adoption.

The following are the classifications of adopter's categories:

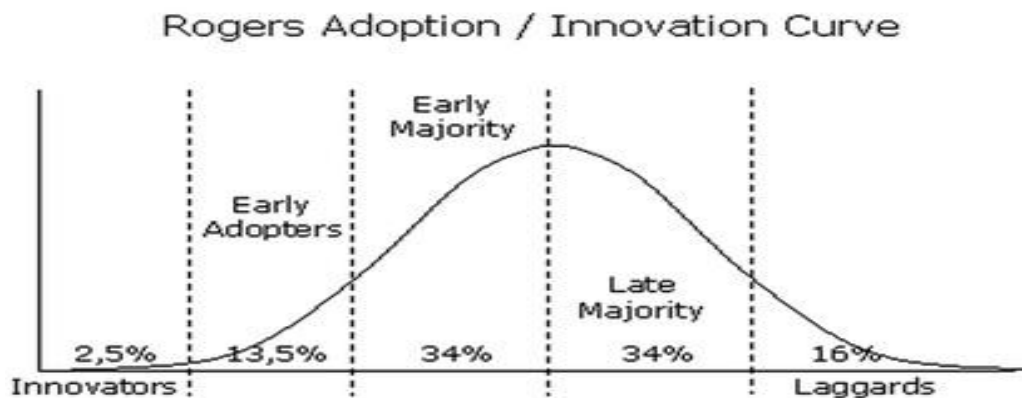
Innovators: Those who take the pain to come out with some innovation.

Early Adopters: Those who takes the initiating to adopt the innovation.

Early Majority: Those who are next to adopters in accepting the change.

Late Majority: Those who adopt the new idea and change only after it has been accepted by the **early** majority.

Laggards: Those who are traditional and adopt the change once it has been accepted by all and become the trend, (change in a situation). Farmers will only adopt technologies they are aware of or practice by others with positive results and very close participation in the same field of action either agriculture, industries and commerce (**Researcher, 2014**).



Rogers Curve of Adoptors category

2.3.7 Agricultural innovations:

Many technologists believe that advantageous innovations will sell themselves, that the obvious benefits of a new idea will be widely realized by potential adopters, and that the innovation will therefore diffuse rapidly. Seldom is this the case. Most innovations, in fact, diffuse at a disappointingly slow rate” (**Rogers 1995**). An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption.

In industrial and agricultural innovation literature, distinction is made between products, processes, and social organisational innovations. Agricultural innovations, as traditionally studied, are mainly to categorise as products, but with elements of processes. Technology is used synonymously (the same meaning) with innovation.

2.3.8 Agricultural innovations parameters (Classification):

- * Genetic, mechanic and chemical innovations (private goods) and agronomic, managerial and animal husbandry innovations (public goods);
- * Individual innovations (individual adopter) and collective innovations (group of persons);
- * Continuous innovations, semi-continuous innovations, and discontinuous innovations with increasing demands for new skills, knowledge and even investments;
- * Labour saving innovations and land saving innovations;
- * Process innovations and product innovations;
- * Endogenous and exogenous innovations (based on Sandino 2009).

A slightly different categorization is suggested by Sun ding (1999):

- * Innovations embodied in capital goods or products (“shielded” and “non-shielded”) and innovations not embodied;

Innovations according to impact:

- * New products; * Yield increasing innovations; * Cost-reducing innovations;
- * Innovations that enhance product quality. * Innovations according to form: Mechanical, biological, chemical, biotechnical, and informational innovations for the purpose of this study a distinction is made between Embodied, exogenous innovations (**EEI**) and packages of disembodied agronomic and managerial innovations (**PDAMI**). In practice the two categories are often combined.

The first category would mainly qualify as continuous or semi-discontinuous innovations, whereas the PDAMI category leans more to the discontinuous category, i.e. more skill-intensive.

2.3.9 Innovation Acceptance by Targeted people:

Innovations are defined: as the new technical products, scientific knowledge, application methods, and tools that facilitate problem solving for potential adoption. Different adopters perceive and assess innovation in a variety of ways. Rogers (1983; 2003) suggests that analysis of innovations should be made in the context of the potential adopter's own perspective and situation; in other words, to emphasize the subjective nature of innovations. Robertson and Gating (1986) suggest that this subjective approach is likely to differ from the descriptions of Journal of International Business and Cultural Studies Individual and cultural factors, Page 3 innovations, which are provided by a manufacturer or distributor. This suggests that perception of subjective characteristics of innovations will affect the outcome of the adoption decision. Considerable efforts by diffusion researchers indicated that adoption decisions followed a hierarchy of effects model that led to the cognitive assessment of cost/benefits associated with innovations. Investigations of adoption decisions have gained broader recognition when marketing researchers became concerned with acceptance of innovations. Consequently, the new product adoption process is most often viewed as a hierarchal sequence from knowledge/awareness and evaluation to full adoption.

It is argued that communication of information about new products is essential in order to create positive perception of the benefit and favorable attitude toward the innovation being described (**England & Stewart, 2007**). Traditional diffusion models (Rogers, 1983) are based on the assumption that making consumers aware of innovations will produce positive attitudes, which will facilitate acceptance. It is assumed that consumers act on their perceptions, once they become aware of the

desirability of adopting a particular innovation. Once the consumer becomes aware of a felt need and possesses the means to satisfy the need, he or she begins a process of innovation evaluation.

The concept of diffusion was first studied by the French sociologist Gabriel Trade (1890) and by German and Austrian anthropologists such as Friedrich Pretzel and Leo Fresenius.^[1] Its basic epidemiological or internal-influence form was formulated by H. Earl Pemberton,^[2] who provided examples of institutional diffusion such as postage stamps and standardized school ethic codes. Roger: Diffusion and innovation book, 1962. In 1962 Everett Rogers, a professor of rural sociology published his work: "Diffusion of Innovations".

In this seminal piece, Rogers synthesized research from over 508 diffusion studies and produced a theory applied to the adoption of innovations among individuals and organizations. Roger's work asserts that 4 main elements influence the spread of a new idea: the innovation, communication channels, time, and a social system. These elements work in conjunction with one another. Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Rogers adds that central to this theory is process. Individuals experience 5 stages of accepting a new innovation: knowledge, persuasion, decision, implementation, and confirmation. If the innovation is adopted, it spreads via various communication channels.

During communication, the idea is rarely evaluated from a scientific standpoint; rather, subjective perceptions of the innovation influence diffusion. The process occurs over time. Finally, social systems determine diffusion, norms on diffusion, roles of opinion leaders and change agents, types of innovation decisions, and innovation consequences. To use Rogers' model in health requires us to assume that the innovation in classical diffusion theory is equivalent to scientific research findings in the context of practice, an assumption that has not been rigorously

tested. How can we spread and sustain innovations in health service delivery and organization? Green high et al., evaluate an evidence-based model for considering the diffusion of innovations in health service organizations.^[3]

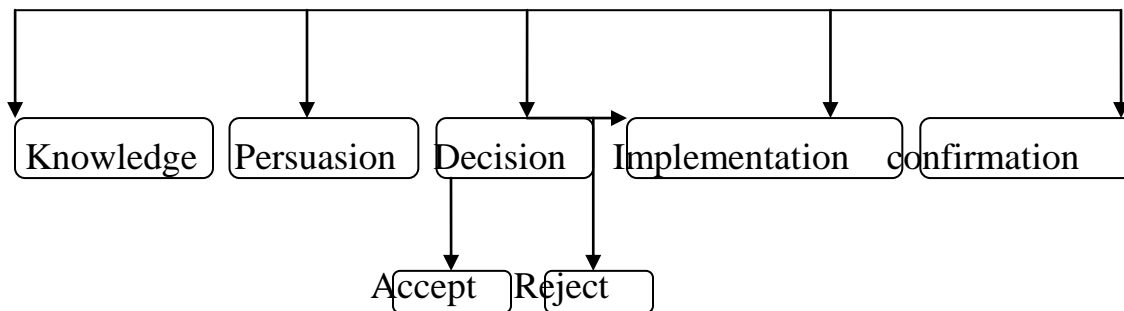
The origins of the diffusion of innovations theory are varied and span across multiple disciplines. Rogers identifies six main traditions that impacted diffusion research: anthropology, early sociology, rural sociology, education, industrial sociology, and medical sociology. The diffusion of innovation theory has been largely influenced by the work of rural sociologists.^[4]

Diffusion of an innovation occurs through a five-step process. This process is a type of decision-making. It occurs through a series of communication channels over a period of time among the members of a similar social system. Ryan and Gross first indicated the identification of adoption as a process in 1943 (Rogers 1962, p. 79). Rogers's five stages (steps): awareness, interest, evaluation, trial, and adoption are integral to this theory. An individual might reject an innovation at any time during or after the adoption process. Scholars such as Abrahamson (1991) examine this process critically by posing questions such as: How do technically inefficient innovations diffuse and what impedes technically efficient innovations from catching on? Abrahamson makes suggestions for how organizational scientists can more comprehensively evaluate the spread of innovations.^[10] In later editions of the *Diffusion of Innovations* Rogers changes the terminology of the five stages to: knowledge, persuasion, decision, implementation, and confirmation. However the descriptions of the categories have remained similar throughout the editions.



Source: Ryan and Gross first indicated the identification of adoption as a process in 1943 (Rogers 1962, p. 79).

Five Stages in Decision Innovation Process:



Source©: (researcher, 2015)

2.3.10 Rate of Adoption:

The rate of adoption is defined as the relative speed in which members of a social system adopt an innovation. Rate is usually measured by the length of time required for a certain percentage of the members of a social system to adopt an innovation (Rogers 1962, p. 134). The rates of adoption for innovations are determined by an individual’s adopter category. In general, individuals who first adopt an innovation require a shorter adoption period (adoption process) when compared to late adopters. Within the rate of adoption, there is a point at which an innovation reaches critical mass. This is a point in time within the adoption curve

that the amount of individuals adopters ensure that continued adoption of the innovation is self-sustaining. Illustrating how an innovation reaches critical mass, Rogers outlines several strategies in order to help an innovation reach this stage. Strategies to propel diffusion include: when an innovation adopted by a highly respected individual within a social network, creating an instinctive desire for a specific innovation. Also, injecting an innovation in to a group of individuals who would readily use said the technology, and provides positive reactions and benefits for early adopters of an innovation.

2.3.11 Costs of Adopting the New Technology:

In order to use the new technology, costs of acquisition, complementary investments, and learning are included. The need of complimentary investments slows the diffusion because it increases the costs, also because it takes time slowing down the rate at which the benefits of the technology are seen.

The standardization, modularity, and the possibility of reusing the services tend to decrease the costs of the applications development, while launching new products and services, what could increase the rate of adoption. Notwithstanding, there are many issues involving costs and uncertainties about the technology that tends to slow down the process of adoption. Some companies have stated the need of acquiring particular skills to implement the web services architecture. Frequently, the adoption of a new technology is followed by other changes to the individual's or organization way of doing things. The adoption of web services must be accompanied by the evolution of the systems mentality, since it is necessary to have a more modular approach to the development, as the reuse of services. While such thing can delay the adoption, the technology is being deployed and the learning curve effect acts accelerating the speed of adoption. Moreover, only observing the applications in the long run, it is possible to figure out possible unknown or hidden costs in their use and maintenance.

Additional costs can also be added due to the aspects of the XML documents mentioned before. Web services are still quite immature and a decision of investing or not must be made in an especially uncertain environment. Adopting a loser standard can make the support of the vendors to that standard decrease and force the company to replace the standards to guarantee the interoperability, demanding additional investments. Furthermore, it is not clear if the web service will evolve in the structure presented so far, what increases the uncertainty surrounding the making of the decision. Information and Uncertainty (Life is full of uncertainties) The adoption of a technology involves information about its suitability to the potential adopter's situation. The information about the technology can be influenced by the actions of the suppliers (as the vendor's push in the case of web services) and availability of information about experience with it in the decision maker's environment. The adoption of web services increases the information about their benefits, problems, and costs involved.

Vendors and consultants publish a lot of information about positive deployments of web services trying to reduce the uncertainty and show the positive aspects presented, what tends to increase the adoption rate. On the other hand, the many publications and project-pilots, as the one realized by the Financial Services Technology Consortium (**FSTC**), raising concerns about security aspects slows down the rate of adoption. The adoption is also influenced by the information about experiences in the decision maker's immediate environment such as industry associations, standard committees, peers, partners, and suppliers. The trial ability, or the facility of a potential adopter to experiment the innovation before high investment, and the observe ability, or the ease to evaluate the results after the trial influence the uncertainty about web services. Due to the modularity of web services, it is not difficult to test their use in a proof of concept project which does not involve a critical process of the company. Although some of the results of such

tests are observable in the short run like the performance of the systems, some characteristics such as the scalability demand some time to be observed, and many companies delay the adoption until further tests are made by other companies.

Uncertainty about benefits, costs, and length of life slows the adoption rate.

Then, the decision about the adoption can be seen as a real-option. Potential adopters have an option on a new technology, and if the adopter thinks the uncertain payoff reaches a certain value (the strike price), he exercises the option by adopting the new technology. So, the adoption tends to more often take place in industries with lower uncertainty and lower sunk costs. Adopting a new technology is similar to any other investment under uncertainty and can, then, be analyzed in the real options framework. As in the case of an investment, the decision of adopting a new technology is characterized by uncertainty over future profit streams, irreversibility creating at least some sunk costs, and opportunity to delay. In a real options framework, the potential adopter is viewed as having a call option to adopt the new technology that can be exercised at any time the attitude towards risks of each company has a great influence on uncertain situations as the one faced in the current stage of web services. As seen before, some companies risk facing the flaws so far encountered to take advantage of the pledged benefits.

2.3.12 Factors that influence adoption of an innovation:

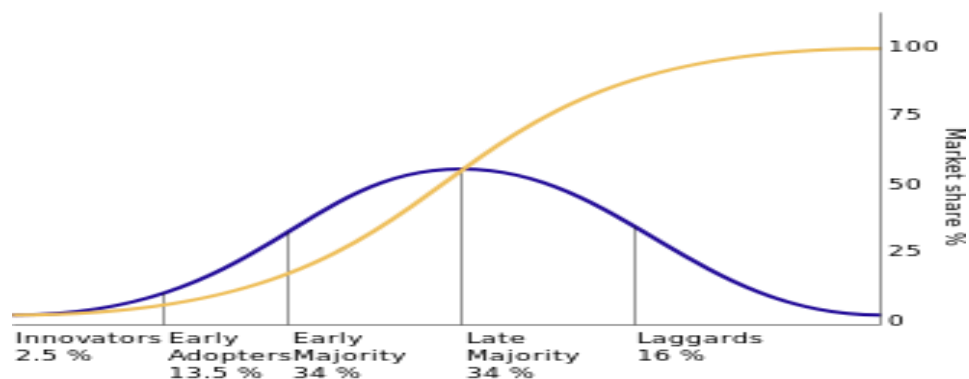
Innovations and Training importance Social factors, Diffusion and Adoption of innovations are: Social System or Structure (Farmers), Culture, Local Environment, Innovation Itself, Time, Communication Channel.

2.4.1 Part Four: The Diffusion Process

Diffusion research goes one step further than two-step flow theory. The original Trade who plotted the original S-shaped diffusion curve. Trades' 1903 S-shaped curve is of current importance because "most innovations have an S-shaped rate of adoption" (Rogers, 1995). Diffusion research centers on the conditions which increase or decrease the likelihood that a new idea, product, or practice will be adopted by members of a given culture. Diffusion of innovation theory predicts that media as well as interpersonal contacts provide information and influence opinion and judgment. Studying how innovation occurs, E.M. Rogers (1995) argued that it consists of four stages: invention, diffusion (or communication) through the social system, time and consequences. The information flows through networks. The nature of networks and the roles opinion leaders play in them determine the likelihood that the innovation will be adopted. Innovation diffusion research has attempted to explain the variables that influence how and why users adopt a new information medium, such as the Internet. Opinion leaders exert influence on audience behavior via their personal contact, but additional intermediaries called change agents and gatekeepers are also included in the process of diffusion. Five adopter categories are: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. These categories follow a standard deviation-curve, very little innovators adopt the innovation in the beginning (2,5%), early adopters making up for 13,5% a short time later, the early majority 34%, the late majority 34% and after some time finally the laggards make up for 16%.

Statements: Diffusion is the “process by which an innovation is communicated through certain channels over a period of time among the members of a social system”. An innovation is “an idea, practice, or object that is perceived to be new

by an individual or other unit of adoption”. “Communication is a process in which participants create and share information with one another to reach a mutual understanding” (Rogers, 1995). According to Rogers: "Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system . . .[it] is a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system" (Rogers 5-6). The characteristics of the innovation, the nature of the communication of the innovation among members within the social system, and the structure and norms of the social system all affect the rate at which the innovation diffuses (15-24). Characteristics of innovations that Rogers outlines include relative advantage, compatibility, complexity, Triability, and observe ability. Relative advantages represent the extent to which innovations are viewed as superior to the ideas they supplant. Compatibility requires that they be consistent with potential adopters' requirements, prior experiences, and values. Complexity is determined by the degree to which innovations require adopters to develop new skills and understandings. When they can be tested on a restricted basis, they score high in the category of Triability, and the visibility of their use and its effects determines their observe ability (15-16). **Jump to: navigation, search**



In mathematics the S curve is known as the logistic function

The diffusion of innovation matters because the agribusiness companies, land grant colleges and research institutions paid attention and used the theory to help get the word out about new products and techniques. So, if the innovations of the last 50 years had been ignored or adopted more slowly, food prices would be higher, productivity would be down and literally millions around the world would have starved. The Green Revolution (73/1974) might not have happened without the science of diffusion of innovation.

But there have been critics of the diffusion literature and its use by research institutions, particularly when it is applied to international development.

For instance, in 1972, Jim Hightower reviewed the impact that two parallel innovations had the mechanical tomato harvester and a hybrid tomato that would stand up to the jostling of the new harvester. The two innovations are credited with saving the tomato industry in California. But in the process, only the largest growers survived. Where there had been 4,000 farmers who worked their crops using migrant and hired farm laborers, only 600 large growers remained. Thousands of farm workers lost their jobs and, presumably, moved to the cities. And consumers began complaining that the tomatoes they bought in groceries were tougher and not as flavorful. Internationally, studies have shown that the way new technologies have been introduced has favored the largest, wealthiest farmers. The income gap between the wealthiest and poorest farmers widened after new technologies were introduced in Latin America.

The critics have pointed out several negative factors:

*There is a "pro-innovation" bias. It is generally assumed that all new technology is inherently good. But, in fact, there may be negative consequences that are foreseen.

*There is a bias toward larger and wealthier farmers. These are the individuals who are most receptive and most likely to adopt the new idea, so most of the information has been targeted at them. Those who need help the most are ignored.

*On the other hand, those who don't adopt a technology quickly are termed "laggards" and are blamed for their lack of response. There is an "individual-blame" bias. Critics say the companies, development agencies and research institutions should respond to the needs of all farmers.

*There are equality issues. Will an innovation cause unemployment or migration in rural communities? Will the rich get richer and the poor get poorer? Have the negative impacts of an innovation been considered?

Many in the development institutions are now considering these critiques. There are efforts to develop and advocate appropriate technologies in agricultural and other research fields. The needs of small scale farmers are being considered. Ag journalists are trying to get the message to those who are hardest to reach. In some areas in the developing world, cooperatives are being encouraged so that high technology can be shared within a disadvantaged community. And the consequences of innovation are being studied (**Gensler, S. and Garcia, R. 2011**).

Diffusion of Innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. Everett Rogers, a professor of communication studies, popularized the theory in his book *Diffusion of Innovations*; the book was first published in 1962, and is now in its fifth edition (2003). The book says that diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. The origins of the diffusion of innovations theory are varied and span multiple disciplines. The book espouses the theory that there are four main elements that influence the spread of a new idea: the innovation, communication channels, time, and a social system. This process relies heavily on human capital.

The innovation must be widely adopted in order to self-sustain. Within the rate of adoption, there is a point at which an innovation reaches critical mass. The categories of adopters are: innovators, early adopters, early majority, late majority, and laggards (**Rogers 1962, p. 150**). Diffusion of Innovations manifests itself in different ways in various cultures and fields and is highly subject to the type of adopters and innovation-decision process. Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system (**Rogers, 2003**). An innovation is an idea, practice, or object perceived as new by an individual or other unit of adoption. The diffusion process typically involves both mass media and interpersonal communication channels. And, in today's world, information technologies such as the Internet and cell phones – which combine aspects of mass media and interpersonal channels, represent formidable tools of diffusion (**Morris & Ogan, 1996**).

2.4.2 Improving access to information:

A farmer's choice to adopt a new technology requires several types of information. The farmer must know that the technology exists; she must know that the technology is beneficial; and she must know how to use it effectively.

These types of information may come from different sources as followed:

- * From external sources, such as agricultural extension workers and markets;
- * From observing the decisions and experiences of neighbors; and from the farmer's own experience.* from endogenous knowledge developed like intermediate technology, (Researcher, 2014).

2.4.3 Sources of Information in details:

External sources of information: such as extension workers may be particularly important for the adoption of new technologies. Though many farmers cite extension workers as an important source of information about agricultural

technologies, not all extension workers are motivated to do their job well. Many lack incentives to perform well because they are not monitored and are not rewarded for good work nor held accountable for shirking their responsibilities. In addition, extension workers may under serve disadvantaged groups such as women and minorities (problems creators).

Other farmers are also an important source of information about new technologies. Studies on technology adoption in fields other than agriculture show that individuals learn from **others within their social network**. The results are mixed, however: adoption by one's peers can make adoption more likely,¹ less likely² or have no effect³. Learning from others can result in a less rapid spread of technology if social networks are small or if the benefits of a technology are hard to observe. Examples include technologies for slow growing crops that take multiple seasons to mature or technologies that require considerable customization for a farmer's particular growing conditions.

Learning from Personal Experience: one study of fertilizer adoption in Kenya showed that intensive information provision by extension workers had a bigger effect on adoption than did information spread among peers.⁴ in this setting, farmers learn how to use the technology rather than learning about whether or not it is beneficial. The authors find that learning by trial and error, in this case, did increase adoption significantly over the short run, though not as much as extension services. Even more puzzling is that farmers stopped using the beneficial fertilizer even after experiencing its benefits.

Given that the relative importance of different sources of information is likely to vary across technologies and contexts, understanding this difference can help improve the effectiveness of interventions which seek to provide farmers with information to promote technology adoption.

Some previous studies suggests that the way information is presented (who provides the information, how much information is given and in what form) can be as important as the content of the information itself. For example, presenting information in different ways (i.e. framing) can have large effects on decision making. While framing appears to have large effects in some settings, research on the adoption of weather insurance in India shows that framing is much less important than other factors, such as the price of the insurance.⁵ Information about a technology is, of course, only one of many factors that affect whether or not a farmer will adopt the technology. During this stage the individual may also want, as part of the test phase, to compare the innovation with other available or possible options. They may reject it, because it —failed|| the test. However, if the innovation —passes|| these test, they will adopt the innovation. Once adopted, discontinued application or use is also a possibility, e.g. rejection after adoption.

Extension theory Assumptions and concepts: Extension science evolved from rural sociology and over time extension has become more and more aligned (straight) with social psychology and communication (Rolling, 1988). Traditionally, it was assumed that all farmers would eventually see the benefit of new innovations and thus adopt them. Therefore, views and measures of the success of an innovation were based on the level at which an innovation was adopted. A further assumption was that increased adoption rates would occur as information about the innovation was communicated through farmers ‘social networks. This organized and formal process of actively communicating such information was called extension, basically the process of changing voluntary behavior via communication. The goal of extension is to determine how to convey information regarding a new innovation to a certain population (such as farmers) so that they will adopt it. The challenge then of extension is to design an appropriate communication channel (Rolling, 1988). Over time within the field of agricultural extension the term

extension has also been used to collectively include any advisory, consulting, technology transfer, research, training, marketing, industry development, learning, change, communication, education, attitude change, collection and dissemination of information, human resource development, facilitation, or self-development activities that are undertaken with the aim of bringing about positive change on farms and in agriculture (Fulton, et al, 2003). Traditional extension models were widely accepted yet failed to adequately explain the adoption behavior of farmers.

2.4.4 Strengths and weaknesses of extension theory:

Extension theory helps us better understand the contextual factors of the adoption process and provide insights into the communication aspects there of – using communication to influence adoption decision-making. Essentially the extension approach is not about studying or analyzing the adoption of innovations. It is about bringing about behavior change. In itself the approach does not provide a framework for studying the adoption of innovations apart from evaluating extension outcomes. The approach could have contributed more to consider the adoption of innovations, but evaluation of extension projects and programmes, i.e. assessing adoption levels and rates, is rather uncommon. It is uncommon because it is difficult. In this regard Qamar (2000) says: —There has always been concern for the difficulties faced in carrying out objective evaluation and impact assessment of agricultural extension programmes. Identifying the impact of extension within an agricultural development programme is a difficult task. It would be unfair to say or even imply that extension projects or programs are not evaluated at all, because there are good examples of this happening, e.g. Target 10, a state-wide dairy industry extension program delivered through the Department of Natural Resources and Environment in Victoria.

2.4.5 Bounded Rationality Assumptions and concepts:

In 1957 Herbert Simon challenged the classical economic theory that economic behavior was essentially rational behavior in which decisions were made on the basis of all available information with a view to securing the optimum result possible for each decision maker. Instead, he contended that in today's complex world individuals cannot possibly process or even obtain all the information they need to make fully rational decisions. Rather, they try to make decisions that are good enough and that represent reasonable or acceptable outcomes. Simon proposed a less ambitious (successful) view of human decision making which he called "bounded rationality" (**BR**) or "intended rational behavior". It is, as he called it —that property of an agent. That behaves in a manner that is nearly optimal with respect to its goals as its resources will allow|| . He described the results it brought as "satisfying." As early as 1947, he rejected the notion of an omniscient "economic man" capable of making decisions that bring the greatest benefit possible. Instead he and proposed the idea of "administrative man" who "satisfies i.e. looks for a course of action that is satisfactory or `good enough.' "

Simon (1991) points out that most people are only partly rational, and are in fact emotional/ irrational in the remaining part of their actions. He gives Albert Einstein as an example of bounded rationality. Simon indicated that there were two major causes of bounded rationality: Limitations of the human mind, the structure within which the mind operate: Strengths and weaknesses of Bounded Rationality.

Bounded Rationality (BR) is about the whole decision-making process rather than its different stages. It is useful to better understand the intent of an individual when making a decision which, according to BR, is to —satisfied|| or reach acceptable outcomes. It also adds the understanding that imperfect information is acceptable for decision-making, and that an individual's goals and resources play a role in decision-making. Simon's research interest lay in the psychology of

problem solving although he published widely in a variety of disciplines. BR is a psychological concept. Initially it was defined negatively rather than positively, i.e. it tends to be seen as all those aspects of decision-making that substantive rationality is not (**Foss, 2002**). **Simon** later changed the term into —procedural rationality|| because he felt that BR was largely characterized as a residual category, i.e. rationally is bounded when it falls short of all-encompassing knowledge. His theory of satisfying search is one such characterization. BR contains virtually nothing about the merits of alternative search procedures and it lacks a theoretically developed basis (**Foss, 2002**).

2.4.6 Diffusion of agricultural innovations

Theories and concepts:

Diffusion of innovations has been studied by many disciplines (e.g.) anthropology, sociology of various brands, education, medicine, communication studies, marketing, business administration, etc.). From an initial domination of sociology, economics has gradually taken over, possibly because of a stronger emphasis on the theoretical basis for adoption, and its policy relevance.

The sociologist Everett Rogers' seminal work on diffusion of innovations (1995) is a good starting point into this area of study. An innovation according to Rogers is “an idea, practice or object that is perceived as new by an individual or other unit of adoption”. Diffusion is seen as “the process by which an innovation is communicated through certain channels over time among members of a social system”. A technological innovation usually has two components: a hardware aspect (the tool, product) and a software aspect (how to use the hardware).

For good reasons studies of diffusion of innovations have often addressed individual innovations, in practice innovations often come in packages – clusters – and are interrelated and interdependent.

The characteristics of innovations explain their rate of adoption. Five such characteristics of importance are **discerned to (understand something not clear):**

1) The relative advantage reflects how the innovation is subjectively perceived superior to the previous idea; 2) Compatibility reflects how the innovation is perceived “consistent with the existing values, past experiences, and needs of potential adopters”; 3) Complexity reflects the perceived difficulty to understand and use the innovation; 4) Trial ability is “the degree to which an innovation may be experimented with on a limited basis”; and 5) Observe ability reflects how the results of an innovation are visible to others. An innovation can further be changed or modified (re-invented) by a user.

Communication, through channels, provides information to a social system with the purpose to influence the knowledge and assessment of the innovation. Mass media is often more effective in creating awareness of an innovation, whereas personal contacts are more effective in forming an opinion about a new idea. Such interpersonal communication is facilitated if conveyors (transfer) of information are optimally similar to the receiver in certain attributes.

Time is a main factor in the decision-making process, innovativeness and an innovation’s rate of adoption. In the innovation-decision process, an individual passes through the stages: knowledge, persuasion, decision, implementation (adoption) and confirmation (post-adoption assessment). Information is sought at the various stages to reduce uncertainty about the usefulness of the innovation. The decision stages result in adoption or rejection of the idea. Innovativeness is an expression for how early an individual or other unit of adoption is adopting a new idea compared to other members of the social system.

Adopters are divided into five categories, each with its own characteristics:

*Innovators * early adopters * early majority * late majority and laggards.

Finally, rate of adoption is the relative speed with which an innovation is adopted by members of a social system.

The social system with its interrelated units shares an interest in finding solutions to a common goal, i.e. to improve their agricultural system to enhance livelihoods. Such a system has a social and communication structure that facilitates or impedes the diffusion of innovations in the system. **Norms**, being part of the social system, are the established behaviour patterns for system members. Often opinion leaders are the established behaviour patterns for system members. Often opinion leaders play a crucial role in influencing system members. Change agents may have the explicit role to influence members in a certain direction. Both opinion leaders and change agents are central actors in diffusion of innovations.

2.4.7 Three main distinguished types of innovation-decisions:

Independent individual decisions (adopt high yield varieties (**HYV**), collective decisions (soil conservation on hillsides), and authority imposed decisions.

The accumulated adoption over time, i.e. the diffusion, is frequently found to follow a sigmoid distribution. In marketing applications, this feature has often been used to predict and influence diffusion. Rogers' account for innovation adoption and diffusion does not give theoretical explanations to how adoption decisions are actually made. A classic article by Feeder (1985) is a frequent departure for theoretical analysis of decision making. This line of studies is mainly pursued by economists. The essence of his article and follow-up renderings on the subject include a number of complicating issues.

Often distinct technological options are present. Several decision processes may then run simultaneously or sequentially. Farmers may therefore rather consider portfolios (drawings) of innovations. Further, innovations may be divisible or of a lumpy character, presenting a dichotomous choice, which could be a deterrent to those interested in trying on a small scale. Lumpy investments may be only partially recoverable and adoption decisions may at times be close to irreversible.

There may be fixed transaction or information costs associated, that may again deter resource-constrained farmers. Innovations may be scale-neutral or contain economies of scale, i.e. the innovation may favour better resourced households. For divisible innovations, the intensity of use is of great interest (e.g. proportion of land allocated, intensity of use per area unit). Technologies may show improved performance over time, or become cheaper due to economies of scale, and therefore gradually become more attractive to farmers, *ceteris paribus*. Diffusion of technologies is more complex than the spread of influenza. Potential adopters are uncertain what an innovation may offer. Over time information from different sources and from the farmer's own experience reduces this uncertainty. A better base is established for adoption/rejection and intensity of use decisions.

The decision maker is assumed to maximise the utility of asset use over time, subject to various resource constraints, usually assuming a concave utility function. This can be expressed by static models, or by dynamic, sequential models that consider changing knowledge and conditions. In a dynamic model, new decisions depend on the results of previous decisions and their effect on wealth and income, and revised subjective knowledge about the utility of the innovation, including production outcomes, expected costs and revenues. Farmers gradually learn how to make better use of the innovation.

For management-oriented improvements, a better systems performance may also materialise over time. Hence parameters determining farmers' choice are continuously updated. Risk has been included in many models.

Production, incomes and costs are not deterministically known. Farmers have their subjective perception of risks involved, and consider not just the expected mean outcome but also the distribution of risks around the mean. The subjective perception of risk may well deviate from the objective reality. It is often assumed that farmers are risk averse with the extent depending on several characteristics. To

the farmer, the riskiness of an innovation compared to the old idea then matters; also whether the risk varies together with risks in other parts of the system or moves in the opposite direction. Some models suggest safety-first decision moves in the opposite direction. Some models suggest safety-first decision behaviour, implying that farmers have to be assured of a minimum result, and not base their decision on expected results. Theoretical models of adoption behaviour have looked into variables that may explain the decision to adopt or the intensity of adoption. Such factors include farm size, credit and information access, personal traits of the decision-maker, tenure arrangement, etc.....

Theoretical models for the aggregate adoption complement individual adoption models. Alternative assumptions regarding individual adoption behaviour usually result in S-shaped curves. Cochrane's technological treadmill suggests diminishing gains over time due to price declines following increased production due to adoption, (Discussion paper, version 2011-01-28 Johan Tobol).

2.4.8 Innovation Use World Wide for Fertilizer:

Fertilizer use intensity, by region worldwide: (kg/ha)

Asia, excl. ME	222.2
Central America & Caribbean	068.1
Europe	152.3
Middle East and North Africa	144.3
North America	161.0
Oceania	167.3
South America	195.0
Sub-Saharan Africa	009.6
Developed countries	165.3
Developing countries	180.1

Source: World Resources Institute (version 2011-01-28 Johan Tobol).

2.4.9 Understanding of innovation:

At its simplest innovation means novelty, new things being done, or old things being done in new ways. A more formal definition is the application of technological, institutional and human resources and discoveries to productive processes, resulting in new practices, products, markets, institutions and organizations that are improved and efficiency-enhancing. A simple model of the process involves recognition of need, articulation of demand, design of the innovative solution, implementation, replication, and up scaling, the latter stages of which in particular have entrepreneurial characteristics.

Innovation in agriculture and rural enterprise has happened for millennia through chance and through the informal but purposive action of rural people seeking new and better ways of production and organization. Rural people themselves, therefore, have been a major source of new knowledge and practices – indigenous knowledge and organization. Small-scale farmers' own creative responses continue to be important sources of improvement to agricultural productivity in many regions of developing countries. The process and rate of agricultural research and innovation were accelerated by the formal application of scientific methods in the relatively advanced economies in the 18th and 19th centuries.

Mandate was developed in the last century for agricultural research and development within public sector organizations, together with the philanthropic activities of private charitable foundations, which led to the development of formal national research systems in advanced and developing countries, and to the formation of international organizations such as those that make up the Consultative Group on International Agricultural Research (CGIAR) system.

There has been a limited, slow and incomplete convergence of informal farmer innovation with the research efforts of formal systems, and with mixed results. The Green Revolution (**GR**, 1960/70) is conventionally viewed as an output of public

sector research, but has also been interpreted as a classic example of a farmer-first participatory methodology. That it was also the result of a fortuitous conjunction of resource availability, timing, demand growth, and active policy support, draws attention to the wider economic and policy context within which challenges are perceived and opportunities exploited. Although huge financial resources have been expended on formal agricultural research and development, many poor people in remote and less-favored regions have not benefited from technologies developed for resource-rich areas, especially where government policies have been unsupportive. Moreover, formal research processes have been dominated by a top-down public sector model, without embracing the potential contribution of indigenous knowledge. Beneficiary participation in setting and implementing the research agenda has been difficult to achieve effectively. Innovation is now seen to come from multiple sources of research and be diffused through multiple extension processes, within given historical, political, economic, agro-climatic and institutional contexts. The increasing rate of technological change has led to the emergence of platform Technologies towards the end of the last century such as information and communications technology (**ICT**) and biotechnology. This highlights the opportunities for rural innovation and enterprise by the creative activity of private sector firms in non rural sectors. Deep participation, if not ownership, by beneficiaries is essential at some or all stages of the innovations process. The systems approach captures the critical elements: multiple sources of innovation; the need for participation of the rural poor as actors and in setting the research agenda according to local conditions; and networks of partnership with governmental and non-governmental organizations, and with commercial players. The complex and interactive nature of problems presented by the current challenges to rural societies, outlined below, suggests that external resources increasingly need to be brought to bear on rural problems solving, in partnership

with other stakeholders, at each stage of the innovation process. Only by surpassing the repetitive cycles of narrow economic evaluation and by adopting a systems learning perspective will agricultural and rural innovation systems find better ways to fulfill their economic and broader social purposes, and thereby help to achieve the Millennium Development Goals (MDGs, 2002\2015).

2.4.10 Diffusion Theory Assumptions and concepts:

According to Yates (2001) the work of Ryan and Gross (1943) in rural sociology is cited as the beginning of diffusion research. They used interviews as their main method of data collection. This has been a trend in diffusion research since. The diffusion theory literature overview of Nutley et al (2002) shows how evidence and ideas from a wide range of underpinning disciplines are drawn together. These disciplines include anthropology, education, geography and sociology. These underpinning disciplines provide a range of perspectives on the diffusion of innovations (Nutley et al, 2002). Although different, the perspectives and emphases of many of these research traditions are said to complement one another: According to Rogers (1995) diffusion theories have their origins in the explanation of the adoption of technological change by farmers. The first edition of Rogers 'influential text on the diffusion of innovations was published in 1962. Since then the scope of diffusion theories and associated empirical research has broadened. While diffusion literature largely covers innovations in industrial and service settings, a good deal of attention has now also been paid to public service and public policy innovations, with considerable emphasis on the diffusion of innovations in the health care and educational fields (Nutley & Davies, 2000). Rogers (1995) points out that diffusion is not a single, all-encompassing theory. It is several theoretical perspectives that relate to the overall concept of diffusion; it is a meta-theory (Yates, 2001).

2.4.11 Diffusion of Innovation Theory

Diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product.

Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behavior, etc.). The key to adoption is that the person must perceive the idea, behavior, or product as new or innovative. It is through this that diffusion is possible. Adoption of a new idea, behavior, or product (i.e., "innovation") does not happen simultaneously in a social system; rather it is a process whereby some people are more apt to adopt the innovation than others. Researchers have found that people who adopt an innovation early have different characteristics than people who adopt an innovation later. When promoting an innovation to a target population, it is important to understand the characteristics of the target population that will help or hinder adoption of the innovation.

There are five established adopter categories, and while the majority of the general population tends to fall in the middle categories, it is still necessary to understand the characteristics of the target population. When promoting an innovation, there are different strategies used to appeal to the different adopter categories.

*Innovators - These are people who want to be the first to try the innovation. They are venturesome and interested in new ideas. These people are very willing to take risks, and are often the first to develop new ideas. Very little, if anything, needs to be done to appeal to this population.

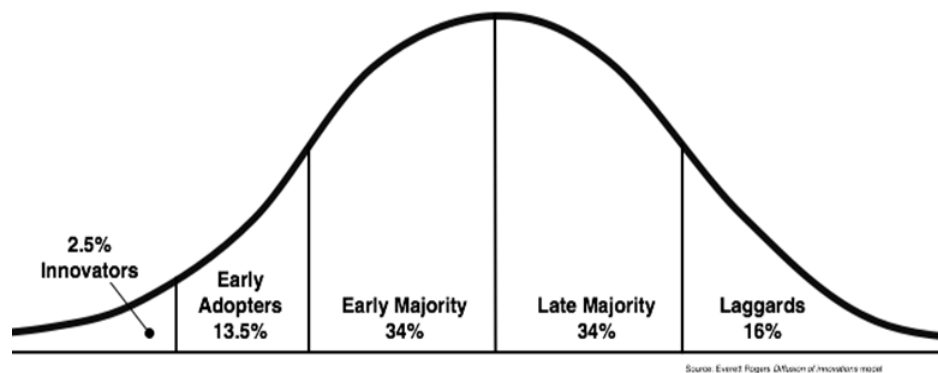
*Early Adopters - These are people who represent opinion leaders. They enjoy leadership roles, and embrace change opportunities. They are already aware of the

need to change and so are very comfortable adopting new ideas. Strategies to appeal to this population include how-to manuals and information sheets on implementation. They do not need information to convince them to change.

*Early Majority - These people are rarely leaders, but they do adopt new ideas before the average person. That said, they typically need to see evidence that the innovation works before they are willing to adopt it. Strategies to appeal to this population include success stories and evidence of the innovation's effectiveness.

*Late Majority - These people are skeptical of change, and will only adopt an innovation after it has been tried by the majority. Strategies to appeal to this population include information on how many other people have tried the innovation and have adopted it successfully.

*Laggards - These people are bound by tradition and very conservative. They are very skeptical of change and are the hardest group to bring on board. Strategies to appeal to this population include statistics, fear appeals, and pressure from people in the other adopter groups.



The stages, by which a person adopts an innovation, and whereby diffusion is accomplished, include awareness of the need for an innovation, decision to adopt (or reject) the innovation, initial use of the innovation to test it, and continued use of the innovation.

There are five main factors that influence adoption of an innovation, and each of these factors is at play to a different extent in the five adopter categories.

*Relative Advantage - The degree to which an innovation is seen as better than the idea, program, or product it replaces.

*Compatibility - How consistent the innovation is with the values, experiences, and needs of the potential adopters.

*Complexity - How difficult the innovation is to understand and/or use.

*Triability - The extent to which the innovation can be tested or experimented with before a commitment to adopt is made.

*Observe ability - The extent to which the innovation provides tangible results.

2.4.12 Limitations of Diffusion of Innovation Theory

There are several limitations of Diffusion of Innovation Theory, which include the following:

-Much of the evidence for this theory, including the adopter categories, did not originate in public health and it was not developed to explicitly apply to adoption of new behaviors or health innovations.

-It does not foster a participatory approach to adoption of a public health program.

-It works better with adoption of behaviors rather than cessation or prevention of behaviors.

-It doesn't take into account an individual's resources or social support to adopt the new behavior (or innovation).

This theory has been used successfully in many fields including communication, agriculture, public health, criminal justice, social work, and marketing. In public health, Diffusion of Innovation Theory is used to accelerate the adoption of important public health programs that typically aim to change the behavior of a social system. For example, an intervention to address a public health problem is developed, and the intervention is promoted to people in a social system with the goal of adoption (based on Diffusion of Innovation Theory). The most successful

adoption of a public health program results from understanding the target population and the factors influencing their rate of adoption, (**Boston University,2013**).

2.4.13 Classification of Innovation Decisions:

- **Innovation-decision process theory**

The innovation-decision process theory is based on time and five distinct stages (**Nutley et al, 2002**). The first stage is knowledge. Potential adopters must first learn about the innovation. Second, they must be persuaded as to the merits of the innovation. Third, they must decide to adopt the innovation. Fourth, once they adopt the innovation, they must implement it. Fifth, they must confirm that their decision to adopt was the appropriate decision. Diffusion results once these stages are achieved (**Rogers, 1995**).

Individual Innovativeness Theory: Nutley et al (2002) say the individual innovativeness theory is based on who adopts the innovation and when. A bell-shaped curve is often used to illustrate the percentage of individuals that adopt an innovation. **Rogers (1995)** also pointed out that as well as the determinants of apportion at the individual level, there are a variety of external or social conditions that may accelerate or slow the diffusion process such as: Whether the decision is made collectively, by individuals, or by a central authority. The communication channels used to acquire information about an innovation, whether mass media or interpersonal. The nature of the social system in which the potential adopters are embedded, It is norms and the degree of inter-connectedness. The extent of change is agents, advertisers, development agencies...etc. Promotion efforts are important communication, or rather the process where information is both created and shared in order to reach a mutual level of understanding between individuals. This provides the means by which information is transmitted between individuals and social systems creating the communication channel (**Rogers & Scott, 1997**).

2.4.14 Sequence of Change Agent Roles (Rogers):

- * To develop a need for change.
- * To establish an information-exchange relationship.
- * To diagnose problems.
- * To create an intent in the client to change.
- * To translate an intent to action.
- * To stabilize adoption and prevent discontinuance.
- * To achieve a terminal relationship.

Diffusion Definitions: is a process by which an innovation is communicated through certain channels over time among the members of a social system.

The definition indicates that:

- * The adopters can be an individual, groups, or organization at different levels of social system.
- * The target is innovation.
- * The process is communication.
- * The means is communication channels.
- * The context of innovation is a social system.
- * It is a change over time.

Different types of adopters categories for innovations:

- Innovators (risk takers)
- Early adopters (hedgers)
- Early majority (waiters)
- Late majority (skeptics)
- Late adopters (slowpokes)

2.4.15 Nature of the Social System:

A social system is defined as a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and or subsystems. All members cooperate at least to the extent of seeking to solve a common problem in order to reach a mutual goal: Sharing of a common objective binds (connect) the system together.

The social structure affects the innovation's diffusion in several ways:

*Social structure and communication structure: patterned arrangements of the units in a system.

*System norms: norms are established behavior patterns for the members of a social system.

*Roles of opinion leaders and change agents: opinion leadership is the degree to which an individual is able to influence other individual's attitudes or overt behavior informally in a desired way with relative frequency

Types of innovation decisions:

- Optional innovation-decision, collective innovation -decision, authority innovation-decision; contingent innovation-decision.

The consequences of innovation:

*Desirable vs. undesirable, direct vs. (versus against, explain the word that define above). Indirect, anticipated vs. unanticipated (to imagine or expect something will happen).

Additional factors of Rogers' theory, (Siegel, 1999):

*Pro-innovation Bias: three assumptions about innovation:

*It should be diffuse and adopted by all members of a social system.

*It should be diffused more rapidly. *It should be neither reinvented nor rejected.

2.4.16 Innovation-decision process for individual

Knowledge: it occurs when an individual is exposed to the innovation's existence and gains some understanding of how it functions

Persuasion: it occurs when an individual forms a favorable or unfavorable attitude toward the innovation

Decision: it occurs when an individual engages in activities that lead to a choice to adopt or reject the innovation.

Implementation: it occurs when an individual puts an innovation into use

Confirmation: it occurs when an individual seeks reinforcement of an innovation decision or reverse the previous decision due to the conflict what **are the contributions of Rogers' Model? Ellsworth (2000) pointed out the most critical benefits of Rogers' model is the innovation attributes he said:**

"Practitioners are likely to find this perspective of the greatest use if they are engaged in the actual development of the innovation or if they are deciding whether (or how) to adapt the innovation to meet local requirements...Rogers' framework can be useful in determining how it is to be presented to its intended adopters." (p.40) Rogers' model has identified the critical components in the change system and their characteristics. The model is relatively systematic because the consequence of the change is confined with a predetermined "innovation", a predetermined goal. The interrelationship and dynamic exchange between the components in the change system is not expected to contribute to the continuous shaping of the vision, but to be controlled to adopt a desirable idea, object, or programme.

2.4.17 Innovation Decision Process:

The Innovation Decision Process theory: (Rogers, 1995) states that diffusion is a process that occurs over time and can be seen as having five distinct stages. The stages in the process are Knowledge, Persuasion, Decision, Implementation, and Confirmation. According to this theory, potential adopters of an innovation must learn about the innovation, be persuaded as to the merits of the innovation, decide to adopt, implement the innovation, and confirm (reaffirm or reject) the decision to adopt the innovation. This theory has been so widely cited in the instructional technology literature that Sachs (1993) writes, somewhat derisively, "after looking at [the literature] in our field, one might get the impression that the only important thing we need to know about how to encourage the adoption of innovations or how to be better change agents is that there are five stages to the innovation adoption process (p. 1)". While Sachs correctly concludes that many other important theories of innovation diffusion area overlooked, the Innovation Decision Process theory remains among the most useful and well known.

2.4.18 Individual Innovativeness:

The Individual Innovativeness theory (Rogers, 1995) states individuals who are predisposed to being innovative will adopt an innovation earlier than those who are less predisposed. Figure 1 shows the bell shaped distribution of Individual Innovativeness and the percentage of potential adapters theorized to fall into each category. On one extreme of the distribution are the Innovators. Innovators are the risk takers and pioneers who adopt an innovation very early in the diffusion process. On the other extreme are the Laggards who resist adopting an innovation until rather late in the diffusion process, if ever.

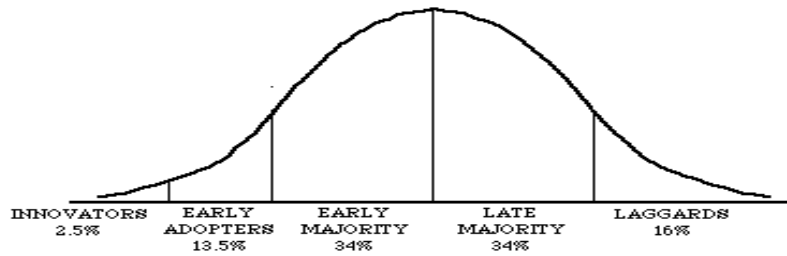


Figure 1. Bell shaped curve showing categories of individual innovativeness and percentages within each category

2.4.19 Rate of Adoption of Innovation:

The third widely-used diffusion theory discussed by Rogers (1995) is the theory of Rate of Adoption. Rate of Adoption theory states that innovations are diffused over time in a pattern that resembles an s-shaped curve. Rate of Adoption theorizes that an innovation goes through a period of slow, gradual growth before experiencing a period of relatively dramatic and rapid growth. An example of how rate of adoption might typically be represented by an s-curve is shown in Figure 2. The theory also states that following the period of rapid growth, the innovation's rate of adoption will gradually stabilize and eventually decline.

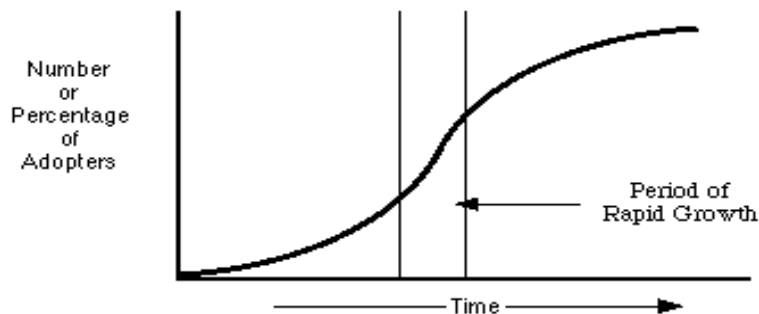


Figure 2. S-curve representing rate of adoption of an innovation over time

2.4.20 Perceived Attributes of Innovation

The Theory of Perceived Attributes (Rogers, 1995) states that potential adopter's judge an innovation based on their perceptions in regard to five attributes of the innovation. These attributes are: Trial ability; Observe ability; Relative Advantage; Complexity; and Compatibility. The theory holds that an innovation will

experience an increased rate of diffusion if potential adopters perceive that the innovation: 1) Can be tried on a limited basis before adoption; 2) Offers observable results; 3) Has an advantage relative to other innovations (or the status quo); 4) is not overly complex; and 5) Is compatible with existing practices and values.

The Theory of Perceived Attributes has been used as the theoretical basis for several studies relevant to the field of instructional technology. Perceptions of compatibility, complexity, and relative advantage have been found to play a significant role in several IT-related adoption studies. Wyner (1974) and Holloway (1977) each found relative advantage and compatibility to be significant perceptions among potential adopters of instructional technology in high schools. Eads (1984) found compatibility to be the most important attribute among students and school administrators. Surry (1993) studied the perceptions of weather forecasters in regard to innovative computer based training and found relative advantage; complexity and compatibility were important adoption considerations.

2.4.21 Factors Affecting Farmers' Adoption of Agricultural Innovations

There is a large literature on the adoption of agricultural technology (for good overviews see Rogers, 2003; Sanding and Zilberman, 2001; Feder and Umali, 1993). Viewed through a broad cross disciplinary lens, there is agreement that the adoption of agricultural technology depends on a range of personal, social, cultural and economic factors, as well as on the characteristics of the innovation itself (Pannell et al., 2006). A meta level analysis of this type of research undertaken by Prokopy et al (2008) shows that education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness and utilization of social networks are generally positively, associated with the adoption of best management practices. Narrowing the disciplinary focus, the agricultural economics literature on technology adoption emphasizes the role of fixed and variable costs and heterogeneity, whether in terms of structural farm factors such

as size or land Quality, or the characteristics of farmers in terms of human capital (Sanding and Zilberman, 2001). Focusing on factors outside the farm gate, Fulginiti and Perrin (1993) report a positive relationship between past output prices and current productivity, while Miller and Talley (1989) show that market interventions such as price supports can speed up the adoption of new technologies. The characteristics of the technology itself are also an important influence on farmers' technology adoption and usage decisions (Adesina and Zinnah, 1993). In particular, the relative complexity, risk and investment characteristics of technologies significantly affect their adoption and diffusion (Batz et al, 1999). Looking at the differences between capital-intensive and management-intensive technologies, El-Ostia and Morehart (2002) found that age, size and specialization in dairy production increased the likelihood of adopting a capital-intensive technology, whereas education and size of operation positively impacted the decision to adopt a management-intensive technology. In this context, the risk preferences of farmers are also important in influencing the technology adoption decision, especially if capital-intensive technology costs are irreversible (Sanding and Zilberman, 2001). Other parts of the social science literature emphasize the role of distance and geography in the adoption of agricultural technologies (Rogers, 2003; Diamond, 1999). In this case, any significant travel costs involved in the initial learning about a technology and subsequently establishing it might reduce the likelihood of that technology's adoption. More recently, some economists and other social scientists have focused more explicitly on farmers' motivations, values, objectives and behavioral influences in the context of technology adoption (e.g. Rehman et al., 2007). This literature focuses on explaining how social norms, beliefs about a technology's performance and importance and farmers' intentions to change practices impact on the adoption of technologies.

2.4.22 Communication concepts and definitions

Communication Definition: The term “communication” has Latin roots; the term we commonly use today comes from communicate, which means to make common or impart (Peters, 1999; Williams, 1985). While the concept of communicate persists in the way we commonly think of communication, the term has also lent itself to many other uses and practices over the past several centuries. Since appearing in the English language, the term “communication” has been used to represent means of physical connections such as roads and railways, the media industry, (Williams, 1985), and sexual intercourse as well as participation in scheduled meetings among Freemasons or Christian practices such as Holy Communion (Communication, 2010).

2.4.23 The current definitions of 'communication':

As recorded in the Oxford English Dictionary are classified into three categories:

1) Senses relating to an affinity or association; 2/ Senses relating to the imparting or transmission of something; and 3/ Senses relating to access. The first category houses definition, “interpersonal contact, social interaction, association, intercourse,” though admittedly this definition is often difficult to distinguish from 5b, defined as “The transmission or exchange of information, knowledge, or ideas, by means of speech, writing, mechanical or electronic media, ..etc,” which is classified in the second category (2010). Dance (1970) worked to clarify the concept of communication by outlining three points of “critical conceptual differentiation” (p.208). **First**, Dance considered level of observation or abstractness. Some definitions of communication are broad (and thereby inclusive) while other definitions are more restrictive (and there by narrow).

Second, definitions of communication can differ on the dimension of intentionality; some definitions include only purposeful messages while others do

not impose this restriction. Finally, conceptualizations of communication differ in terms of normative judgment; some definitions include a statement of communicative success or effectiveness while others do not. Anderson (1991) explained that these differing conceptualizations of communication move scholars down different theoretical trajectories and those definitional choices lead scholars to ask different research questions. Dance (1970) seems to agree with Anderson when he ultimately concludes “we are trying to make the concept of ‘communication’ do too much work for us” (p.210). He asserts that communication is actually a family of concepts rather than a single theory or idea that collectively defines ‘communication.’ Communication is, of course, an academic discipline, yet it is a significant term within the “practical life world” (Craig, 1999, p.120).

A Google search for “communication” generates almost 1.3 billion results, which include pages for university communication departments alongside histories of communication industries and tips to improve one’s communication skills.

This may indicate what Craig (2005) suggests is a cultural emphasis on the importance of communication to solve problems, as well as the idea that bad communication can cause problems (p. 660).

The emphasis on communication may also stem from our desire for community; Peters (1999) describes communication as longing, both for understanding of others as well as expression of us. Communication, thus, signifies both access and solitude, bridge and chasm (Peters, 1999).

2.4.24 Communication as a discipline History and interpretations:

The National Communication Association (2010) describes the field of communication as a study of “how people use messages to generate meaning within and across all kinds of contexts, cultures, channels and media Communication is a large and diverse field that includes inquiry by humanists, social scientists and critical and cultural studies scholars.” The diversity of the field

has also contributed to what some consider a “fractured” history of communication (Delia, 1987, p. 22), difficulty in determining a curriculum (see Morale & Backland, 2002) and a lack of consistency among scholars and research interests. Craig (1999) argued that communication as a theory does not exist because of these divisions and, specifically, a lack of common theory. While Craig allows that communication’s interdisciplinary roots are a good thing, part of the lack of coherence is due to the treatment of communication as an “interdisciplinary clearing house” (p. 121). In response to this problem, Craig identified seven traditions of communication theory: rhetorical, semiotic, phenomenological, cybernetic, socio-psychological, socio-cultural, and critical. Central to Craig’s argument is the idea that because the term “communication” remains familiar and relevant in our society, the development of communication theory would have wide applications and legitimize the discipline (Myers, 2001, and Craig, 2001).

2.4.25 Communication and "the West":

There has also been criticism of the field of communication for its Western or, more specifically, American bias. Guarantee (2010) identifies the United States and the United Kingdom as the primary gatekeepers of communication and champions the inclusion of non-Western ideas. Specifically, he classifies Craig’s seven traditions as either communication science or communication arts, and then identifies the best candidates for championing non-Western research in these traditions. Likewise, Kim (2009) criticizes the discipline’s “Amery centric” bias, particularly as communication gains traction in Asia (p. 412). Kim’s interpretation of North American communication is that the discipline is lacking because it does not include culture in theory, research, and practice, and argues that, while social sciences have been criticized in the past for Eurocentric biases, “Communication science is implicitly a science of the American people, but U.S. Research seems unaware of the cultural biases” (p. 413). Like Guarantee, Kim (2009) does not call

for the elimination of American or European theories, nor does she advocate simply adjusting the theories for a non-Western context, but rather, that the field of communication should not be limited to Western interpretations of communication (p.415-16). Littlejohn & Foss (2008) argue that communication scholars have begun to attend to distinctions between Western and other forms of communication theory. For example, Western theory is dominated by a vision of individualism and Eastern theories tend to view communication outcomes as unplanned. Modernization Theory Effects of the modernization process on human communication: History and Orientation a macro - theory with a historical and sociological inspiration, developed in large scale historical research investigating the effects of the modernization process on human communication.

Modernization means the appearance of ‘modes of social life or organization which emerged in Europe from about the seventeenth century onwards and which subsequently became more or less worldwide in their influence’ (Giddiness, 1991). Modernization theories explain the changing ways of communication and media use in traditional and (post) modern societies.

2.4.26 Core Assumptions and Statements for modernization

Modernization theory has evolved in three waves: **The first wave** appeared in the 1950s and 1960s. One made the attempt to explain the diffusion of Western styles of living, technological innovations and individualist types of communication (highly selective, addressing only particular persons) as the superiority of secular, materialist, Western, individualist culture and of individual motivation and achievement (Lerner, 1958), Schramm, 1964).

2.4.27 Diffusion concepts and definitions

Diffusion:

Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas. It is this ‘newness’ of the idea in the message content of communication that gives diffusion its special character. The diffusion of innovations is essentially a social process in which subjectively perceived information about a new idea is communicated.

Diffusion process:

Diffusion of innovations process is refers to the spread of those innovations through a population, and is simply the result of a host of individual adoption decisions. If individual adoption decisions are, to an extent, predictable, then the larger diffusion process is also predictable. It follows a pattern, and that element of predictability has substantial implications. Therefore the diffusion process can be explained with the terms given by Rogers as “the spread of a new idea from its source of invention or creation to its ultimate use of adopters”. The diffusion of innovations is essentially a social process in which subjectively perceived information about a new idea is communicated.

Diffusion of Innovations:

Diffusion of Innovations (published in the fifth edition in 2003), EV Rogers’ life all 73 years – represented a curious engagement with the topic of innovation diffusion. The story begins on the family Pinehurst Farm in Carroll, Iowa, where EV Rogers was born on March 6, and 1931. The Great Depression was raging, and life on Pinehurst Farm was tough for everyone, especially for a young Eva, who was responsible for carrying out such daily chores as milking cows, feeding chickens, and cleaning the barn. Eva credited that daily hard work ethic, learned early on an Iowa farm, to his illustrious scholarly career, complete with 36 books,

over 300 peer-reviewed essays, and countless . Who would now believe that Eva almost never went to College? He would have stayed home and farmed if it were not for Pep Martens, a high school teacher, who packed a bunch of promising seniors in his car and drove them to Ames, Iowa, the home of Iowa State University. It was Eve's first visit to Ames, located 60 miles from the family farm. Eva liked Ames, and decided to pursue a degree in agriculture. Iowa State in those years had great intellectual tradition in agriculture and in rural sociology. Numerous agricultural innovations were generated by scientists at Iowa State. Rural sociologists – including Bryce Ryan and George Beal, Eve's doctoral advisor -- were conducting pioneering studies on the diffusion of these innovations -- like the high-yielding hybrid seed corn, chemical fertilizers, and weed sprays. Questions were being asked about why do some farmers adopt these innovations, and some don't? These questions intrigued Eva.

At the farm, Eva remembers that his father loved electro-mechanical farm innovations; but was resistant to biological-chemical innovations such as the new hybrid seed corn, even though it yielded 20 percent more crop, and was resistant to drought. However, during the Iowa drought of 1936, while the hybrid seed corn stood tall on the neighbors' farm; the crop on the Rogers' farm wilted. Eve's father was finally convinced. It took him eight years to make up his mind. These questions about innovation diffusion, including the strong resistances, and how they could be overcome, formed the core of Eve's graduate work at Iowa State University in the mid-1950s. Eve's doctoral dissertation sought to analyze the diffusion of the 2-4-D weed spray (and a cluster of other agricultural innovations) in Collins, Iowa, and a community close to Pinehurst Farm.

In the review of literature chapter, Eva reviewed the existing studies of the diffusion of all kinds of innovations--agricultural innovations, educational innovations, medical innovations, and marketing innovations. He found several

similarities in these studies. For instance, innovations tend to diffuse following an S-Curve of adoption.

In 1962, Eva published this review of literature chapter, greatly expanded, enhanced, and refined, as the Diffusion of Innovations book. He argued that diffusion was a general process, not bound (to be serious intending to do something) by the type of innovation studied, by who the adopters were, or by place or culture. By reviewing diffusion studies across a range of disciplines, he concluded that the diffusion process displayed patterns and regularities, across a range of conditions, innovations, and cultures (Rogers, 2004).

Book provided a comprehensive theory of how innovations diffused, or spread, in a social system. The book's appeal was global (Hornik, 2004). Its timing was uncanny. National governments of newly-independent countries of Asia, Africa, and Latin America were wrestling with how to diffuse agricultural, health, and family planning innovations in their newly-independent countries (Barker, 2004; Bertrand, 2004; Haider & Kreps, 2004; Murphy, 2004). Here was a theory that was useful during the research reports. *Not bad for an Iowa farm boy who almost did not go to college!

What is Diffusion Mean?

When the World Health Organization launched a worldwide campaign to eradicate small pox, it was engaged in diffusion. When Apple launched I-POD, it was diffusing a new product. When Bob Dylan wrote “The Times They Are A-Chang in,” he was describing diffusion (Dearing & Meyer, 2006). When professional dancers –both standing up and sitting down (in wheelchairs) -- perform on stage, as do the artistes of the Dancing Wheels dance company in Cleveland, they are diffusing a new image of what constitutes (dis)ability².

Diffusion: is the process by which an innovation is communicated through certain channels over time among the members of a social system (**Rogers, 2003**).

An innovation: is an idea, practice, or object perceived as new by an individual or other unit of adoption. The diffusion process typically involves both mass media and interpersonal communication channels. And, in today's world, information technologies such as the Internet and cell phones – which combine aspects of mass media and interpersonal channels, represent formidable tools of diffusion (Morris & Ogan, 1996). Consider the following experience of co-author Signal in the Philippines.

Why diffusion is important for technology transfer?

The challenges of diffusion:

Diffusion of Innovation Theory Diffusion of Innovation (DoI) Theory, developed by E.M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product. Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behavior, etc.). The key to adoption is that the person must perceive the idea, behavior, or product as new or innovative. It is through this that diffusion is possible. Adoption of a new idea, behavior, or product (i.e., "innovation") does not happen simultaneously in a social system; rather it is a process whereby some people are more eager to adopt the innovation than others. Researchers have found that people who adopt an innovation early have different characteristics than people who adopt an innovation later. When promoting an innovation to a target population, it is important to understand the characteristics of the target population that will help or hinder adoption of the innovation.

Limitations of Diffusion of Innovation Theory

There are several limitations of Diffusion of Innovation Theory, which include the following:

- * Much of the evidence for this theory, including the adopter categories, did not originate in public health and it was not developed to explicitly apply to adoption of new behaviors or health innovations.
- * It does not foster a participatory approach to adoption of a public health program.
- * It works better with adoption of behaviors rather than cessation or prevention of behaviors.

* It doesn't take into account an individual's resources or social support to adopt the new behavior (or innovation). This theory has been used successfully in many fields including communication, agriculture, public health, criminal justice, social work, and marketing. In public health, Diffusion of Innovation Theory is used to accelerate the adoption of important public health programs that typically aim to change the behavior of a social system. For example, an intervention to address a public health problem is developed, and the intervention is promoted to people in a social system with the goal of adoption (based on Diffusion of Innovation Theory). The most successful adoption of a public health program results from understanding the target population and the factors influencing their rate of adoption. (Content©2013. All Rights Reserved. Date last modified: January 22, 2013, Boston University School of Public Health).

Global area of biotech crops in 2009: by country (million hectares)

Country	Area	Biotech crops
USA	64.0	Soybean, maize, cotton, canola, squash, papaya, alfalfa, sugar beet
Brazil	21.4	Soybean, maize, cotton
Argentina	21.3	Soybean, maize, cotton
India	8.4	Cotton
Canada	8.2	Canola, maize, soybean, sugar beet
China	3.7	Cotton, tomato, poplar, papaya, sweet pepper
Paraguay	2.2	Soybean
South Africa	2.1	Maize, soybean, cotton
Uruguay	0.8	Soybean, maize
Bolivia	0.8	Soybean
Philippines	0.5	Maize
Australia	0.2	Cotton, canola
Burkina Faso	0.1	Cotton
Spain	0.1	Maize
Mexico	0.1	Canola, soybean
Chile	<0.1	Maize, soybean, canola
Colombia	<0.1	Cotton
Honduras	<0.1	Maize

Czech Republic	<0.1	Maize
Portugal	<0.1	Maize
Romania	<0.1	Maize
Poland	<0.1	Maize
Costa Rica	<0.1	Cotton, soybean
Egypt	<0.1	Maize
Slovakia	<0.1	Maize
25 countries	134	

Source: World Resources Institute, (2008)

The concept and definition of diffusion:

Diffusion is defined as the process by which an innovation is adopted and gains acceptance by members of a certain community. A number of factors interact to influence the diffusion of an innovation. **The four major factors** that influences the diffusion process are the innovation itself, how information about the innovation is communicated, time, and the nature of the social system into which the innovation is being introduced (Rogers, 1995). Diffusion research, in its simplest form, investigates how these major factors, and a multitude of other factors, interact to facilitate or impede the adoption of a specific product or practice among members of a particular adopter group.

The study of diffusion theory is potentially valuable to the field of instructional technology for three reasons. **First**, most instructional technologist do not understand why their products are, or are not, adopted. In a very real sense, the underlying causes of instructional technology's diffusion problem remain a mystery to the field. There appear to be as many reasons for instructional technology's lack of utilization as there are instructional technologists. Some instructional technologists blame teachers and an intrinsic resistance to change as the primary causes of instructional technology's diffusion problem; others cite entrenched bureaucracies and inadequate funding (Shine Berger and Joist, 1994). By better

understanding the multitude of factors that influence adoption of innovations, instructional technologists will be better able to explain, predict and account for the factors that impede or facilitate the diffusion of their products.

Second, instructional technology is inherently an innovation-based discipline. Many of the products produced by instructional technologists represent radical innovations in the form, organization, sequence, and delivery of instruction. An instructional technologist who understands the innovation process and theories of innovation diffusion will be more fully prepared to work effectively with clients and potential adopters (Schiffman, 1991).

Third, the study of diffusion theory could lead to the development of a systematic, prescriptive model of adoption and diffusion. Instructional technologists have long used systematic models to guide the process of instructional development (**ID**). These systematic ID models have resulted in the design and development of effective and pedagogically sound innovations. A systematic model of diffusion could help guide the process of adoption and diffusion in a similar manner and, perhaps, with similarly effective results.

General Diffusion Theory

Before discussing how diffusion theory has been incorporated into instructional technology, I will provide a brief background and overview of general diffusion theory. The most important fact to consider in discussing diffusion theory is that it is not one, well-defined, unified, and comprehensive theory. A large number of theories, from a wide variety of disciplines, each focusing on a different element of the innovation process, combine to create a meta-theory of diffusion.

The most likely reason why there is not a unified theory of diffusion is that the study of innovation diffusion is a fairly recent field. Rogers (1995) points out that a 1943 study by Ryan and Gross at Iowa State University provided the genesis of modern diffusion research. The Ryan and Gross (1943) study, from the field of

rural sociology, used interviews with adopters of an innovation to examine a number of factors related to adoption. The interview-based methodology used in the Ryan and Gross study has remained the predominant diffusion research methodology ever since (Rogers, 1995). A number of researchers from rural sociology (e.g., Fliegel and Kivlin, 1962) and other disciplines (e.g., Weinstein, 1986) have built on the Ryan and Gross' work to conduct studies and develop theories related to the diffusion of innovations.

The researcher who has done the most to synthesize all of the most significant findings and compelling theories related to diffusion is Everett M. Rogers. Rogers' book *Diffusion of Innovations*, first published in 1960, and now in its fourth edition (Rogers, 1995) is the closest any researcher has come to presenting a unified theory of diffusion... Four of the theories discussed by Rogers are among the most widely-used theories of diffusion: Innovation Decision Process; Individual Innovativeness; Rate of Adoption; and Perceived Attributes.

The stages of diffusion and time factors

Diffusion Stages: Diffusion of Innovations: The process by which an innovation spreads within a social system is called “diffusion” An innovation, however, diffuse within a social system through its “adoption” by individual and groups. Diffusion and adoption are thus closely interrelated even though they are conceptually distinct. It takes time for an innovation to diffuse throughout a social system. It is unrealistic to expect that all farmers in a community will adopt an innovation immediately after its introduction. There is always a variation among the members of a social system in the way they respond to an innovative idea or practice.

While there is always few members in a social system who are so innovative that they adopt an innovation almost immediately after they come to know about it, the majority take a long time before accepting the new idea or practice. It is the first

few adopters of an innovation who influence the other members of a community to adopt the innovation as they interact with them. This is referred to as the “interaction effect.” After the innovation is adopted by a few farmers, they influence a few others to adopt it who, in turn, offers a new stimulus to the remaining ones. There is a definite pattern in which innovations diffuse within a community. Attempts to plot the cumulative proportion of adopters of innovation over time within a social system have shown that the resulting curve assumes the form of an S-shaped growth curve. This is called the “diffusion curve”. Although all diffusion curves tend to be S-shaped, their exact forms vary by particular innovations in specific social systems. The traits which characterize an innovation affect its rate of diffusion within a social system and the resulting diffusion curve. The rate of diffusion of an innovation and the form of its diffusion curve are also influenced by the characteristic features of a social system. When an innovation is first introduced in a social system, a small proportion of farmers adopt it. Through interaction with these first adopters and observing the results of its use on their farms, a few more farmers come to know about the innovation and its usefulness, and eventually adopt it. Over the period of time a large number of farmers become familiar with the innovation through interaction with farmers who have already adopted are reflected in the upward slope of the S-shaped diffusion curve. After the majority of the farmers of the social system have adopted the innovation, only a few hard-core resisters are left who have not yet adopted the practice, and they upward slope comes to an end. The remaining part of the curve now has a gentler slope until the entire village adopts the innovation. The diffusion process of an innovation thus involves four major stages. At the first stage, only a few innovative farmers try out and adopt the innovation after its introduction in a village. This group of farmers is often referred to as “innovators” who have been described to be prosperous and venturesome enough to be able to take the risk of trying out an

innovative idea or practice, In the Diffusion and Adoption Process second stage, a larger group of farmers, but still a small majority in the village is influenced by the innovators to adopt the recommended practice, referred to in the literature as “early adopters”, the group of farmers is not too different from the average farmer, of a village although they are often respected for their farming ability and successful and “discrete” use of new ideas and practices. Because of their respectability in the village, the early adopters serve as the role model for other farmers who seek opinion and advice on farming matters from them. It is primarily this influence of early adopters which makes the large majority of the farmers in a village, called the “late adopters”, to adopt the innovation in the third stage of the diffusion process. This is when the diffusion curve takes a rather steep upward climb.

In the final stage, the diffusion process slows down and the diffusion curve gently levels off as the proportionately few remaining farmers of the village gradually adopt the innovation. The small group of farmers who take the longest time to adopt an innovation is called the “laggards”.

The elements affecting diffusion process:

Diffusion: The factors affecting the diffusion of an innovation can be classified as those affecting the benefits received the costs of adoption, those related to the industry and social environment, and those due to the uncertainty and information problems.

Benefits Received through the New Technology

The most important determinant of the benefit originated from the adoption of a new technology is the amount of improvement of the new technology over the previous ones, as the analysis of the benefit-cost ratio. The existence of current technologies that are fairly close to the new one can slow the adoption rate.

Furthermore, the relative advantage of the new technology is frequently small when it is introduced; as the diffusion progresses, the learning about the technology takes place, bringing improvements and adaptation to diverse environments, making it more attractive to more potential users.

Today the use of web services is very limited, since the standards are not yet totally developed. Therefore, their use does not bring enough benefits to motivate the adoption by a great number of companies. The same benefits can be achieved in a satisfactory way by the current technologies. If the standards are agreed-on, web services have the possibility to bring the benefits mentioned before and its adoption can be triggered. But, by and large, new technologies present disadvantages or a small advantage over the current ones to great part of the market. Over time, however, it tends to be enhanced and be more attractive to a greater number of segments and uses. Furthermore, the improvements in the complementary assets can also affect the rate of adoption. As to web services, for example, the development of faster and more powerful processors can increase the performance of applications using XML-based documents that so far have shown a much lower performance than their competitors'.

Often, when a technology is under threat of being substituted, their providers tend to enhance or change its characteristics to keep competitiveness in the new environment. In general, it tends to slow the diffusion of new technologies. However, in the case of web services, it can even accelerate the process, since providers of Enterprise Resource Planning (**ERP**) and Enterprise Application

Integration (**EAI**) solutions try to embed web services characteristics in their products to keep market share.

Although the evolution of past innovations is not guarantee of success for web services, one should not judge the future of web services only based in its current level of benefits. In many cases, the value of new technologies to the consumer depends partly on its adoption by other users, either because it is used to communicate with others (e.g. fax, internet, instant message, e-mail), or because the provision of complementary, as software and services, improve with the number of customers. The adoption of a particular standard for many companies increases the probability that the standard will survive and that complementary to the standard will continue to be produced and evolve. Furthermore, a standard can increase the size of potential market, which can cause the lowering in the production costs and increase in the variety and availability of complimentary products and services. Then, one important determinant benefit of the adoption is the current and expected rate of adoption.

The effect of a customer to value a product more when it is compatible with other customer's products is called network externalities. Then, the number of adopters of an innovation influences the number of remaining firms that will subsequently adopt it [86]. Technologies subjected to strong network effects tend to exhibit long lead times followed by rapid growth. This pattern happens because, as the installed base of users grows, more users find adoption worthwhile. Owing to such characteristics, the standard battles have increased and companies have adopted strategic behaviors to influence the standards that they adopt or support. But, the heterogeneity in the "tastes" of consumers companies and in the information gathered for them can result in more than one standard surviving. In the case of web services, an increase in the number of standards to one layer can hamper its diffusion.

There are many theories about innovation adoption stating that as the number of adopters of an innovation increases, the adoption cost decreases and the return increases, making the number of adopters even higher.

Additionally, the higher the number of adopters, the more information is generated, and for profitable innovations, it reduces the premium or improve the assessment of the innovation for the non-adopters, also increasing the number of adopters.

Furthermore, in some cases it is important to consider the bandwagon effect and the pressure on organizations to adopt the innovation arising from the threat of lost competitive advantage. The higher the uncertainty level, the higher the competitive and institutional bandwagon pressures tend to be [86]. Such bandwagons can lead to the adoption of standards that are not the best ones. Furthermore, as to web services, we can notice that the vendors try to create the bandwagon and sell the applications as a panacea. In this case, so far, the bandwagon has had limited effect due to few very noticeable highly successful cases published, the immaturity of most of the standards, and even the effect of the internet bubble that lead to concerns about some new ideas. After the promises of dot-com, many companies are skeptical, or overcautious about promises of IT solutions' to solve their problems. In the case of web services, this skepticism is increased due to all the hype surrounding the new technology and the push for some vendors to sell it as a panacea. "Sky-high expectations and reams of hype are too often the death knell for emerging technologies". But, at the same time, the same vendors are making investments to develop the standards and the technologies to make the real and full Implementation of web services possible, since they are interested in creating this new market to sell applications and perfect solutions. In the decisions about the adoption of web services, most of those concepts are applied. Intending to guarantee interoperability not only inside the company, but also with partners and customers, the increase in the number of web services' users tend to attract a larger

number of users, once the benefits of adoption also rises. However, since the standards are not agreed-on, vendors are not yet offering a compelling array of solutions. Also, the number of users neither seems to be enough to accelerate the rate of adoption massively, nor are the vendors offering enough support or compelling solutions, as showed in previous chapters. One of the greatest benefits of web services is to offer the possibility of integration with partners and customers; but, since this possibility is still quite difficult due to lack of standards and few numbers of companies and customers able to integrate through web services the rate of adoption is still low.

One example of the influence of those factors affecting the decision on adopting a new technology in the financial services was in the introduction of EBPP - Electronic Bill Presentment and Payment - technology in the USA. The network effects could lead some billers to adopt the first technologies available, even with the possibility of new and better technologies to be developed. At the same time, considering the high costs of early adoption, billers were willing to wait. The anticipation of a new and better technology caused the billers to wait, depending on the benefits of the early adoption and costs of possible upgrade in the future. To generate the network externalities benefits, there was a chicken-and-eggs problem, since consumers were waiting for lots of companies to offer the service and other customers to sign up, companies were waiting for more customers using the service before offering it. The question to the billers was not whether or not to offer the service, but when and which technology to use. Although the first mover movement can bring long-term advantages, the uncertainty about the new technology can bring advantages to the second mover. This is especially true when the new technology is not a disruptive technology, and the companies have time to learn with past failures and burden of first movers. This seems to be exactly the case of web services in the financial industry.

Adoption and Diffusion of onion seeds - Jebel Marra Project

The Jebel Marra Rural Development Project was a major programme of rural development in Jebel, Zalingei and Wadialih Districts of what is now West Darfur: an area of some 90,000 sq km. Between 1981 and 1992, Government of Sudan and the European Union funded the project to carry out agricultural research, build rural infrastructure and provide extension and community development services. With over 40 extension stations, it had a level of direct contact with the rural community which Darfur had never seen before. Throughout its life, the project's Monitoring and Evaluation Department carried out wide ranging surveys of rural livelihoods to guide the work and assess its impact. With over 900 households interviewed, the 1988 Post Harvest Survey Report presented here is typical of the breadth and depth of survey coverage. The report is technical, with a focus on the complex strategies Darfur farmers use to mitigate drought and flooding and fend off the many pests that attack their crops, and on the performance of the Jebel Marra Project Extension Service. Nevertheless, it covers much more than that: **Agriculture** - A very detailed picture of the skill with which Darfur farmers manage different soils, crops and varieties to make the maximum benefit from the rains and their own labour.

A key lesson is the need to look beyond drought and food security. In some years, pests are a bigger threat and cash crops are a major element in most livelihoods. Darfur livelihoods depend on making the maximum out of a good year more than on defending against a bad one. Varieties that yield a large crop when there is a lot of rain are at least as important as varieties that can survive a drought. **Gender** - How land-holdings, farming and grain consumption differ between male-headed and female headed households. **Education** - The contrast between sparse primary education and the 'strong popular tradition' of Islamic Khalwa education. **Water Supply** - The dominance of seasonal water sources: watercourses during the rains

and temporary wells in the dry season. **Immigration** - How, in earlier years, communities had welcomed migrants from drought stricken areas to the north, and allocated them farm land without charge; and how the flow slackened after a better harvest in 1986. **Food Security**-Grain production and stocks relative to household consumption needs. **Cash Incomes** - Over half of households sell crops, over 80% in some areas, and just under half sell livestock. Groundnuts, Tomatoes, Onions and Oranges were all more important than grain crops for cash income.

Land Tenure - The vast majority of cropped land is owned by the farmer and the rest is borrowed without charge. Renting is almost non-existent. More than half the farmers had fallow land - equivalent to more than 50% of their cropped land.

The main reason for not cropping fallow was lack of labour and cash to hire labour. For those seeking to understand and help Darfur in 2008, this report from 20 years earlier offers an insight into how Darfur livelihoods might look during more normal times; especially so as it fell in the relatively short window between the drought and famine of 1984/85 and the first outbreak of serious conflict in 1989. James Morton & Co Ltd www.jfmorton.co.uk March 2008

Part five: General Information About Onion varieties, Agricultural Extension and Community Development

2.5.1 Onion varieties - Jebel Marra Project:

The indigenous varieties are the traditional varieties and its historical background of (Onion): there are two types of onion varieties in the previous time called Foria and Falatia its history goes to the year (1940/58) practice by women in narrow space for home consumption.

But when the new varieties introduced through (JMRDP) which added the economic value for onions. Due to the characteristics that classified the improved onion seeds. The economical factor also is the fact that the indigenous varieties disappeared for very quick production and agricultural innovations as packages used. From this period of time onions take its rank among other vegetable crops as a cash crop up to date. This revealed the base of competition between men and women start for onion growing until now.

2.5.2 Soil and Suitable Climate:

It is a winter season crop cultivated in low lands with shallow soil around valise, which considered as best type of soil.

Varieties:

The most endogenous wince locally are consist the following:

Foria, Falatia, costi, Segue red, Camlin yellow and Shandi...etc

Characteristics of Some Varieties:

1/ Foria: Medium size with fewer periods time of maturity and tolerant to storage.

2/ Falatia: Big size and early period of time maturity, but not tolerant to storage.

3/ Costi segue red: The maturity period is short and medium size between Foria and Falatia less acceptable to be storage not protected to root rotten diseases.

Seed Rate / Feddan:

10- 12 Retool (local measurements) = 1 ¼ Kg / Feddan and It depends on the season of cultivation and varieties.

2.5.3 Cultivation period and methods followed:

Two ways of cultivation methods either by direct bulbs or seedlings transfer to the farm in winter or summer season around 15 of October to 15 November in the previous period of time. But due to Climate change and this study was considering the optimal time frame of cultivation is 15 August and 15 September, high yield in plots, but low size of bulbs if it compare with rows production= recommended by JMRDP. The method of cultivation either by plots or rows, in plots the space between plants should be 15-20 Cm and 20 Cm between the lines. Furthermore the methods of cultivation in rows are recommended to be 40Cm between Rows and 10Cm between plants.

Irrigation: organized period is 4-7days which is depends on soil type and climate.

Fertilizers: During the preparation of land agreed if local composed used only one Coffa (local measures) and 80 Kg phosphate or 50kg of Urea\ Feddan. The first, dose after 3 weeks when seeds were transferred to the farm and the next dose after one month from the first dose has added.

Rotation of Cultivation: *Recommended that: not to be cultivated after the cultivation of potato, sweet potato and Okra in the same plots of land grown before by onion itself, in order to avoid disease transmittion.

Pest and Diseases: Thrips which affects the crop leaves is the one of the families' one which controlled by Malison and Ripcord drugs.

Harvesting time of the crop: Three -Four month and it differ according to the type or varieties which are mainly Foria or Falatia.

Productivity: 120-140 sac\ Feddan it depend on all cultivation package implementation.

Storage Recommendations:

- 1/ Complete the whole maturity period recommended.
- 2/ Minimize the irrigation before harvest time.
- 3/ Isolation of the damage ones after the post harvest period.
- 4/ Good ventilation must be accompanied after post harvest period.
- 5/ Fumigate onion stores after post harvest time.
- 6/ Agricultural Extension Agents must be consulted.

2.5.4 Historical & Economic Importance of Onion

The primary centre of **origin of onion is Central Asia** with secondary centre in Middle East and the Mediterranean region. From these centers, onion has spread widely too many countries of the world. Onion is different from the other edible species of alliums for its single bulb and is usually propagated by true botanical seeds. According to Dahlgren et al. (1985) onion is one of the oldest cultivated vegetables, and has been in cultivation for more than 4000 years.

The earliest records came from Egypt, where it was cultivated at the time of the old kingdom. Carvings of onion can be seen on the walls of pyramids in the 3rd and 4th dynasties. A global review of major vegetables show that onion ranks second to tomatoes in area under cultivation.

According to FAO (1999), over 40 million tones of onion were produced worldwide in 1998, covering about 4.5 million hectares. Tropical countries, having about 45% of the world's arable land, grow about 35% of the world's onions (Pathak, 1993). About 8% of the total area was in Africa in 1995. The productivity of tropical onion is around 9.6 tons/ha, which is very low, compared to the average bulb yield in temperate countries, which is about 19.5 tons/ha.

The world average yield at present is about 17.3 tons/ha (FAO, 1999). Ethiopia has a great potential to produce onion every year for both local consumption and export with an average yield 13.3 tons/ha (CSA, 2001/02 as cited Taha 2007).

Onion is grown mainly for its bulbs; although the green shoots of salad onion is also an important crop. The onion bulb consists of the swollen bases (sheaths) of bladed leaves surrounding swollen bladeless leaves. Each leaf consists of a blade and sheath; the blade may or may not be distinctive. The sheath develops to encircle the growing point and forms a tube that encloses younger leaves and the shoot apex. Collectively, the grouping of these sheaths comprises the pseudo-stem. It is used primarily as flavoring agents and its distinctive pungency, which is due to the presence of a volatile oil (allyl propyl disulphide).

The mature 7 bulbs contains some starch, appreciable quantities of sugars, some protein, and vitamins A, B, and C (Decoteau, 2000). Onion yield per hectare of sample households was 13060 quintal. This figure is almost similar to than the national productivity reported by CSA (2002) which is 133.92 qt/ha.

Onion was introduced to the agricultural community of Ethiopia in the early 1970s when foreigners brought it in. Though shallots are traditional crop in Ethiopia, onions are becoming more widely grown in recent years. Currently, the crop is produced in different parts of the country for local consumption and for export of flowers to European markets. The average annual sale of dry bulb and cut flowers from Ethiopian Fruit enterprise alone was estimated to be about 6.2 million birr (ETFRUIT, 1992). According to World Bank report (2004), in the year 2001 the crop shared one fourth of the vegetable export quantities and stood third following green beans and peas contributing about 20% of the total vegetable export value which is about 244,000 US dollar of export earnings. In addition to dry bulb, onion cut flower also constitutes significant proportion of foreign export values. In between the years 1999-2001 alone, about 1.75 million birr worth cut flower stems

were exported. This indicates that Ethiopia has high potential to benefit from onion production. In recent years the demand for onion increased for its high bulb yield, seed and flower production potential. The establishment of state owned enterprises contributed substantially to the increase in the production and expansion of area under onion in the country with limited amount of seed production experiences. Onion seed production depends on the cultivar, location, growing season and adequate plant protection measures (Lemma and Shameless, 2003:3).

One of the problems of onion production in the tropics is lack of seed which is true to type and of high germination and vigor (Currah and Proctor, 1990). Therefore, it is essential to produce and use fresh seeds for bulb production. Onion seed is usually produced in the temperate and subtropical countries. In the countries where high temperature prevails throughout the year, only the easy-bolting types of onion, requiring relatively low-temperature exposure, can produce seed. Shallots were the traditional vegetative propagated alliaceus crop of the Ethiopian highland, but in the 1980's, Sudanese onion cultivars were selected. To improve onion production, the agricultural research system of the country has made efforts to generate improved varieties. 8 Currently the research system made available the varieties like; Adama red, Bombay red, Red Creole, Melkam, Merrimu brown and Nasik red (Dereselegn) to farmers. Bombay Red and Adama Red are widely grown in Ethiopia. In Ethiopia there is no agency involved in the multiplication and distribution of seed of this cultivar and other cultivars to the farmers. However, seeds of Bombay Red and Admired are being produced on limited scale by research centers and some farmers.

Farmers living in the Amhara region produce large amount of onion bulbs every year. For instance, in 2005/06 production year the region contributes 706526 quintals onion bulb with 5338 hectares of land coverage of onion crop. According

to the Fogera district office of agriculture in 2005/2006 production season the district contributes 355315 quintal with 3100 hectares.

This indicates that the district comprises 49.9 % of the regional onion production.

2.5.5 Agriculture, Pastoralist and Energy

Agriculture is broadly defined to include pastoralist, crop production, forestry, fruit and vegetable production, as well as other types of rural development. Increasing agricultural productivity would help meet the food and nutritional needs of Darfur's population that has increased seven-fold since the 1960s and currently represents almost 19% of Sudan's 34.5 million people.

In 2004, approximately 60% of the population was primarily farmers and most of the remaining 40% were primarily pastoralists. Historically some tribes tended to specialize in nomadic pastoralist and others in small-scale crop farming, although many groups have diversified activities. Farming communities, such as the Fur, have aspired to produce livestock as a means of acquiring wealth, while the nomadic communities expanded into cultivation with mixed success.

The productivity of crop farming is hampered by low and declining rainfall; land and soil degradation; destruction of woodlands from pressures associated with fuel wood and charcoal extraction, grazing and expansive agriculture; poor traditional land tenure and dysfunctional user arrangements; isolation from extension services and markets. Soil value is also a problem. The soils of Darfur are either sandy or made up of dark clay. The sandy soils are mainly stabilized sand dunes (known as goz) that have both low holding capacity and low fertility. The clay soils, including the soils of the Jebel Mara area, are found in the central plains of Sudan. These are soils with high clay content and substantial water retention capacity. Millet is the staple food for more than 75 percent of the population and is cultivated throughout Darfur. Sorghum and other cash crops (groundnuts, sesame, and Roselle or kardadeh – a local plant used as tea) is essential for the local economy. Gum

Arabic from acacia trees on farms and rangelands is the most prevalent cash crop, despite market access issues.

Only half of the land that was cultivated before the onset of the Darfur conflict is currently in use. Excess exploitation by repeated grazing and cultivation without fallow or rest periods has depleted soil fertility. In response, Darfur's farmers have developed various coping strategies. To improve production, they have increased the area under cultivation; used animal drawn plows (mostly donkeys); improved water harvesting using terraces; diversified products; intercropped and farmed on different plots. UN agencies, in particular the Food and Agriculture Organization (FAO), have provided vegetable seeds and gardening tools to Darfur Early Recovery and Development Dossier 14 the poorest and most vulnerable households in conflict areas. Vegetables help improve the vitamin intake of the community while also generating income through sales at local markets.

Cowpea varieties used by the Darfur farmers could be improved with promotion of the dual-purpose and leafier cowpea cultivars that is widely planted by farmers in the dry lands of northern Nigeria (Inaizumi et al., 2000). In this event, added benefits would include food security during a critical period of the year, cash income, fodder, and in situ grazing after harvesting, in periods when the prices of cowpea grain peak, and when good quality fodder is scarce. There are only about 13 active extension workers in the Ministry of Agriculture for over 80,000 farmers in North Darfur, and 49 for 480,000 farms in South Darfur Livestock is an important sub-sector in Darfur and the rest of Sudan, accounting for about 22 percent of total GDP and 53 percent of agricultural output. The main reasons of centralization of the innovation package of agricultural Onion improved seeds in the head quarter of the Jebel Marra Rural Development Project.

2.5.6 Population of Central Darfur State:

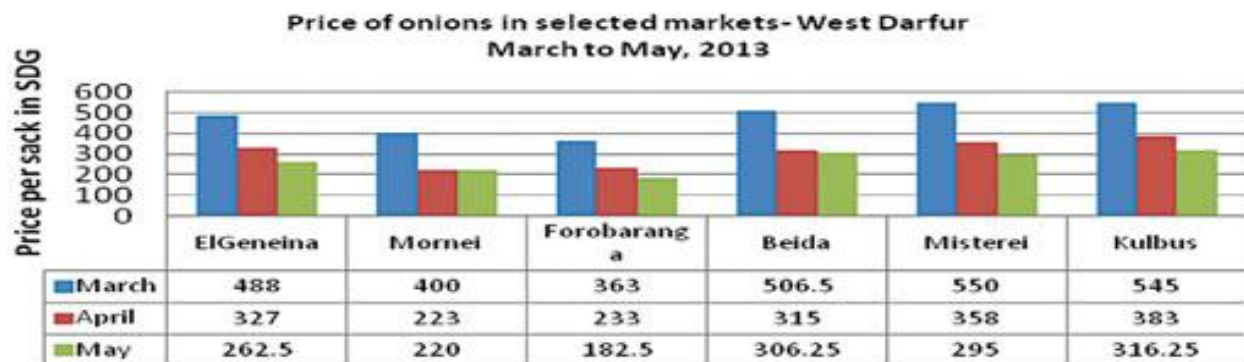
Households, Farmers and Population Estimate for dry season 1988 –Jebel Marra project with added population estimate of IDPs in (2014):

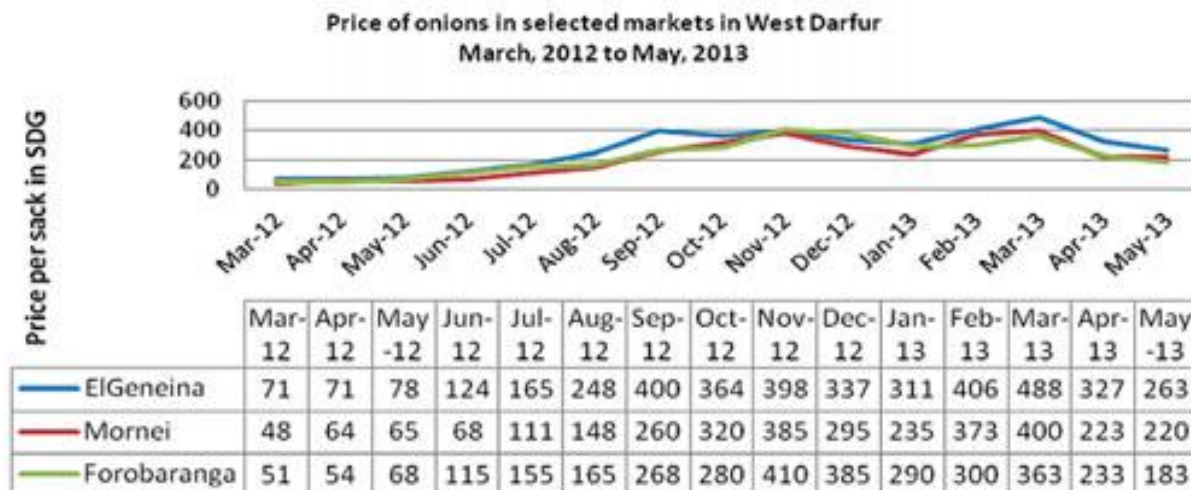
Council	Households	Farmers	Population	IDPS/ HH
Nyertete(Locality Centre)	9399	21901	69838	40.688
Golo- sub unit	6067	13286	33125	non
Rokero (Locality)	7329	16637	48812	non
Zalingei(Head of the State)	15103	35642	96355	124.449
Zambia (Wadisalih area)	8134	20578	47989	67.360
Mukjar (Locality)	13746	30242	76292	23.606
Azoum (Locality)	13826	32905	79635	7.352
Zalingei Town (Locality)	4240	9117	35788	2.258 ** UoZ
Umdohken (Locality)				65.756
Bendisi(Locality)				19.744
Total	96049	220906	586506	348.955*WFP

Source: Jebel MRDP Post harvests Survey -1988 Updated in2014 with the added last Colum/each

** Source: University of Zalingei. September, 2011

2.5.7 Price of Onion in Selected Markets- west Darfur(March-May,2013)





2.5.8 Understanding Agricultural Extension:

The concept and practice of extension are the central themes of this guide. However, before beginning to look at the many different aspects of extension practice in further studies, the meaning of the term extension needs to be examined. Rural extension is now a common activity in most countries of the world, and it is a basic element in programmes and projects formulated to bring about change in rural areas. Extension services are similarly a common feature of the administrative structure of rural areas and these services have the responsibility, in partnership with the farmers, of directing programmes and projects for change. By adoption of agricultural innovations to improve and increase agricultural production. Enhance of better income and life standard changes for rural community in general.

2.5.9 The concept of agricultural 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 which 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.

2.5.10 Knowledge and skills Improvement for Rural Community:

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 the agent can usefully 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.

2.5.11 Technical Advice and Information Transfer:

Extension also provides advice and information to assist farmers in making decisions and generally enable them to take action. This can be information about prices and markets, for example, or about the availability of credit and inputs. The technical advice will probably apply more directly to the production activities of the family farm and to the action needed to improve or sustain this production. Much of this technical advice will be based upon the findings of agricultural

research. In many instances, however, farmers are also sources of valuable advice and information for other farmers, and agents should always try to establish a farmer-to-farmer link.

2.5.12 Farmers' organization (Creation) or Establishing:

As well as knowledge, information and technical advice, farmers also need some form of organization, both to represent their interests and to give them a means for taking collective action. Extension, therefore, should be concerned with helping to set up, structure and develop organizations of local farmers. This should be a joint venture and any such organization should only be set up in consultation with the farmers. In the future, these organizations will make it easier for extension services to work with local farmers, and will also serve as a channel for disseminating information and knowledge.

2.5.13 Community Motivation and Self-confidence:

One of the main constraints to development that many farmers face is isolation, and a feeling that there is little they can do to change their lives. Some farmers will have spent all their lives struggling in difficult circumstances to provide for their families with little support or encouragement. It is important for extension to work closely with farmers, helping them to take the initiative and generally encouraging them to become involved in extension activities. Equally important is to convince farmers that they can do things for themselves, that they can make decisions and that they have the ability to break out of their poverty.

The above are the four fundamental elements of the extension process. It is not suggested that all extension activities must contain each of these elements, nor that some are more important than others. Clearly, the extension approach will be determined by the particular circumstances. However, an overall extension service should be based on these elements and should seek to promote them within the

rural areas. Sometimes the local farmers' problems will demand prompt information and advice; on other occasions, more patient work of organization and motivation may be required. An extension service must be able to respond to these different demands.

2.5.14 Principles of Agricultural extension:

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

2.5.15 Extension works with people, not for them (Participation):

Extension works with rural people. Only the people themselves can make decisions about the way they will farm or live and 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 programmes and decisions which they have made themselves than in those which are imposed upon them.

2.5.16 Extension is accountable to its clients:

Extension services and agents have two sets of masters. On the one hand, they are accountable to their senior officers and to the government departments that determine rural development policies. Agents are expected to follow official policies and guidelines in their work.

On the other hand, extension is the servant of the rural people and it has the responsibility to fulfill the needs of the people in its area. This means that the rural poor should have a say in deciding how effective extension actually is. One measure of effectiveness is to see how well policies and plans have been carried out. An equally important measure is the extent to which incomes and living standards of the rural people have increased as a result of extension work.

Extension programmes, therefore, are based on people's needs, as well as on technical and national economic needs. The extension agent's task is to bring these needs together. For example, an important part of government policy may be to increase the amount of food grown and sold in the country. By choosing to encourage the mass of small farmers to increase their output by improving their farming methods, national needs and farmers' needs can be satisfied together.

2.5.17 Extension is a two-way link (Feed Back):

Extension is not a one-way process in which the extension agent transfers knowledge and ideas to farmers and their families. Such advice, which is often based upon the findings of agricultural and other research stations, is certainly important but the flow of information from farmers to extension and research workers is equally important. Extension should be ready to receive farmers' ideas, suggestions or advice, as well as to give them. This two-way flow of ideas can occur at different stages.

When the problem is being defined. Being in regular contact with the farmers, the extension agent can help research workers to understand the farming problems of the area and the limitations under which farmers have to work. It is even better if the agent can bring researchers into direct contact with farmers in order to ensure that research recommendations are relevant to farmers' needs.

Extension links farmers with research Centers: When recommendations are being tested in the field. A new farm practice or crop variety might produce good results at a research station but not do so well on a farmer's field. Trials on farmers' fields are an opportunity to test research recommendations and provide feedback for research staff.

When farmers put recommendations into practice. Sometimes farmers discover problems with a recommendation which the research station failed to note. With the feedback the recommendations can be adjusted accordingly.

The two-way link between research, extension and the farmer is fundamental to sound extension practice and should be a basic principle of extension activity.

2.5.18 Extension cooperates with other rural development organizations

Within rural areas, extension services and agents should work closely with the other organizations that provide essential services to farmers and their families. Extension is only one aspect of the many economic, social and political activities that seek to produce change for the better in rural society. Extension, therefore, must be prepared to collaborate with all other such organizations, both government and non-government, and to take them into account when preparing to implement extension policies. The kinds of organizations with which extension services should cooperate include:

Political institutions and local political leaders whose active local support will help the extension agent, who may thereby be brought into closer touch with local farmers.

Support organizations such as those which supply agricultural or other inputs, credit facilities or marketing services. Such inputs must be available in sufficient quantity, in the right place and at the right time if they are to be of any use. Health services, so that the extension agent is kept aware of local health problems, particularly nutritional levels. Agricultural development and nutrition are closely

related and the agent must keep closely in touch with health programmes and projects and adapt his programme to conform to local health requirements. Local schools, so that the agent can have early access to the farmers of the future, and begin to equip them with the knowledge and skills required for farming. Community development, whose objectives will be very similar to the educational work of extension. Extension agents often work very closely with community development workers to break down local social and cultural barriers to change, and to encourage community action programmes.

It is essential that the extension agent in the field know what his colleagues in other services and government departments are doing, and that they understand what he is doing. Close cooperation not only avoids duplication but provides opportunities for integrated farm programmes.

2.5.19 Extension works with different target groups

Extension recognizes that not all farmers in any one area will have the same problems. Some will have more land than others and will be keen to try out new ideas. Others, with fewer resources, will probably be more cautious. Extension cannot offer a single "package" of advice, suitable to all farmers. Different groups need to be identified and the agent will have to develop programmes appropriate to each group.

In the past, much extension effort was concentrated on the progressive farmer who was expected to spread new ideas to others. It has been seen, however, that this does not always work, because progressive farmers often have different problems. They have more land, more education and are usually more involved in the marketing of their produce.

Extension must, therefore, be aware of the existence of different farming groups and plan its programmes accordingly. The smallest and poorest farmers will need particular attention, as they may lack the basic resources needed to become

involved in extension activities. The point to stress, therefore, is the existence of farmer groups with different resources and skills in any one community, and the need for extension to respond to these groups accordingly.

2.5.20 Extension and education Process:

It has been seen that the extension agent's task is an educational one. Farmers and their families need to learn new skills, knowledge and practices in order to improve their farming and other productive activities. As they do so, they develop new attitudes toward farming and the new practices, and to extension itself; this in turn influences their future behavior. Extension agents, however, must also be prepared to learn from farmers about the way they farm, and keep themselves up to date with relevant developments in agricultural knowledge. In this educational work of extension, the agent should be aware of a number of principles of learning.

2.5.21 The Educator Must Also Be a learner For Farm Families:

Education is not a process of filling empty minds with knowledge. Farmers already have a lot of knowledge about their environment and about their farming system; they would not be able to survive if they did not. Extension must build on the knowledge that already exists.

An extension agent, therefore, needs to learn as well as to teach. He must learn what farmers already know about agriculture: for example, how they describe and explain things that happen on their farms and what they know already about improved farming methods.

2.5.22 Learning requires motivation:

No one can compel another person to learn. There has to be a desire to learn. Adults find it more difficult than children to grasp new ideas and information. Also, unlike a schoolteacher, the extension agent does not have a captive audience.

Farmers can choose not to learn and they can choose not to listen to extension agents.

People do not learn unless they feel that the learning will result in their being able to satisfy a need or want. Food and drink are needs that are essential for life, together with the starting and raising of a family and the search for safe living conditions, which provide protection and shelter from danger and discomfort for the family.

In addition to needs, people have wants or desires. These are less intense than needs, but still important. People desire approval and praise from their family and friends; they want prestige in their society and to be well thought of by their neighbors. These desires become more apparent once basic needs have been satisfied. Farmers and their families who are well-fed and have good homes still strive for improvement. They want to produce more and the extension agent, by helping them to improve farming methods, can use this legitimate ambition to help them to improve the productivity of their farms. A farmer who is motivated to learn is likely to do so more rapidly and completely than a farmer who lacks motivation. This is a very important principle for the extension agent to remember.

2.5.23 Dialogue and practice are important for learning

An extension agent tells a group of farmers how to thin their crops in order to improve yields. He then goes away, thinking that the farmers have learning the new knowledge and skills. A few weeks later, he returns to find that none of the farmers have thinned their crops and that they have only a very vague idea of what he told them.

The extension agent should not be surprised. Farmers do not learn very much from a straightforward talk and most of what they do hear they soon forget. But if they are given the chance to ask questions, to put the new information into their own words and to discuss it with the extension agent, much more will be learned and

remembered. Furthermore, when a new practical skill is being taught, the farmers must have a chance to practice it. The extension agent can then correct any initial mistakes, and the farmer will gain the confidence to use the new skill.

2.5.24 Learning and adoption occur in stages

Different types of learning are involved in extension. Before a group of farmers can decide to try out a new practice, they must first learn of its existence. They may then have to learn some new skills.

Five stages can be identified in the process of accepting new ideas.

Awareness: A farmer learns of the existence of the idea but knows little about it.

Interest: The farmer develops interest in the idea and seeks more information about it, from either a friend or the extension agent.

Evaluation: How the idea affects the farmer must now be considered. How will it be of benefit? What are the difficulties or disadvantages of this new idea? The farmer may seek further information or go to a demonstration or meeting, and then decide whether or not to try out the new idea.

Trial: Very often, farmers decide to try the idea on a small scale. For example, they may decide to put manure or fertilizer on a small part of one field and compare the result with the rest of the field. To do this they seek advice on how and when to apply fertilizer or manure.

Adoption: If the farmers are convinced by the trial, they accept the idea fully and it becomes part of their customary way of farming.

Similar stages are involved with individual farmers, farmers' groups, or whole communities. In groups and communities the process is more complex and may take much longer. The extension agent uses a range of extension methods to bring the right kind of information and support to each stage of the process. He must arrange learning experiences that will lead people from one stage to the next. In a community forestry programme, he begins by encouraging people to recognize that

there is a problem of declining numbers of trees and that this could be overcome by the community planting and looking after a wood-lot. Interest can then be increased by a visit to another village that has already planted a wood-lot.

During the evaluation stage, a lot of discussion will go on in the village. The extension worker can provide detailed information about the costs and returns, and answer questions and doubts. When a decision is taken to do something he can then arrange skill training sessions.

2.5.25 Farmers differ in their speed of learning and adoption

The process by which a new idea spreads among people in an area is known as diffusion. Not all farmers will accept a new idea at the same time. In any rural community, the readiness to accept new ideas and put them into practice varies from farmer to farmer depending on each farmer's previous experience with new ideas, the personality of the farmer and the amount of land and other resources available. Thus we can identify different categories of farmers in terms of their abilities to adopt new ideas.

Innovators. Innovators are farmers who are eager to accept new ideas. Usually there are only a few people in this class in a farming community. They are often farmers who, having spent some years outside the village, feel that they can make their own decisions without worrying about the opinions of others. In villages, innovators are often looked on with suspicion and jealousy. Yet they are important to the success of an extension programme since they can be persuaded to try new methods and thereby create awareness of them in the community.

However, the extension agent should exercise tact and caution, and avoid over praising innovators in public or spending too much time with them.

This could result in rejection of the idea by the rest of the community because of jealousy and suspicion of the innovator's motives in adopting new methods.

Early adopters. Farmers who are more cautious and want to see the idea tried and proved under local conditions are known as early adopters.

They express early interest but must first be convinced of the direct benefit of the idea by result demonstration. Usually this group of farmers includes local leaders and others who are respected in the community.

The majority. If the rest of the farmers adopt a new idea, they will do so more slowly and perhaps less completely. Many farmers will lack the resources to adopt the new idea at all, while others may only do so slowly and with caution.

The majority who can and do adopt the idea are likely to be more influenced by the opinions of local leaders and neighbors than by the extension agent or the demonstrations he arranges.

2.5.27 Types of Agricultural Extension

There is no one universal type of extension but a variety of activities and approaches which can be called extension. It has already been stated that since agriculture is the basis of a rural economy, agricultural extension is the most common type of extension to be found in rural areas. But the areas of knowledge and new ideas that farmers and their families require are not restricted to agriculture. There are other aspects of family life in which new knowledge and practices can lead to improvement. Extension is any activity that works with farmers and their families in order to improve the economic and social conditions of their lives and to develop their ability to take responsibility for their own future development. This extension, however, can take different forms and it would be useful to review the two principal ones.

2.5.28 Agricultural extension

There are probably more extension agents involved in agricultural activities than in any other aspect of rural life. Given the importance of agriculture and the need to

produce food both for the farm family and for the nation as a whole, this emphasis upon agricultural extension is understandable. Some agricultural extension services are based upon a single crop, while others adopt more of a "whole farm" approach. The choice is very much dependent upon the local agricultural system and the national crop requirements. In regions where cash crops such as cotton, cocoa or sugar grow, the single crop extension approach is more common.

An agricultural extension service offers technical advice on agriculture to farmers, and also supplies them with the necessary inputs and services to support their agricultural production. It provides information to farmers and passes to the farmers new ideas developed by agricultural research stations. Agricultural extension programmes cover a broad area including improved crop varieties, better livestock control, improved water management, and the control of weeds, pests or plant diseases. Where appropriate, agricultural extension may also help to build up local farmers' groups and organizations so that they can benefit from extension programmes. Agricultural extension, therefore, provides the indispensable elements that farmers need to improve their agricultural productivity.

2.5.29 Non-agricultural extension

In the absence of a collective term to cover the other types of extension, it is convenient to refer to them all as non-agricultural extension. This term includes all activities and efforts not directly related to agriculture or livestock production, but which are important to the farm families. Home economics, family health and nutrition, population education and community development are all non-agricultural extension activities.

Rural extension covers many aspects of rural life: When talking of extension and extension agents, therefore, all activities of the above type are included. These activities also involve the basic elements and principles of extension outlined earlier in this chapter, such as knowledge, learning and practice. Home economists

and community development workers, therefore, are extension agents who deal with farm families in the same way as agricultural extension agents. The only difference is their areas of concern.

In fact, it is becoming increasingly common to talk of rural extension as a collective term which brings together all agricultural and non-agricultural extension activities. The feature common to both types of extension is that they work with families in rural areas and deal with problems in a rural environment. Their different programmes and approaches have a common aim, which is the improvement of the lives of the rural people, and they are both guided by common principles and ideals.

This guide, therefore, is a guide to rural extension and is relevant to both agricultural and non-agricultural extension agents. Given the predominance of agriculture in the rural economy, however, there will be some emphasis on agricultural extension within the guide. The understanding of extension, the methods used by extension agents, the planning processes involved and the qualities and skills required by agents are factors relevant to all forms of rural extension. The content and subject-matter may be different, but the same general principles apply in both types of extension.

2.5.30 Definition and History of Community Development

(I) Definition: There are many definitions of community development but the basic concept was stated by the United Nations in 1948 "Community Development is a process designed to create conditions of economic and social progress for the whole community with its active participation and fullest possible reliance upon the community's initiative." (quoted in Head, 1979:101).

(ii) Brief History of Community Development

Community development practice has arisen from a variety of sources and settings. Its roots can be traced to the social reform movement in Britain and North America

in the latter half of the 18th century. Community development principles were formulated and applied in third world development efforts following decolonization. In the 50's and 60's CD or community organization, as it came to be called, was used in deprived or underdeveloped urban and rural settings in North America (Smith,1979:52). CD was a response to the perceived disintegration of society due to rapid technological change, economic dislocations, disruption in traditional family and community structures and the extension of government and commercial services into personal and family life, with negative impacts on personal effectiveness and community ties (Carey,1979:20). CD is eclectic, integrating specialized knowledge from education, public health, economic development and politics. (Head, 1979:101) However, it is also a discipline unto itself, with a body of theory, standards of practice and professional associations. Master's and doctoral programs in community development are usually associated with either a school of social work or rural development.

2.5.31 The Green Revolution Benefits:

As a result of the Green Revolution and the introduction of chemical fertilizers, synthetic herbicides and pesticides, high-yield crops, and the method of multiple cropping, the agricultural industry was able to produce much larger quantities of food. This increase in productivity made it possible to feed the growing human population.

One person who is famous for his involvement in the Green Revolution is the scientist Norman Borlaug. In the 1940s, Norman Borlaug developed a strain of wheat that could resist diseases, was short, which reduced damage by wind, and could produce large seed heads and high yields. He introduced this variety of wheat in Mexico and within twenty years the production of wheat had tripled. This allowed for the production of more food for people in Mexico and also made it possible for Mexico to export their wheat and sell it in other countries. Norman

Borlaug helped introduce this high-yield variety of wheat to other countries in need of increased food production, and he eventually won a Nobel Peace Prize for his work with developing high-yield crops and for helping prevent starvation in many developing countries.

In addition to producing larger quantities of food, the Green Revolution was also beneficial because it made it possible to grow more crops on roughly the same amount of land with a similar amount of effort. This reduced production costs and also resulted in cheaper prices for food in the market.

The ability to grow more food on the same amount of land was also beneficial to the environment because it meant that less forest or natural land needed to be converted to farmland to produce more food. This is demonstrated by the fact that from 1961 to 2008, as the human population increased by 100% and the production of food rose by 150%, the amount of forests and natural land converted to farm only increased by 10%. The natural land that is currently not needed for agricultural land is safe for the time being, and can be utilized by animals and plants for their natural habitat.

2.5.32 Issues with the Green Revolution

Although the Green Revolution had several benefits, there were also some issues associated with this period that affected both the environment and society. The use of chemical fertilizers and synthetic herbicides and pesticides dramatically influenced the environment by increasing pollution and erosion. The new materials added to the soil and plants polluted the soil and water systems around the fields. The pollution of the water exposed people and the environment downstream to the chemicals being used in the farm fields. The pollution of the soil resulted in lower soil quality, which increased the risk of erosion of the topsoil.

In addition to pollution, the environment was also influenced by the large irrigation systems that were required to sustain the growth of the plants. The large amount of

water required put pressure on the natural water reserves and resulted in water shortages and droughts. The environment was also negatively affected by the Green Revolution due to the consumption of more energy. From 1900 to 2000, the amount of energy put into agriculture worldwide increased 80 times due to the shift from human and animal labor to the use of large machines. The increase in energy consumption and the dependency on more fossil fuels has resulted in pollution and has caused harm to the environment.

2.5.33 Importance of Community Participation

Despite some authors contesting that participation makes no difference, the importance of community participation is well established in the literature. Chamala (1995)^[1] identified efficiency benefits from participation, stating that ‘involving stakeholders and empowering community participants in programs at all levels, from local to national, provide a more effective path for solving sustainable resource management issues’. Participation enhances project effectiveness through community ownership of development efforts and aids decision-making (Kelly and Van Vlaenderen 1995^[2] ; Kolavalli and Kerr 2002^[3]). Price and Mylius (1991)^[4] also identified local ownership of a project or program as a key to generating motivation for ecologically sustainable activities. The authors also identify the role of community participation in disseminating information amongst a community, particularly local knowledge, that leads to better facilitation of action (Price and Mylius 1991^[4] ; Stieglitz 2002^[5]). Kelly (2001)^[6] identified that participation results in learning, and learning is often a prerequisite for changing behavior and practices. Gown and Vansant (1983)^[7] identified four affirmations that summarize the importance of participation in development:

*People organize best around problems they consider most important

*Local people tend to make better economic decisions and judgments in the context of their own environment and circumstances

*Voluntary provision of labor, time, money and materials to a project is a necessary condition for breaking patterns of dependency and passivity

*The local control over the amount, quality and benefits of development activities helps make the process self-sustaining (cited in (Botch way 2001) page 136)^[8] .

White (1981)^[9] identified a number of beneficial reasons for community participation:

with participation, more will be accomplished, and services can be provided more cheaply. Participation: has an intrinsic value for participants; is a catalyst for further development; encourages a sense of responsibility; guarantees that a felt need is involved; ensures things are done the right way; uses valuable indigenous knowledge; frees people from dependence on others' skills; and makes people more conscious of the causes of their poverty and what they can do about it.

Curry (1993:33)^[10] identifies that 'policies that are sensitive to local circumstances will not only be more effective in taking the uniqueness of local social structure, economy, environmental, and culture into account, but also, through the involvement of the local community, will be more likely to be successful in their implementation. Communities that have a say in the development of policies for their locality are much more likely to be enthusiastic about their implementation' (Curry, 1993: 33 cited in (Storey 1999) page 308)^[11] . Golooba - Mutebi (2004)^[12] found that participation has a role in enhancing civic consciousness and political maturity that makes those in office accountable.

Chapter Three

Research Design and Methodology

3.1 Area of the Study

Introduction:

Greater Darfur region is located in the western most part of the Sudan, occupies an area of 549 thousand square kilometers (equal to the size of France) divided into three states in 1994 respectively; North Darfur (equal to the size of Burkina Faso), South Darfur (the size of England) and West Darfur (the size of Tunisia).

Darfur lies between longitudes 220 – 270 east and latitudes 100 – 160 north. It has an estimated population of 6.165.000 people unequally distributed among the three states: South Darfur densely hosting 2.869.000 people, West Darfur 1.653.000 and North Darfur sparsely was hosting 1.552.000 people. Darfur shares the international borders Egypt, Libya, T-Chad, Central Republic of Africa and southern Sudan, (DDAG, 2005).

3.2 Establishment & formation of JMRDP

Establish the initial project in 1980 a joint venture between the government of Sudan 27% of the European Economic Community (EEC) and 73% stage at a cost of 40 million dollars in the area of 35 thousand km² sandwiched between latitudes 10.5 and 13.5 north and longitude 22.5 and 24.5 east longitude.

Target crops are: Millet – Dura and fruit, where the second phase during the past 87-1992. Annexation of the project since its inception three council areas in South Darfur province (now the states of South and West Darfur). It adjoins the border with the states of Chad and Central Africa, and internally with the North Darfur province (now the state of North Darfur). Estimated cultivated area of about 500 thousand acres and the number of sedentary population of about 345,563 a breeze of about 84,364 captured rural and nomadic breeze around 94 392 22 601 captured

rural (census 1983). In addition to 85 thousand Chadian refugees fled to the region in the year (1984/85) period of drought that hit the region on that date.

* The rate of the average rainfall in the year ranges from 450-600 mm in low-lying areas were up to (1000 mm) high in Jebel Marra.

In Darfur irrigated agriculture expanded in Zalingei during the Jebel Marra Rural Development Project has started and inherit its experience by the community, within the operation in South and West Darfur between 80/1996. Supported by the European Economic Community (EEC, 73%), and Gov of Sudan with 27%.

This project sought to build up the area's development infrastructures, smallholder irrigation, while increasing extension and other public services, (Morton, 1993 and Elnur, 2009). In Zalingei locality 77% of households reported using irrigation approximately total area (10670) feddan, watering average area of 4483.1 hectares (CDS Investment doc, 2012). They stated that 60 % of their plots were devoted to onion, 14 % to watermelon, 10 % to sugarcane, 4 % to okra and 13 % to other crops, which include chilli, potato and tomato. (Monitoring and evaluation department, 2008:39). Marketing of onions was an important source of income to families, amounting to 33 % of the value of all sales or marketing for Zalingei locality and 60 % for Zalingei townships (monitoring and evaluation department, 2008:43). For onion, higher temperature and humidity increase the risk of post-harvest losses due to mould and other problems (El-Negerabi and Ahamed, 2003). All Rural Development projects aim to minimize poverty, and increase income of rural people and improve their living standard situation of onion and potato growers in Zalingei, West Darfur. Horticultural crops for local and export markets offer Sudan's farmers potentially significant source of income.

The communities in Zalingei started adopting onion and potato Cultivation on a small-scale since at least the 1940s, developing irrigated farming techniques using traditional technology and adapting local crop varieties.

During the 1980s the Jebel Marra Rural Development Project fostered the expansion of these crops through infrastructural development and extension services created that fruitful environment (**Castro, 2012**). In the Sudan's most onion harvested and consumed locally, though some exports occur to European and Gulf countries. In the 1940s the crop started to spread to various parts of the country where conditions were suitable for its production (**Elrasheed and Awad, 2009**). Onions have emerged as one of the leading vegetable crops in the country due to its crucial characteristics either fresh or cooked usages.

Darfur's only livelihood is farming and work started with surveys of soils, water resources and vegetation. It quickly extended to innovative efforts to monitor environmental change and to socioeconomic research. In the 1980s, this led to ten years of agricultural research and development, to investments in rural infrastructure and to attempts to tackle social and institutional issues, such as the sustainability of public services and community development. Managing farm land and range land for sustainable improvements in productivity was particular focus. In south and West Darfur, Government of Sudan set up the Western Savanna and Jebel Marra Rural Development Project, With support from the World Bank, the EU, the UK and Saudi Arabia: a commitment of some 100 million US over ten years. In hindsight, the thought occurs that if the international community had maintained that commitment through the 1990s, the disaster that is Darfur today might have been avoided, or at least mitigated.

Darfur has suffered more than most from the international community's attention deficit disorder. It only commands that attention at times of crisis: the Sahel drought of the 1968 to 1970, the Band Aid of 1984/5 and the current conflict. As each crisis recedes, important lessons are forgotten and the effort spent learning them is wasted. And every wave of international engagement is framed by a new

set of assumptions that are not grounded in any knowledge of Darfur, preconceptions that lack depth and perspective.

Making sense of Darfur is about replacing these assumptions with a real understanding of what is needed and just as important, of what will work and what not work in the region. More is known about Darfur than most people realize. 1957 saw the start of a 30 year effort to understand the region, an effort that ended in the early 1990s (May 6, 2006 James Morton).

3.3 Objectives of JMRDP:

The JMRDP aims to assist small farmers in 33,000 km² of western Darfur to raise productivity and improve their living standards. This is mainly by providing advice and selected agricultural inputs. Feeder roads are being improved, and some communities helped with wells, health clinics, and women's training.

3.4 In Terms of Geography and Demography

Darfur is divided into three States, 1994:

* The northern semi-arid desert extending between the Sahara and northern belt of South Darfur State where scanty rains fall during short rainy seasons.

* The central Darfur State centered by and split into two halves by Jebel Marra volcanic massif, at ten thousand feet (10,000 f) above sea level. This State is characterized by heavy torrential rains reaches sometimes its maximum rate at about (800-1000mm), terrace cultivation at the top or steppes of the Jebel, hemmed in by sandy and rocky plains in the east, and by vast plains in the west.

The southern Darfur State which lies shares its border with Bahr Al-Arab and is characterized by heavy rains and rich alluvial soils covering most of the Savanna Region.

3.5 Darfur Population Statistics:

Growth of Darfur Population after Dependency of the Sudan (1956):

Year	1956	1973	1983	1993	2008
Population	1.080.000	1.340.000	3.500.000	5.600.000	6.480.000
Density/KM2	3	4	10	15	18

Source: University of Peace. Environmental Degradation as a cause of conflicts, December 2004,p.35

War-Affected Population in Darfur, early 2008 per State

Great Darfur States	Total affected	IDPs	Residents
Northern Darfur	1.340.869	521.012	819.857
Southern Darfur	1.628.275	1.185.012	443.263
Western Darfur	1.301.235	745.952	555.283
Total	4.270.379	2.451.976	1.818.403

Source: OCHA; Darfur Humanitarian Profile No. 30 – January 2008

3.6 People and Activities in Darfur:

The vast majority of population in Darfur is either rural sedentary farmers or pastoralists. There are also a sizable number of urbanized citizens who practice petty trades, employees or unemployed. Farmers are usually settled, representing 74% of the population, while nomads represent 25% (Mohamed, 2007:363). But these figures might not be so accurate, since assigning a particular description to each group is difficult. These groups are very roughly classified according to industries they practice. I shag (2002:14; Ahmed & Hariri, 1981) divide them into indigenous cultivators, Baggara (cattle breeders) and Abbala (camel breeders) as nomads. In fact, it might be improper to conclude that there is exclusively transhumant or symbiotic communities in Darfur. People are remarkably becoming so symbiotic that clear industry boundaries are no longer static. Yet, the relationship between these groups has always been sensitive and, too often,

conflicts over resources are heightened by frequent droughts and shrinking natural resources. Whenever average annual rainfall decreases conflicts increase and vice versa.

3.7 Area of Study Sectors:

Zalingei is Sector (A)

Figure (1) administrative unit population

No	Locality Name	Population No/000	observations
1	Triej	059.800	Sub Unit
2	Azoum	061.492	Locality Central Darfur State (CDS)
3	Silo	063.244	Head of the Locality /CDS
4	Dirasa	051.573	Sub Unit
5	Zalingei Town	083.000	Locality & Head of the State
	Total	263.889	

Source: locality files Zalingei

(B) Wadi Salish (Garsila Area: 12,000 km 2)

Figure (2) administrative unit population

No	Locality Name	Population No/000	observations
1	Garsila	038.047	Locality Central Darfur State (CDS)
2	Deleij	052.987	Sub Units / CDS
3	Angicoti	029.835	Sub Unit / CDS
4	Umkhair	039.219	Sub Unit / CDS
5	Mukjar, Bendisi, Umdohken	049.192	Localities / CDS
	Total	209.270	

Source: Commissioner Office on 6 \ 5 \ 2009 at 10:00 am

Third: Sector (C) is Jebel Marra administration unit/ population

No	Locality Name	Population No/000	observations
1	Rokero	145.000	Locality Central Darfur State (CDS)
2	Golo	125.000	locality/ CDS
3	Gildo	058.000	Sub Unit/ CDS
4	Nyertete	102.000	Locality/ CDS
	Total	430.000	

Source: locality files Jebel Marra/ Central Darfur State (CDS)

3.8 The Importance of Agriculture in Darfur:

The traditional agricultural system in Darfur is more affected by land degradation and decline of land productivity. And the Fur's attempts to face drought conditions evolved in developing various adaptation mechanisms to. Various studies indicated the ability of the Fur people to adopt mechanisms to cope with the changing environmental conditions and food crisis. Expansion in cultivated area to compensate for the decline in grain production, (**Elnour, 2007**), which is initiated the practice on vegetable production mainly Onion to avoid the shortage of rainy season crops production. Jebel Marra is an important place in Darfur region and in the Sudan, rich with diversity of resources. It is characterized by abundant plants, trees, animals and fertile land. The plenty water flowing down from the large catchment location, Jebel Marra mountain constitutes the most important water catchment and forms the North-South divide separating the Nile and lake Chad Basins (**FAO1968" Mie he 1986**). In 2003, the majority of the Sudanese population depended on subsistence agriculture, which employed over 80% of the workforce and contributed 35 %t of the nation's Gross Domestic Products (GDP). The economy of Darfur is also largely agrarian. Its main consumption crops are millet, followed by sorghum. Groundnuts, tobacco, vegetables, and watermelons are the main cash crops. Before (2003), the main household food sources were

localized subsistence agricultural production (45–60%), livestock (10–30%), and market purchases (15–30%). Most communities farm according to the following calendar: planting in July- August, weeding in September - October, and harvesting in November-December, sometimes January. Vegetables normally need less time to ripen than cereals. Tobacco (chewing tobacco) was a major cash crop. But following the attack of the pro-government forces in May 2004, the areas under tobacco cultivation have declined dramatically—most of the tobacco farmers now live as internally displaced people (IDPs) in El-Fasher.

3.9 Research Population

The Study Population were IDPs Farmers: To achieve the objectives of study the state was divided into three sectors to allow and facilitate the distribution of approximate IDPs farmers with each sector they practice agricultural activity during any season per year as follows:

No.	Sector Name	Targeted Farmers/ sector selected (10 %)	Farmers
1	Zalingei	1000	100
2	Wadisalih	500	50
3	Nyertete	500	50
	Total	2000	200

Source: Field Survey,2013

According to the mentioned table above the population of the study was approximately (2000 farmers) due to Darfur present situation since (2003). The three sectors in Central Darfur State respectively consist: Zalingei, Wadisalih, and Nyertete districts. In 1988 farmers are (220906) per 586506 as a population number with a percentage of 45%-60% practice on farming system and lives in multi- villages with full stability. But now due to the last great Darfur Crisis on 2003 all activities are under vulnerable situation which affects their stability in

general for all the population of Darfur. Furthermore farmers of the rural areas, were internally displaced people (IDPs) in the big towns per each locality. Some are doing the same activities they do before example: agricultural crops farming, but others have taken a new style of work to accommodate the environment of the newly destinations where they live. To cover the requirements of the study target total population which approximately 2000 farmers at the state level 10% of farmers was selected from the whole population which equal 200 farmers to cover the State population considered.

3.8.1 Sampling & Sample Selection

There was multi-methods to success sample size selection, so the researcher followed the Finite Population Correction for Proportions. This procedure for sample size selection when the population is small then the sample size can be reduced slightly. This is because a given sample size provides proportionately more information for a small population than for a large population.

Where n is the sample size, N is the population size, and e is the level of precision. When this formula is applied to the above sample, we get the equation below.

$$n = \frac{N}{1 + N(e)^2} = \frac{2000}{1 + 2000(.05)^2} = 333 \text{ farmers}$$

According the above equations the researcher chose (200) farmers and Distributed in 3 sectors 100 for sector (A) Zalingei and the other 100 will equally divided equally between sector (B & C) which represent Wadisalib and Nyertete (before are mentioned as local councils but now are called localities authorize by Central Darfur State). What the reasons of this distribution of sample size? The exceptional

situation for Darfur region, to gather the views of the farmers on the Impact of the Jebel Marra Rural Development Project in the area of coverage and to assess what factors that affect the centralization of the adoption and diffusion of improved onion seeds. In addition to assess the grassroots participation among the communities with Accidental sample size representatives in Central Darfur State which the Jebel Marra Rural Development Project is allocated.

3.8.2 Sample size by the Equation:

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

* n=sample size

* N=Population= example=2000 famers

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

$$* n = \frac{N}{1 + N(e)^2} = \frac{2000}{1 + 2000 \times 1.01} = 99.9 \text{ farmers}$$

From here the researcher select 100 farmers for sector (A) Zalingei and other extra 100 for both Sectors (B&C) Wadisalih and Nyertete 50 farmers per each to accumulate the total number (200) farmers as sample size at the state level.

3.9 Administrative unit's selection:

The study focused on the three Localities (Zalingei, Garsila and Nyertete) that has the whole state population numbers in the IDPs Camps which they were followed their agricultural activities around the areas that they confidential with it security and suitable for the vegetable production exactly onions.

3.9.1 Selection of Units:

Hence the targeted population was IDPs farmers, so the three localities mentioned has the sub Administrative Unit which each once of it covered with the very rich and fertile areas for onion production like in Zalingei (North & East, Abata and Dankog) Garsila: at Deleij and Umkhair) Nyertete around the down site of the valleys, due to the very slope drainage of the mountain. Then the area was

geographically sited which enable for accidental random sampling to the targeted population.

3.9.2 Selection of localities:

According to sampling methods, and in order to generalize the result of the study. The researcher follows the road map of project while they start fixation of the services centers in the heads of these three localities Zalingei, Garsila and Nyertete respectively. And then they start to disseminate other sub centers. From this point of view the three localities sample size will expresses the whole population number within the state level.

3.10 Research Methodology

was consists social research method used:

- primary:** Face to face contact with farmers followed: interviews, group discussion, field survey and observations within the project area movement.
- **Secondary:** official publications as an example, books, reports, M.S.c, PhD thesis and scientific papers.

3.10.1 Tools Collection Procedure:

Data collected: To achieve the study objectives, 200 respondents were selected as a sample size. Personal interviewing as well as informal meetings were means of primary data collection and followed with field survey. While secondary data were collected from relevant sources such as institutions, organizations, books, reports and M.Sc. PhD thesis.

The following was considered:

- Farmer's personal characters.
- Participation in extension field work.
- Participation in extension campaigns.
- Participation in extension training.

- Participation in extension field visits. (Not only have the participation but the rate of adoption packages of innovations to improved onion seeds, in addition to gather of other relivant information).
- Level of participation in project planning, implementation, monitoring and evaluation.
- Level of participation in community base organizations. The collected data shall be subjected to different statistical analysis, which are statistical packages for social sciences (SPSS).

3.11 Data Analysis:

Statistical package for social science (SPSS), Percentages, frequencies was followed to fulfill the requirements of social data analysis.

3.12 Problem encountered or faced by researcher (Limitation on difficulties), The challenges that the researcher faced as followed:

- ✓ Long distances and trouble of security situation is the overall area phenomenon.
- ✓ Due to the stress of the war the farmers were not giving the information easily.
- ✓ Cost of transportation from area to another is so high, and risky incidents are expected at any time.

Chapter Four

Results and Discussion

Introduction:

In this chapter the researcher represented the results of the study analyzed with certain methods using, statistical package for social sciences (SPSS), percentages and frequencies. The data collection followed; Simple random sampling, geographical direction, field survey and special structured format questionnaire used. Through random accidental selection targeted respondents were selected 10% from approximately (2000) farmers farming around the state level due to Darfur crisis situation. Sample size was breakdown to represent that cumulative number of the studied beneficiaries equal (200), this selected number were distributed into three sectors mainly Zalingei (100) farmers by gender to give them chance for competition equally as sample members to be represented. Wadisalih and Nyertete (50) per each, according to some similarities in the two sectors either farming systems in the rainy season or environmental factors which allow for some horticultural crops practices, bellow the details should consider the outcomes of the study with the proposed recommendations.

4.1 Distribution of Respondents according to Personal Characteristics

Age

Table (4.1.1) Distribution of Respondents according to their Age

Age	Frequency	%
18 – 25 years	020	10
25 – 32	050	25
32 – 39	049	24.5
39 – 46	042	21
above 46	039	19.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.1 shows that the Age of the respondent's variations is range between 32-46 years which indicate that 45.5 % of the respondents are the youth and they have productive abilities due to the age factor. But 10% are under 18-25 years.

Sex

Table (4.1.2) Distribution of Respondents according to their sex

Sex Differences	Frequency	%
Male	145	72.5
Female	055	27.5

Source: Field Survey, 2014

Table 4.1.2 Shows that 72.5 % respondents are male and 27.5 % Female and this variation Indicate that the methods of agricultural facilities has been changed and highly cost like mechanization used and improved seeds adopted. Family responsibilities and ability to pay the cost of tools or agricultural inputs male have a wide chance more than female also in lawns and bank lends system share there for the cause need successful gender analysis (SGA).

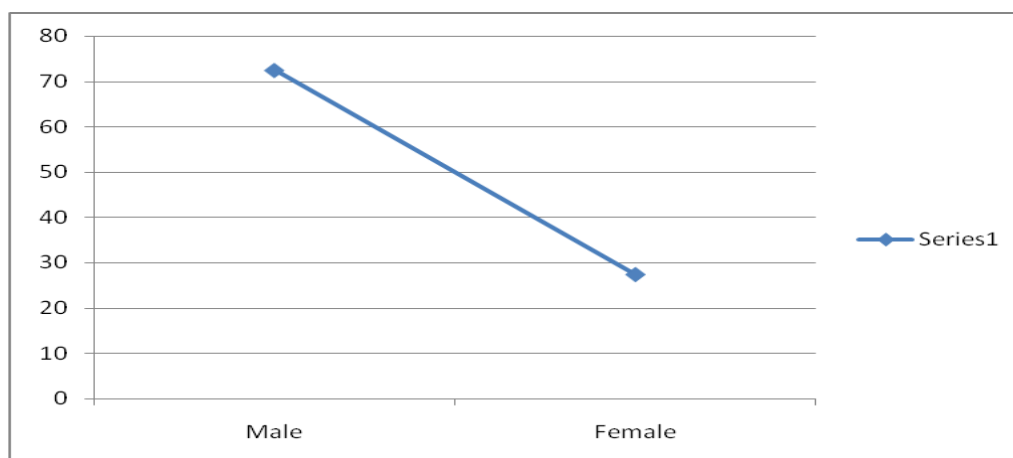


Figure 1 represent respondents by gender

Education

Table (4.1.3) Distribution of Respondents according to their education

Education Situation	Frequency	%
illiterate	024	12
Khalwa	054	27
Before university	077	38.5
University	042	21
Post graduate	003	1.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.3 Shows that 38.5% respondents had formal education before university followed by 27% of Khalwa traditional education system. In addition to 21% university level involve in agricultural activities. This result certifies that the targeted people were engage on the process of project activities.

Which can enable the awareness creation will occur easily and transfer of innovations should properly perform with low cost according to the presence of the educators.

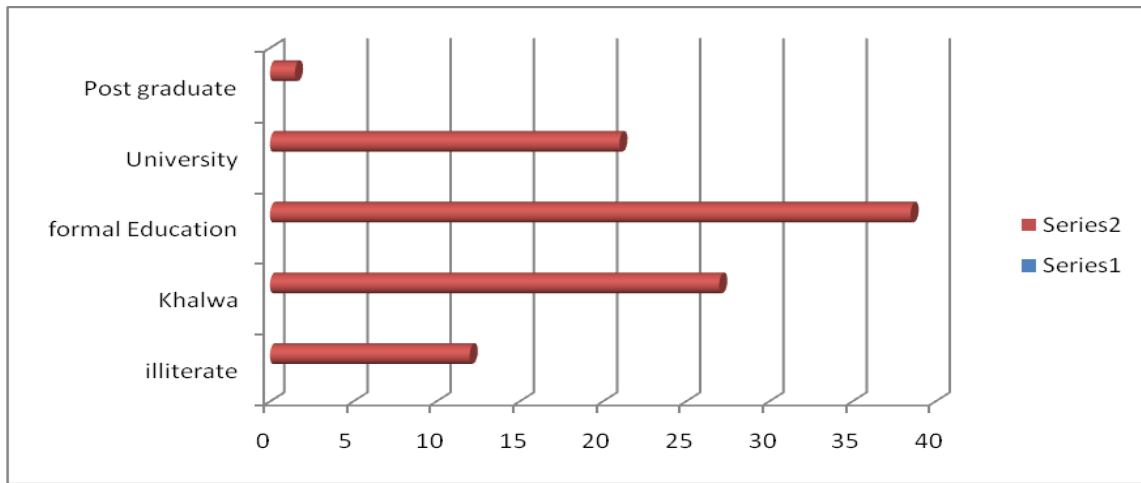


Figure 2 represent respondents by Education Level

The diagram shows that the formal and Khalwa educated respondents were very close to the farm, due to their awareness towards the benefits of the project activities.

Social Status

Table (4.1.4) Distribution of Respondents according to their social status

Social Status	Frequency	%
single	033	16.5
Divorced	006	03
Married	150	75
widowed	009	04.5
Husband Absence	002	01
Total	200	100

Source: Field Survey, 2014

Table 4.1.4 shows that 75% of the respondents are married, it indicates that their responsibilities let them to be well committed with agricultural activities and professionalism on the process by traditional background suitability in the whole state either to be farmer or mix with livestock herders (see the table below) on the other hand single respondents 16.5 % It shows the youngest groups among the targeted sample of study and not socially engaged.

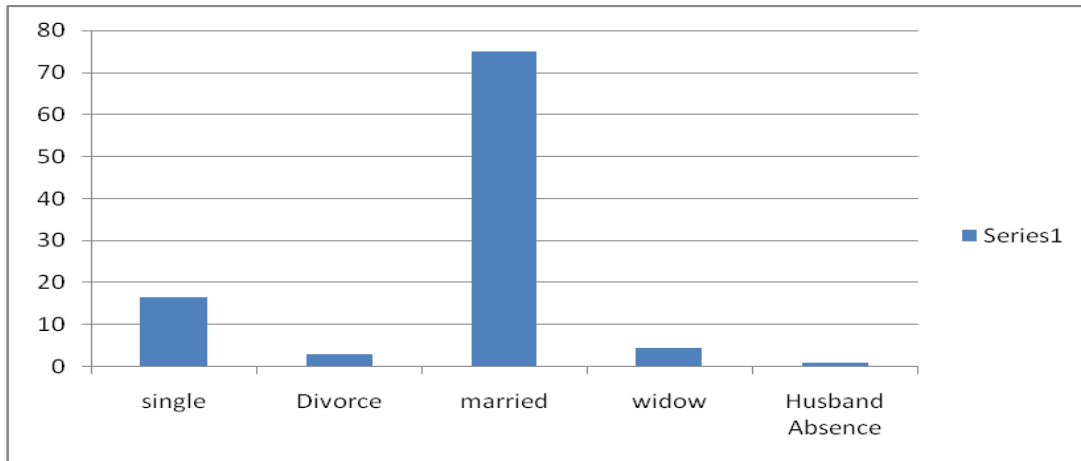


Figure 3 represent respondents by Social Status

Work Type

Table (4.1.5) Distribution of Respondents according to their work type

Type of Work	Frequency	%
Farmer	126	63
Trading	009	4.5
industry	005	2.5
handicrafts	003	1.5
employee	057	28.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.5 Shows that 63% of the respondents are farmers and 28.5% are employee. And 8.5% are involved in other type of work. Also employee recently joint with their official work agricultural practices, due to situation change either social services cost or family basic needs on daily base.

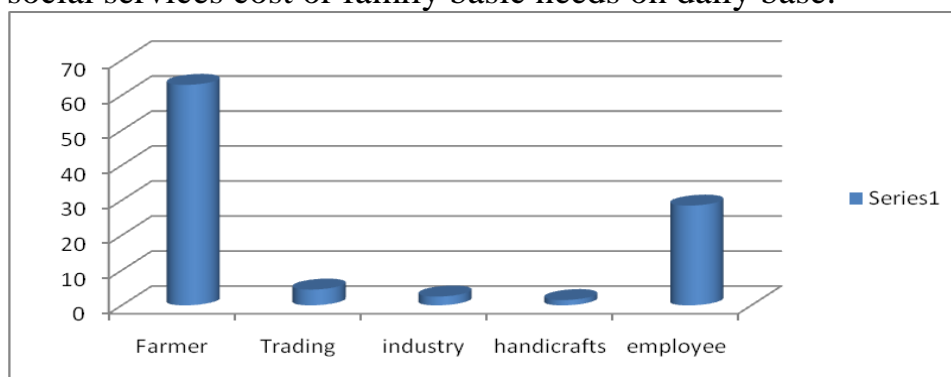


Figure 4 represent respondents by Type of Work

Agricultural Land Tenure System

Table (4.1.6) Distribution of Respondents according to their owning of agricultural land

Land System	Frequency	%
owner	089	44.5
rent	091	45.5
Grant	002	01.0
Crops Share	018	09
Total	200	100

Source: Field Survey, 2014

Table 4.1.6 Shows that the owner and rental land are 45.5 % - 44.5 % and only 10% practice the land by the other methods of grant and share cropping. This phenomenon refer that, some of the farmers are internally displaced persons (IDPs) in Camps far from their origin land. Then they depend on land rent Crops share.

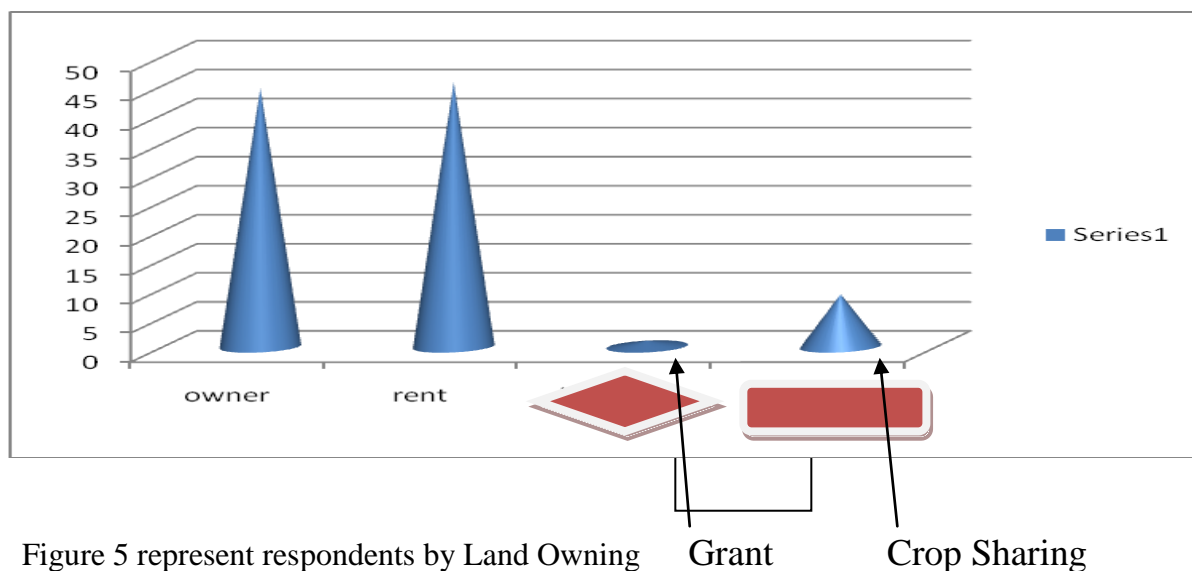


Figure 5 represent respondents by Land Owning Grant Crop Sharing

Having an Idea about Improved (Onion Seeds)

Table (4.1.7) Distribution of Respondents according to their Idea about Improved Seeds (Onion)

Idea about Improved Onion Seeds by answered yes /no	Frequency	%
Yes	162	81
No	038	19
Total	200	100

Source: Field Survey, 2014

Table 4.1.7 shows that 81% respondents said they have an idea about Onion improved seeds, and 19 % answered negatively or were not aware about it. But those who answered yes they mentioned by which ways them here about the Onion improved seeds.

The Way of Information Sources

Table (4.1.8) Distribution of Respondents according to their information sources about improved (Onion) seeds

Sources of Information	Frequency	%
Other farmers	088	44
Media	016	08.0
Agricultural Extension department	067	33.5
Crop Protection department	004	02.0
Others	025	12.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.8 shows that 44% of Respondents had the idea of improved onion seeds from other farmers and 33.5 % form Agricultural Extension and 8% from the media. This indication shows the weakness of extension services.

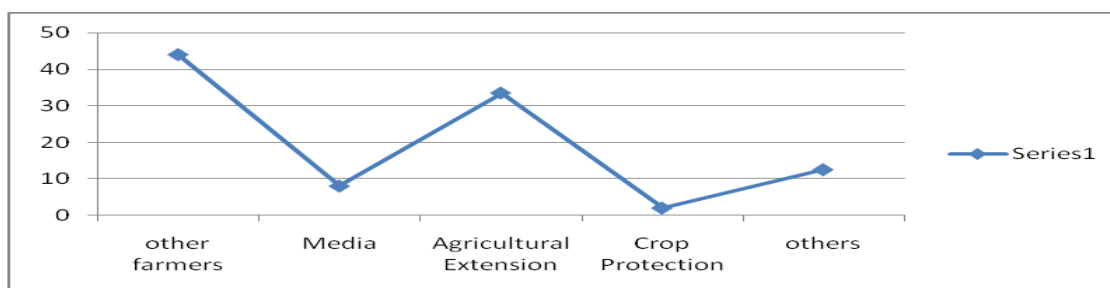


Figure 6 represent respondents according to dept idea about improved onion seeds. The result shows that the neighbouring farmer and agricultural extension department was source of information for the respondents considered.

The Project Stages or Cycle

Table (4.1.9) Distribution of Respondents according to their period or stage of the project they have been aware about Improved (Onion) Seeds

Stage of the project	Frequency	%
Pre-stage	087	43.5
First stage	018	09
Second stage	066	33
Third Stage	004	02
Fourth Stage	025	12.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.9 shows that the preparatory stage of the project which started in the first of 1957\58 and continue to the second stage on 1963\67 followed respectively 1976\77, 1978\79 and 1980\84 which is the real time of Jebel Marra Project started

the implementation to cover 35 km² and irrigated area 500,000 feddan with the population number (1200) as farm families, according to the project achievements by mid 1989. With the project aims to assist small farmers in 33.000 km² West Darfur State to raise productivity and improve their living standards.(JMP-Nov.,1989 and -annex 1V, 1977. What observed is that the pre stage of the project prepared the flour for the targeted respondents here'd about the improved onion seeds. And the second stage followed the implementation period.

participation in the previous project Training

Table (4.1.10) Distribution of Respondents according to their participation in the previous training by the project

Training Attendance by the answer Yes? or No?	Frequency	%
Yes	075	37.5
No	125	62.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.10 shows that 62.5% of the participants not participated in the previous training only 37.5% trained during the project implementation period, this indication showed that the IDPs farmers came from different areas, which some of them they were out of coverage at that time where they settled and this fragile situation in the area of the study, But in the whole great Darfur.

Training Location During the Project Cycle

Table (4.1.11) Distribution of Respondents according to their previous location trained by the project

Training Location	Frequency	%
Inside the state	148	74
Zalingei	044	22
Outside the state	008	04
Total	200	100

Source: Field Survey, 2014

Table 4.1.11 shows that 74% of the training is inside the state and 22% in Zalingei as a head quarter of the project, the first farmer Hall established in Zalingei in the year 1979/80 as a training center. Now is replaced by the Ministry of Finance & human resources Central Darfur State (Zalingei).

Training Period of Time (Duration):

Table (4.1.12) Distribution of Respondents according to their duration of training by the project.

Source: Field Survey, 2014

Training period of time	Frequency	%
one week	176	88
one month	014	07
one month and half	004	02
one year	001	0.5
more than the above mentioned	005	2.5
Total	200	100

Table 4.1.12 shows that 88% of the respondents trained in a period of time reached one week which indicate short period of training and suitable for farmers to attend, due to their multi-responsibilities.

Frequency of training (Rotation)

Table (4.1.13) Distribution of Respondents according to their frequency of Training by the project

Numbers of training	Frequency	%
One up to Four times	012	06
Five times	159	79.5
non	002	02
more than five times	027	12.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.13 Shows that 79.5% of Respondents according to their frequency of training by the project five times is the highest %. Which is acceptable for the farmer to take knowledge & skills. To enable them so as to play role of train of the trainers (ToT) for knowledge transfer.

Improvement of Skills & Knowledge Response

Table (4.1.14) Distribution of respondents according to their improvement of skills & knowledge by the project activities

Either answer Yes? or No?	Frequency	%
Yes	108	54
No	092	46
Total	200	100

Source: Field Survey, 2014

Table 4.1.14 shows that 54% of the respondents answered by yes? their skills and knowledge improved. With answered No by 46% which indicated that some respondents were IDPs from deferent areas out of their origin agricultural land or villages..

Knowledge & Skills Improved measurement

Table (4.1.15) Distribution of Respondents according to their Skills & Knowledge Improved measurement.

Skills & Knowledge Improved measures	Frequency	%
increase Agricultural land	103	51.5
practice extension massage	020	10.0
production increasing	019	09.5
all answers right	025	12.5
others	033	16.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.15 shows that 83.5 % of the respondents measured their skills and knowledge improvement in state level. And 16.5% don't clarify.

Background of Campaign

Table (4.1.16) Distribution of Respondents according to their Idea about campaign.

background of Campaign either the answer Yes or No?	Frequency	%
Yes	130	065
No	070	035
Total	200	100

Source: Field Survey, 2014

Table 4.1.16 shows that 65% of the respondents are aware about campaign background. Except 35% did not given positive result.

Options of Campaign Definitions

Table (4.1.17) Distribution of Respondents according option selection for the Definition of campaign.

Definitions of Campaign	Frequency	%
diffusion of innovations knowledge	127	63.5
avoid any corps risks	012	06
strengthen of new knowledge diffusion	022	11
others	039	19.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.17 shows that 80.5 % of the respondents were selected of options given for the definition of campaign. But 19.5 % did not given positive result.

Methods of Campaign Awareness & Delivery

Table (4.1.18) Distribution of Respondents according to their measurement of Campaign Awareness delivery.

Methods of campaign measurement and delivery	Frequency	%
transfer new knowledge	131	65.5
decrease the crops risk	017	08.5
train beneficiaries on new agricultural tools	052	26
Total	200	100

Source: Field Survey, 2014

Table 4.1.18 shows that 100 % of Respondents are well aware about the ways that Campaign awareness was measured.

Table (4.1.19) Distribution of Respondents according to their feedback of Campaign impact

Variation of campaign feedback or impact	Frequency	%
Very good	120	60
good	073	36.5
Somehow?	007	03.5
Total	200	100

Source: Field Survey, 2014

In table 4.19 shows that 96.5% of the respondent's campaign feedback from very good to good. Except 3.5% answered somehow.

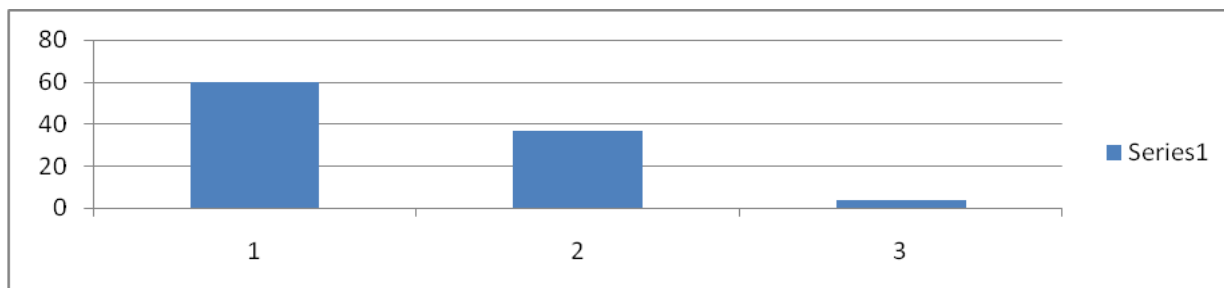


Figure 7 Respondents by the **feedback of Campaign or impact**

Respondents by the feedback of Campaign or impact they were aware so much showing the benefit of campaign.

Campaign is not have good affect? Select from Reasons given?

Table (4.1.20) Distribution of Respondents according to their views on Campaign if it's positive or negative impact.

Options of positive or negative views for campaign	Frequency	%
loss of time	174	87
misuse of resources	013	06.5
complicate production tools	005	02.5
others	008	04
Total	200	100

Source: Field Survey, 2014

Table 4.1.20 shows that 96% respondents has negative views about campaign. Except 4% mentioned others. It indicated that there is a lack of awareness creation, skills, and knowledge transfer.

Field Agent Farmer Farm Visits

Table (4.1.21) Distribution of Respondents according to their received farm visits by Field Agent

Field Agent farm visits either Yes? or No?	Frequency	%
Yes	123	61.5
No	077	38.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.21 Shows that 61.5% of the respondents answered yes? For field agent visits their farms. Except 38.5% answered with No?

How much farm visits you received?

Table (4.1.22) Distribution of Respondents according to their Number of farm visits received

Number of farm visits received by Respondents	Frequency	%
wince per week	047	23.5
wince per month	034	17
sometimes	060	30
not at all	059	29.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.22 Shows that 70.5% of the respondents received farm visits wince per week, wince per month and sometimes, except 29.5% for not at all received.

This result indicated that, the diminishing responsibilities of the extension services in the project area since, (2003) Darfur situation up to date.

Economic affect of improved onion seeds in compare with indigenous varieties

Table (4.1.23) Distribution of Respondents according to their economic view in compression between improved onion seeds with the indigenous

Economic affect of onion seeds varieties either Yes? or No?	Frequency	%
Yes	174	87
No	026	13
Total	200	100

Source: Field Survey, 2014

Table 4.1.23 Shows that 87% of the respondents answered Yes? There is an economic affect for the improved onion seeds in compared with the indigenous varieties. 13% answered with No?.

The Economic Parameter for the improved onion seeds

Table(4.1.24) Distribution of Respondents according to their Economic Parameters towards improved onion seeds.

Options for the Respondents Economic Parameters	Frequency	%
increase of production	079	39.5
insects resistance	015	07.5
early production	030	15
not benefits	033	16.5
Others	043	21.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.24 Shows that 62% of the respondents were positively selected the economic Parameters for the impact of improved onion seeds against 16.5% said not benefited and 21.5% mentioned others.

Types of Improved onion seeds No -(1)

Table (4.1.25) Distribution of Respondents according to their improved onion seeds variety practice Baftam Yamani - (1)

Improved onion seeds varieties practice or not? (1)	Frequency	%
non	034	17
Baftam Yamani	166	83
Total	200	100

Source: Field Survey, 2014

In table 4.1.25 shows that 83% respondents practice improved onion seeds variety Baftam Yamani, except 17% not involved.

Types of Improved onion seeds No -(2)

Table (4.1.26) Distribution of Respondents according to their improved onion seeds variety practice Amreaki (2)

improved onion seeds varieties practice (2)	Frequency	%
non	062	31
American	138	69
Total	200	100

Source: Field Survey, 2014

Table 4.1.26 Shows that 69 % respondents practice improved onion seeds variety locally called Amreaki. Except 31% not involved.

Type of indigenous onion seeds No-(3)

Table (4.1.27) Distribution of Respondents according to their indigenous seeds varieties practice (3)

indigenous onion seeds varieties practice (3)	Frequency	%
non	088	44
Ballade	112	56
Total	200	100

Source: Field Survey, 2014

Table 4.1.27 Shows that 56% respondent's practice with ballade onion seeds varieties. Except 44% not involve. It shows above 50 % of respondents practice ballade onion seeds varieties. And 44 % Non this results indicated that most of farmer practice improved onion seeds.

Will You Want to Continue Practice Improved Onion Seeds?

Table (4.1.28) Distribution of Respondents according to their continuation with improved onion seeds varieties practice.

continuation of improved onion seeds practice either Yes? or No?	Frequency	%
Yes	169	84.5
No	031	15.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.28 Shows those 84.5 % respondents answered Yes? They will continue practice improved onion seeds varieties. Except 15.5% Said No?

Economical Impact of Improved Onion Seeds:

Table (4.1.29) Distribution of Respondents according to their views on the economical impact (improved onion seeds).

Economical impact of (improved onion seeds) options	Frequency	%
early production	90	45
resistance of insects	12	06
high productivity	98	49
Total	200	100

Source: Field Survey, 2014

Table 4.1.29 Shows that 100 % of the respondent's considered that improved onion seeds have economical impact as mentioned by options selection percentages.

Farmer Views towards Improved Onion Seeds

Table (4.1.30) Distribution of Respondents according to their positive or negative views on improved onion seeds varieties

Respondents positive negative views with options given	Frequency	%
Complicate	145	72.5
sources of new diseases communicable	006	03
not storable	038	19
Others	011	05.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.30 Shows that 94.5 % of the respondent's have negative views towards improved onion seeds. And 5.5% mentioned others.

Impact of the project activities

Table (4.1.31) Distribution of Respondents according to their benefited from project previous activities.

benefited from project previous activities by Yes or No?	Frequency	%
Yes	136	68
No	064	32
Total	200	100

Source: Field Survey, 2014

Table 4.1.31 Shows that 68% of the respondents benefited from the previous project training. Except 32% said No?

Alternatives given if the answer is Yes?

Table 4.1.32 Distribution of Respondents according to their answered Yes as a priority for the previous benefited from project activities

Respondents benefited from previous project activities	Frequency	%
continuous training	089	44.5
join with field Demonstration activities	040	20
Suitable Agricultural inputs Availability in time	039	19.5
Not effective the project activities	024	12
Others	008	04
Total	200	100

Source: Field Survey, 2014

Table 4.1.32 Shows that 84 % of the respondent's have benefited from previous project activities. Except 16% mentioned not effective the project activities with others.

Ability to transfer knowledge received without the project intervention

Table (4.1.33) Distribution of Respondents according to their ability to transfer this skills & knowledge received without project intervention for the project.

Ability to transfer this skills & knowledge received without project intervention either answered Yes, No or Others?	Frequency	%
Yes	131	65.5
No	026	13
some how	034	17
not at all	009	04.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.33 Shows that 65.5% respondent's have Ability to transfer this skills & knowledge received without the intervention. For other farmers without project intervention. Except 34.5% said no, somehow and not at all.

Easy to deal with the improved seeds by answered Yes?

Table (4.1.34) Distribution of Respondents according to their ability to deal with onion improved seeds.

Ability to deal with the onion improved seeds either Yes? or No?	Frequency	%
Yes	164	82
No	036	18
Total	200	100

Source: Field Survey, 2014

Table 4.1.34 Shows that 82 % of the respondent's have ability to deal with the onion improved seeds. Except 18% did not.

Options for the deal with improved onion seeds?

Table (4.1.35) Distribution of Respondents according to their interest to deal with improved onion seeds.

Respondents options given (improved onion seeds)	Frequency	%
Easy and available locally & seasonally	086	43
accepted locally	041	20.5
Suitable to store	008	04
the varieties not accepted	019	09.5
others	046	23
Total	200	100

Source: Field Survey, 2014

Table 4.1.35 Shows that 67.5 % of the respondent's have interest to deal with improved onion seeds. Except 32.5%.because they said varieties not accepted with others.

Extension unit Established in The Area (villages)

Table (4.1.36) Distribution of Respondents according to their knowledge about the extension unit Established in the area.

Respondents by Knowledgeable of extension unit / area either Yes or No?	Frequency	%
Yes	111	55.5
No	089	44.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.36 Shows that 52.5 % of the respondent's Respondents were answered with Yes?. Except 44.5% they answered with No?.

In numbers If Yes? How much Field agents covered the unit area?

Table (4.1.37) Distribution of Respondents according to their knowledge about the real numbers of the Field Agent / extension unit in the area

Number of Field Agent / extension unit in the area (villages)	Frequency	%
One field Agent	146	73
Tow	024	12
Three	013	06.5
more than four	017	08.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.37 Shows that 73% of the respondent mentioned that only one field agent /each extension unit in the area. Except 27% mentioned more than one.

Estimation of Villages Numbers Covered by Field Agent Supervision?

Table (4.1.38) Distribution of Respondents according to their knowledge about the real number of villages covered by the field agent /extension unit / area.

Field Agent Available Number /extension unit / area	Frequency	%
1-2 villages	120	60
3-4 villages	018	09
5-6 villages	006	03
more than 6	056	28
Total	200	100

Source: Field Survey, 2014

In table 4.1.38 Shows that 60% of the respondent's mentioned that only one to two field agent available /each extension unit covered, one to two villages. Except 40% for more than three.

Communication Channels in cause of accessibility

Table (4.1.39) Distribution of Respondents according to their knowledge about the Communication Channels accessible and used

Communication Channels used either Yes or No?	Frequency	%
Yes	110	55
No	090	45
Total	200	100

Source: Field Survey, 2014

Table 4.1.39 Shows that 55% of the respondents answered with Yes? they were knowledgeable about the Communication Channels accessible. Except 45% answered with No?.

Options for Communication Channels Accessible?

Table (4.1.40) Distribution of Respondents according to their knowledge on the exact Communication Channels used by their common interests

Communication Channels accessible used	Frequency	%
written messages	101	50.5
field visits	041	20.5
frequent office visits	014	07
others	044	22
Total	200	100

Source: Field Survey, 2014

Table 4.1.40 Shows that 78% of the respondents were motioned that Communication Channels accessibility used. Except 22 % mentioned others.

Options for effective Communication Channels to improved skills & knowledge

Table (4.1.41) Distribution of Respondents according to their skills & knowledge improved with effective Communication Channels used.

Effective Communication Channels used to improved skills & knowledge	Frequency	%
training	082	41
field visit	039	19.5
office visits	017	08.5
no effective methods available	056	28
others	006	03
Total	200	100

Source: Field Survey, 2014

Table 4.1.41 Shows that 69% of the respondents said that their skills and knowledge improved through the effective Communication Channels used. Except 31% said others.

Options for the Progress of Onion production by Area

Table (4.1.42) Distribution of Respondents according to their knowledge about the Progress of Onion production in the area

Options for Onion production by area either Yes or No?	Frequency	%
Yes	191	95.5
No	009	04.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.42 Shows that 95.5% of the respondents said Yes? for Progress of Onion production by area. Except 4.5% said No?.

Suitable soil properties with other factors to facilitate onion growing

Table (4.1.43) Distribution of Respondents according to their knowledge about suitable soil properties with other factors to facilitate onion growing.

Suitable soil properties which facilitate onion growing	Frequency	%
suitable soil for onion production	055	27.5
long life experience	023	11.5
inclusive project activities	090	45
trade value of products	032	16
Total	200	100

Source: Field Survey, 2014

Table 4.1.43 Shows that 45% of the respondents said they were knowledge about suitable soil properties with other factors that facilitate onion growing. In addition to 55% mentioned others.

Accessibility of Roads Situation by Area

Table (4.1.44) Distribution of Respondents according to their knowledge about roads situation accessibility or not accessible by area.

Roads situation Accessibility by area either Yes or No?	Frequency	%
Yes	045	22.5
No	155	77.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.44 Shows that 77.5% of the respondents answered by No? with 22.5% said Yes? for roads situation accessibility. This indication reflect that due to the diminishing of the project activities from 1996 and the present Darfur situation there is no rehabilitation done for rural villages feeder roads.

Options accessibility of roads answered by No?

Table (4.1.45) Distribution of Respondents according to their knowledge roads situation not accessible by area.

options for roads situation not accessible	Frequency	%
more valleys	062	31
Bad road	023	11.5
some how	019	09.5
long distance	012	06.0
scarcity of transports	032	16
Others	052	26
Total	200	100

Source: Field Survey, 2014

Table 4.1.45 Shows that 74% of the respondents said roads situation not accessible. And 26% said others. This result shows that the diminishing of the project services due to fund limitation and insecurity.

Levels Social Services Situation by Area:

Table (4.1.46) Distribution of Respondents according to their knowledge about social services situation by area consists of: Water, health and education, (W H E)?

Level Social services situation in the area (W, H, and E)	Frequency	%
Excellent	023	11.5
Good	058	29
Below acceptable	119	59.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.46 Shows that 59.5% of the respondents said social services situation below acceptable, refer to circumstance of internally displace persons (IDPs), in camps with conceive more people together with lack of services. And 40.5% they said excellent and good.

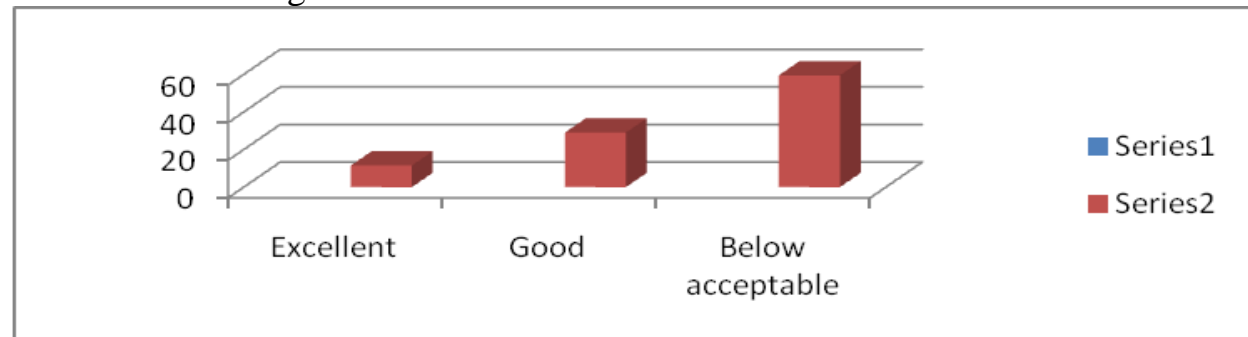


Figure 8 represent respondents by Levels of Social Services Acceptable

Area population Size Standard

Table (4.1.47) Distribution of Respondents according to their knowledge about population size by area.

population size standard by area	Frequency	%
So high	096	48
High	038	19
Medium	066	33
Total	200	100

Source: Field Survey, 2014

Table 4.1.47 shows that 67% of the respondents said their knowledge of population size standard by is range between so high and high. against medium by 33%.

Households Estimation by Area

Table (4.1.48) Distribution of Respondents according to their knowledge about Households number in the area

Their knowledge about Households Estimation by Area	Frequency	%
less than 1000 individuals	029	14.5
1001 - 1200 individuals	005	02.5
1201 - 1300 individuals	002	01.0
1301 - 1500 individuals	001	00.5
more than 1501 individuals	163	81.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.48 shows that 81.5% of the respondents said their knowledge about Households by area is more than 1500 individuals. And 18.5% between 1300 and less than 1000.

Education Increase or Decrease by Area

Table (4.1.49) Distribution of Respondents according to their knowledge about the education increase or decrease in the area

Education increase or decrease in the area	Frequency	%
increase	192	96
decrease	008	04
Total	200	100

Source: Field Survey, 2014

Table (4.1.49) shows that 96% of the respondents said their knowledge about the education increased. And 4% answered with decrease. This results shows the variation between the pass in villages and the present time in the IDPs Camps Under NGOs assistance.

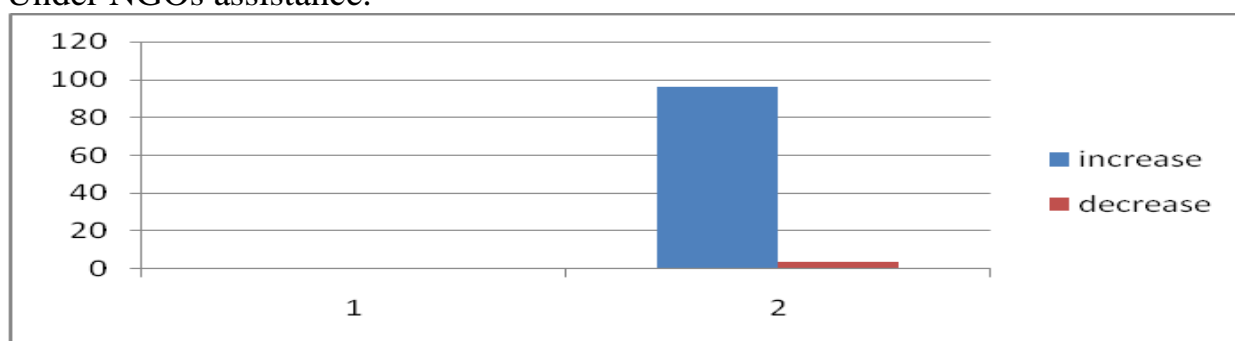


Figure 9 represent respondents by Levels of education increase or decrease by area. The result shows the highest education level % by increased, due to extra services given by INGOs and the Gov in secure areas and all respondents were aware enough with education bebenefits.

Options for Education decrease

Table (4.1.50) Distribution of Respondents according to their knowledge about the education was decrease.

Options of Education Decrease (Reasons)	Frequency	%
displaced situation	119	59.5
increase of the education cost	013	06.5
lack of work opportunity	005	02.5
others	063	31.5
Total	200	100

Source: Field Survey, 2014

Table 4.50 shows that 68.5% of the respondents said their knowledge about the education decrease. And 31.5% said others. It is the reality for rural community in urban society to face the same challenges in towns situation.

The Community Background on Agricultural innovations by Area.

Table (4.1.51) Distribution of Respondents according to their knowledge and background about community by area their practice dependent on agricultural innovations Yes or No?

Agricultural practices Dependent on innovations either Yes or No?	Frequency	%
Yes	160	80
No	040	20
Total	200	100

Source: Field Survey, 2014

Table 4.1.51 shows that 80% of the respondents said their knowledge and background about the area community practices it is depend completely on innovations except 20% said negative views.

Options About Agricultural Innovations knowledge by Area

Table (4.1.52) Distribution of Respondents according to their knowledge About Agricultural Innovations knowledge by Area.

Agricultural Innovations knowledge by Area	Frequency	%
fertilization and insecticide used	055	27.5
improved seeds treated	054	27
animal traction tools used	079	39.5
advanced irrigation tools introduced	011	05.5
not dependent on agricultural innovation inputs	001	0.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.52 shows that 99.5% of the respondents said their knowledge and background about the area community practices dependent on agricultural innovations. And .5% did not.

Farmer's recommended Chose's during field survey:

Recommendation N01 (Improved seeds needed)

Table (4.1.53) Distribution of Respondents according to their knowledge about Agricultural Innovations suggested or recommend with three choices (Improved seeds-1)

Improved (Bafteam and America Onion seeds)	Frequency	%
non	085	42.5
Selection chose for improved onion seeds (No1)	115	57.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.53 shows that 57.5% of the respondents Recommended that improved seeds it's the priority mainly (Bafteam Onion seeds). And 42.5% not recommended.

Recommendation No 2 (Irrigation Tools Needed)

Table (4.1.54) Distribution of Respondents according to their knowledge about Agricultural Innovations to suggest or recommend with three choices (Irrigation tools -2)

Improved (irrigation tools)	Frequency	%
non	97	48.5
irrigation tools	103	51.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.55 shows that 51.5% of the respondents Recommended that improved irrigation tools are the priority. And 48.5% not recommended.

Recommendation No 3 (Cultivation Tools needed)

Table (4.1.54) Distribution of Respondents according to their knowledge about Agricultural Innovations to suggest or recommend with three choices (Agricultural Machinery tools and Insecticide -3)

Agricultural Machinery tools and Insecticide -3	Frequency	%
non	017	08.5
Agricultural Machinery tools and Insecticide	183	91.5
Total	200	100

Source: Field Survey, 2014

Table 4.1.55 shows that 91.5% of the respondents recommended that improved Agricultural Machinery tools and Insecticide are the priority. 8.5% not recommended.

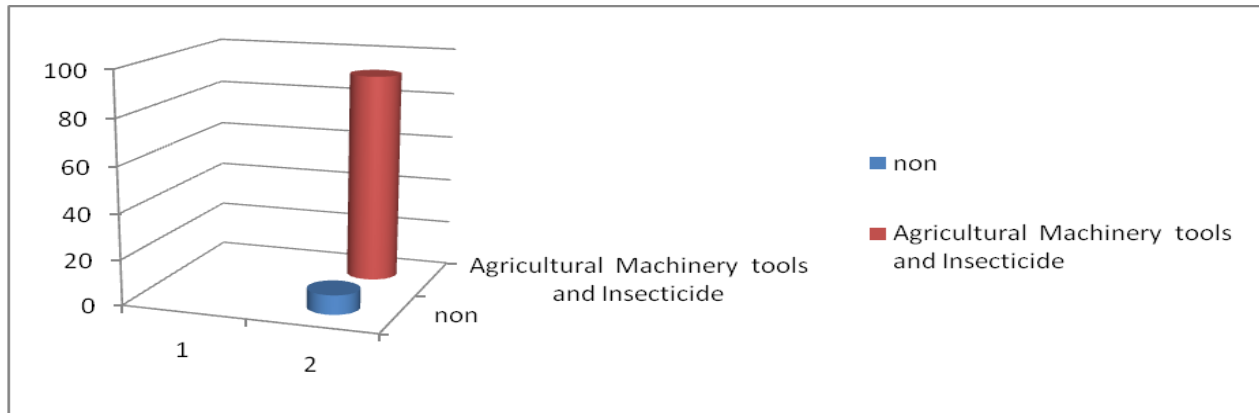


Figure 10 represent respondents by Agricultural Innvations

Chi-Square Test Tables

4-2 Chi-square test for Personal Characteristics Chi-Square test was used to test significant differences between respondent's characteristics and the variables in different project activities.

Table 4-2-1 Chi-square test for the respondents gender participation between Locality in the state level

Gender			Localities			Total	Asymp. Sig.
			Zalingei	Garsila	Nyertete		
male	Count	66	38	41	145	0.096	
	% within Gender	45.5%	26.2%	28.3%	100.0%		
	% within locality	66.0%	76.0%	82.0%	72.5%		
female	Count	34	12	9	55		
	% within Gender	61.8%	21.8%	16.4%	100.0%		
	% within locality	34.0%	24.0%	18.0%	27.5%		
Total	Count	100	50	50	200		
	% within Gender	50.0%	25.0%	25.0%	100.0%		
	% within State	100.0%	100.0%	100.0%	100.0%		

Source: Data analysis

level of sig= 0.05

According to table 4-2-1 there was no association between gender participation in the project and locality at Chi-Square level of 0.05

Table 4-2-2 Chi-square test for the respondents according to their Age Deference's in participation per Locality in the state level

Age/years		Localities				Total	Asymp. Sig.
		Zalingei	Garsila	Nyerte			
18 - 25	Count	11	6	3	20	0.017	
	% within Age \year	55.0%	30.0%	15.0%	100.0%		
	% within locality	11.0%	12.0%	6.0%	10.0%		
25-32	Count	30	16	4	50		
	% within Age \year	60.0%	32.0%	8.0%	100.0%		
	% within locality	30.0%	32.0%	8.0%	25.0%		
32-39	Count	22	15	12	49		
	% within Age \year	44.9%	30.6%	24.5%	100.0%		
	% within locality	22.0%	30.0%	24.0%	24.5%		
39- 46	Count	19	6	17	42		
	% within Age \year	45.2%	14.3%	40.5%	100.0%		
	% within locality	19.0%	12.0%	34.0%	21.0%		
above 46	Count	18	7	14	39		
	% within Age \year	46.2%	17.9%	35.9%	100.0%		
	% within locality	18.0%	14.0%	28.0%	19.5%		
Total		Count	100	50	50	200	
		% within Age \year	50.0%	25.0%	25.0%	100.0%	
		% within State	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-2-2 there was association between age by locality at Chi-Square level of 0.05. But the productive age range between 25-46 years as a period of duration for personal contribution by their localities.

Table 4-2-3 Chi-square test for the respondents according to their Education levels in participation by Locality in the state level

		Education level		Localities			Total	Asymp. Sig.
				Zalingei	Garsila	Nyertete		
		illiterate	Count	18	5	1	24	0.189
			% within literacy	75.0%	20.8%	4.2%	100.0%	
			% within locality	18.0%	10.0%	2.0%	12.0%	
	Khalwa	Count	25	11	18	54		
		% within non formal	46.3%	20.4%	33.3%	100.0%		
		% within locality	25.0%	22.0%	36.0%	27.0%		
		formal education	Count	36	21	20	77	
			% within formal education	46.8%	27.3%	26.0%	100.0%	
			% within locality	36.0%	42.0%	40.0%	38.5%	
		university	Count	19	12	11	42	
			% within university	45.2%	28.6%	26.2%	100.0%	
			% within locality	19.0%	24.0%	22.0%	21.0%	
		post-graduate	Count	2	1	0	3	
			% within post graduate	66.7%	33.3%	.0%	100.0%	
			% within locality	2.0%	2.0%	.0%	1.5%	
Total			Count	100	50	50	200	
			% within education	50.0%	25.0%	25.0%	100.0%	
			% within State	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-2-3 there was no association between education levels by locality at Chi-Square level of 0.05. But education variation was observed the deference's between the three sectors.

Table 4-2-4 Chi-square test for the respondents according to their marital status in participation per Locality in the state level

		Social Status	Localities			Total	Asymp. Sig.
			Zaling ei	Garsila	Nyert ete		
	single	Count	13	13	7	33	0.175
		% within social status	39.4%	39.4%	21.2%	100.0%	
		% within locality	13.0%	26.0%	14.0%	16.5%	
	married	Count	5	0	1	6	
		% within social status	83.3%	.0%	16.7%	100.0%	
		% within locality	5.0%	.0%	2.0%	3.0%	
	divorced	Count	74	35	41	150	
		% within social status	49.3%	23.3%	27.3%	100.0%	
		% within locality	74.0%	70.0%	82.0%	75.0%	
	widow	Count	7	1	1	9	
		% within social status	77.8%	11.1%	11.1%	100.0%	
		% within locality	7.0%	2.0%	2.0%	4.5%	
	husband absence	Count	1	0	1	1	
		% within social status	100.0%	.0%	100.0%	100.0%	
		% within locality	1.0%	.0%	.5%	.5%	
Total		Count	100	50	50	200	
		% within social status	50.0%	25.0%	25.0%	100.0%	
		% within State	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-2-4 there was no association between social status by locality at Chi-Square level of 0.05. Observed divorced factor with the highest % by Localities, it shows the acceptable results for the IDPs Circumstances.

Table 4-2-5 Chi-square test for the respondents according to their marital status in participation by Locality in the state level

		Localities				Total	Asymp. Sig.
Type of Work		Zalingei	Garsilla	Nyerte			
	farmer	Count	60	32	34	126	0.566
		% within Type of Work	47.6%	25.4%	27.0%	100.0%	
		% within Locality	60.0%	64.0%	68.0%	63.0%	
	pastoralist	Count	3	4	2	9	
		% within Type of Work	33.3%	44.4%	22.2%	100.0%	
		% within Locality	3.0%	8.0%	4.0%	4.5%	
	industry	Count	2	2	1	5	
		% within Type of Work	40.0%	40.0%	20.0%	100.0%	
		% within Locality	2.0%	4.0%	2.0%	2.5%	
	handcraft	Count	3	0	0	3	
		% within Type of Work	100.0%	.0%	.0%	100.0%	
		% within Locality	3.0%	.0%	.0%	1.5%	
	employee	Count	32	12	13	57	
		% within Type of Work	56.1%	21.1%	22.8%	100.0%	
		% within Locality	32.0%	24.0%	26.0%	28.5%	
Total		Count	100	50	50	200	
		% within Type of Work	50.0%	25.0%	25.0%	100.0%	
		% within Locality	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-2-5 There was no association between types of works by locality at Chi-Square level of 0.05.

As observed the highest % for the types of work in the field of farmer and employee by Locality.

Table 4-2-6 Chi-square test for the respondents according to the Agricultural Land Owning per Locality in the state level

Agricultural Land Tenure System			Localities			Total	Asymp. Sig.
			Zalingei	Garsila	Nyertete		
	owner	Count	45	21	23	89	0.244
		% within agricultural land	50.6%	23.6%	25.8%	100.0%	
		% within locality	45.0%	42.0%	46.0%	44.5%	
	rental	Count	41	24	26	91	
		% within agricultural land	45.1%	26.4%	28.6%	100.0%	
		% within locality	41.0%	48.0%	52.0%	45.5%	
	grant	Count	1	1	0	2	
		% within agricultural land	50.0%	50.0%	.0%	100.0%	
		% within locality	1.0%	2.0%	.0%	1.0%	
	cropping share	Count	13	4	1	17	
		% within agricultural land	76.5%	17.6%	5.9%	100.0%	
		% within locality	13.0%	8.0%	2.0%	9.5%	
Total		Count	100	50	50	200	
		% within agricultural land	50.0%	25.0%	25.0%	100.0%	
		% within State	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-2-6 there was no association between agricultural land tenure system by locality at Chi-Square level of 0.05. What observed is land tenure system and rental land, which was characterize the IDPs situation they were far from their home land.

4-3 Chi-square test for some project activities

Table 4-3-7 Chi-square test for the respondents according to the idea about improved onion seeds by Locality in the state level.

Gender by project activities			Idea about improved onion seeds		Total	Asymp. Sig.
			Yes?	No?		
male	Count		117	28	145	0.856
	% within Gender		80.7%	19.3%	100.0%	
	% within Idea about Improved onion seeds		72.2%	73.7%	72.5%	
female	Count		45	10	55	
	% within Gender		81.8%	18.2%	100.0%	
	% within Idea about Improved onion seeds		27.8%	26.3%	27.5%	
Total		Count	162	38	200	
		% within Gender	81.0%	19.0%	100.0%	
		% within State level	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-7 There was no association between gender by project activities an idea about improved onion seeds at Chi-Square level of 0.05. According to gender successful analysis (GSA), male and female have an idea about improved onion seeds by Locality in the state level as mentioned yes or no?.

Table 4-3-8 Chi-square test for the respondents according to the Age and Idea about improved onion seeds by Locality in the state level

Idea about improved onion seeds		Age by years					Total	Asymp. Sig.
		18 - 25	26-33	34-41	42-49	above 50		
Yes	Count	13	39	37	38	35	162	0.062
	% within idea about improved onion seeds	8.0%	24.1%	22.8%	23.5%	21.6%	100.0%	
	% within Age by year	65.0%	78.0%	75.5%	90.5%	89.7%	81.0%	
No	Count	7	11	12	4	4	38	
	% within idea about improved onion seeds	18.4%	28.9%	31.6%	10.5%	10.5%	100.0%	
	% within Age by year	35.0%	22.0%	24.5%	9.5%	10.3%	19.0%	
Total		Count	20	50	49	42	39	200
		% within idea about improved onion seeds	10.0%	25.0%	24.5%	21.0%	19.5%	100.0%
		% within State level	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Data analysis

level of sig= 0.05

According to table 4-3-8 There was no association between idea about improved onion seeds age at Chi-Square level of 0.05. Furthermore the respondents according to the Age and Idea about improved onion seeds by Locality in the state level. Age level was not barrier between the respondents to be aware about improved onion seeds Locality in the state level.

Table 4-3-9 Chi-square test for the respondents according to their Education Level and Idea about improved onion seeds by per Locality in the state level

Education Level		idea of improved onion seeds			Total	Asymp. Sig.
		yes	No			
illiterate	Count	20	4	24	0.051	
	% within Education Level	83.3%	16.7%	100.0%		
Khalwa	Count	49	5	54		
	% within Education Level	90.7%	9.3%	100.0%		
formal education	Count	63	14	77		
	% within Education Level	81.8%	18.2%	100.0%		
university	Count	28	14	42		
	% within Education Level	66.7%	33.3%	100.0%		
post-graduate	Count	2	1	3		
	% within Education Level	66.7%	33.3%	100.0%		
Total	Count	162	38	200		
	% within Education Level	81.0%	19.0%	100.0%		
	% within State Level	100.0%	100.0%	100.0%		

Source: Data analysis

level of sig= 0.05

According to table 4-3-9 There was no association between education levels an idea of improved onion seeds at Chi-Square level of 0.05. Respondents to whom were educated either by Khalwa or formal education they are well committed with the idea of improved onion seeds. Due to their relation with farm practice against University and post graduate respondents.

Table 4-3-10 Chi-square test for the respondents according to their Social Status and Idea about improved onion seeds by Locality in the state level

Social status		idea of improved onion seeds		Total	Asymp. Sig.
		yes	No		
single	Count	20	13	33	0.032
	% within social status	60.6%	39.4%	100.0%	
	% within idea about improved seeds	12.3%	34.2%	16.5%	
married	Count	6	0	6	
	% within social status	100.0%	.0%	100.0%	
	% within idea about improved seeds	3.7%	.0%	3.0%	
divorced	Count	126	24	150	
	% within social status	84.0%	16.0%	100.0%	
	% within idea about improved seeds	77.8%	63.2%	75.0%	
widow	Count	8	1	9	
	% within social status	88.9%	11.1%	100.0%	
	% within idea about improved seeds	4.9%	2.6%	4.5%	
husband absence	Count	2	0	2	
	% within social status	100.0%	.0%	100.0%	
	% within idea about improved seeds	1.2%	.0%	1%	
Total	Count	162	38	200	
	% within social status	81.0%	19.0%	100.0%	
	% within idea about improved seeds	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-10 there was association between social status and idea about improved seeds at Chi-Square level of 0.05. Respondents to whom were divorced their idea of improved onion seeds, better than other social status. Due to their circumstances, low income and need gap to fulfill social service requirement.

Table 4-3-11 Chi-square test for the respondents according to their Land owning and Idea about improved onion seeds by Locality in the state level

Agricultural Land Tenure System			Idea about improved onion seeds		Total	Asymp. Sig.
			yes	No		
owner	Count		73	16	89	0.205
	% within Agricultural Land		82.0%	18.0%	100.0%	
	% within Idea about improved onion seeds		45.1%	42.1%	44.5%	
rental	Count		75	16	91	
	% within Agricultural Land		82.4%	17.6%	100.0%	
	% within Idea about improved onion seeds		46.3%	42.1%	45.5%	
grant	Count		1	1	2	
	% within Agricultural Land		50.0%	50.0%	100.0%	
	% within Idea about improved onion seeds		.6%	2.6%	1.0%	
cropping share	Count		13	5	18	
	% within Agricultural Land		76.5%	23.5%	100.0%	
	% within Idea about improved onion seeds		8.0%	10.5%	8.5%	
Total	Count		162	38	200	
	% within Agricultural Land		81.0%	19.0%	100.0%	
	% within Idea about improved onion seeds		100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-11 there was no association between Agricultural Land tenure system an idea about improved onion seeds at Chi-Square level of 0.05. Owning land and rental by respondent was the highest % against grant and cropping share.

Table 4-3-12 Chi-square test for the respondent's participation according to Gender and the previous training by project during the project cycle.

Gender			previous project training			Total	Asymp. Sig.
			Not at all (N/A)	yes	No		
	male	Count	8	48	89	145	0.231
		% within Gender	5.5%	33.1%	61.4%	100.0%	
		% within previous project training	57.1%	78.7%	71.2%	72.5%	
	female	Count	6	13	36	55	
		% within Gender	10.9%	23.6%	65.5%	100.0%	
		% within previous project training	42.9%	21.3%	28.8%	27.5%	
Total	Count	14	61	125	200		
	% within Gender	7.0%	30.5%	62.5%	100.0%		
	% within previous project training	100.0%	100.0%	100.0%	100.0%		

Source: Data analysis

level of sig= 0.05

According to table 4-3-12 There was no association between gender previous project training at Chi-Square level of 0.05. Then the previous project training participation by gender was not well coverage, confirm the case of IDPs.

Table 4-3-13 Chi-square test for the respondent's participation according to Age level and the previous training by project during the project cycle.

Age/ year		Participation within project previous training				Total	Asymp. Sig.
		Not at all (N/A)	yes	No			
18 - 25	Count	3	6	11	20	0.019	
	% within age per year	15.0%	30.0%	55.0%	100.0%		
	% within previous project training	21.4%	9.8%	8.8%	10.0%		
26-33	Count	4	7	39	50		
	% within age per year	8.0%	14.0%	78.0%	100.0%		
	% within previous project training	28.6%	11.5%	31.2%	25.0%		
34-41	Count	4	12	33	49		
	% within age per year	8.2%	24.5%	67.3%	100.0%		
	% within previous project training	28.6%	19.7%	26.4%	24.5%		
42-49	Count	1	17	24	42		
	% within age per year	2.4%	40.5%	57.1%	100.0%		
	% within previous project training	7.1%	27.9%	19.2%	21.0%		
above 50	Count	2	19	18	39		
	% within age per year	5.1%	48.7%	46.2%	100.0%		
	% within previous project training	14.3%	31.1%	14.4%	19.5%		
Total	Count	14	61	125	200		
	% within age per year	7.0%	30.5%	62.5%	100.0%		
	% within previous project training	100.0%	100.0%	100.0%	100.0%		

Source: Data analysis

level of sig= 0.05

According to table 4-3-13 there was association between Age Participation within project previous training at Chi-Square level of 0.05. Respondent's participation according to Age level and the previous training by project during the project cycle consist the Age range between 26-49 Years which are the productive age level.

Table 4-3-14 Chi-square test for the Village Number covered and Extension Units by Area

Villages/covered			Extension Units by Area			Total	Asymp. Sig.
			Not at all (N/A)	Yes	No		
village	Count	4	28	85	117	0.000	
	% within Villages under coverage	3.4%	24.2%	72.4%	100.0%		
	% within Extension Unit per Area	80.0%	25.5%	96.6%	58.0%		
1-2 Villages	Count	1	2	2	5		
	% within Villages under coverage	25.0%	50.0%	50.0%	100.0%		
	% within Extension Unit per Area	20.0%	1.9%	1.9%	2.0%		
3-4 Villages	Count	1	17	0	18		
	% within Villages under coverage	.0%	94.4%	5.6%	100.0%		
	% within Extension Unit per Area	.0%	16.0%	1.1%	9.0%		
5-6 Villages	Count	0	6	0	6		
	% within Villages under coverage	.0%	100.0%	.0%	100.0%		
	% within Extension Unit per Area	.0%	5.7%	.0%	3.0%		
More than 6 villages	Count	0	54	0	54		
	% within Villages under coverage	.0%	96.3%	3.7%	100.0%		
	% within Extension Unit per Area	.0%	51%	2.3%	27.0%		
Total	Count	6	107	87	200		
	% within Villages under coverage	2.5%	54.0%	43.5%	100.0%		
	% within Extension Unit per Area	100.0%	100.0%	100.0%	100.0%		

Source: Data analysis

level of sig= 0.05

According to table 4-3-13 there was very strong association between villages covered and extension units by area at Chi-Square level of 0.05. From the result observed that presence of extension is related with villages covered, but there is no coverage due to farmer presence in IDPs camps not in villages and reduction of project extension services.

Table 4-3-14 Chi-square test for the regular field visits by Field Agent and Numbers of Field Agents by Unit

Regular field visits by Field Agent			Numbers Field Agents by Unit					Total	Asymp. Sig.
			Yes	one	two	three	more than four		
Field Agent is A viable from one to -more than four	Count		16	7	1	1	1	26	0.002
	% within regular field visits		61.5%	26.9%	3.8%	3.8%	3.8%	100.0%	
	% within if yes? how many field agent per unit		15.4%	16.7%	4.2%	7.7%	5.9%	13.0%	
once in week	Count		9	3	6	1	2	21	
	% within regular field visits		42.9%	14.3%	28.6%	4.8%	9.5%	100.0%	
	% within if yes? how many field agent per unit		8.7%	7.1%	25.0%	7.7%	11.8%	10.5%	
once in month	Count		6	12	5	5	6	34	
	% within regular field visits		17.6%	35.3%	14.7%	14.7%	17.6%	100.0%	
	% within if yes? how many field agent per unit		5.8%	28.6%	20.8%	38.5%	35.3%	17.0%	
rarely	Count		32	13	9	2	4	60	
	% within regular field visits		53.3%	21.7%	15.0%	3.3%	6.7%	100.0%	
	% within if yes? how many field agent per unit		30.8%	31.0%	37.5%	15.4%	23.5%	30.0%	
never	Count		41	7	3	4	4	59	
	% within regular field visits		69.5%	11.9%	5.1%	6.8%	6.8%	100.0%	
	% within if yes? how many field agent per unit		39.4%	16.7%	12.5%	30.8%	23.5%	29.5%	
Total	Count		104	42	24	13	17	200	
	% within regular field visits		52.0%	21.0%	12.0%	6.5%	8.5%	100.0%	
	% within if yes? how many field agent per unit		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-14 there was strong association between regular field visits Numbers Field Agents by Unit at Chi-Square level of 0.05. Due to the diminishing of the project activities, there was never field visits a viable rarely.

Table 4-3-15 Chi-square test for the respondent's participation according to Age level and Communication channels

Age /Year		Communication Channels available				Total	Asymp. Sig.
		R.Mmessages	F.V	O.V	Others		
18 - 25	Count	0	13	7	0	20	0.291
	% within Age per Year	.0%	65.0%	35.0%	.0%	100.0%	
	% within Communication Channels a viable	.0%	12.3%	8.0%	.0%	10.0%	
26-33	Count	0	26	22	2	50	
	% within Age per Year	.0%	52.0%	44.0%	4.0%	100.0%	
	% within Communication Channels a viable	.0%	24.5%	25.0%	100.0%	25.0%	
34-41	Count	1	21	27	0	49	
	% within Age per Year	2.0%	42.9%	55.1%	.0%	100.0%	
	% within Communication Channels a viable	25.0%	19.8%	30.7%	.0%	24.5%	
	% of Total	.5%	10.5%	13.5%	.0%	24.5%	
42- 49	Count	1	22	19	0	42	
	% within Age per Year	2.4%	52.4%	45.2%	.0%	100.0%	
	% within Communication Channels a viable	25.0%	20.8%	21.6%	.0%	21.0%	
above 46 years	Count	2	24	13	0	39	
	% within Age per Year	5.1%	61.5%	33.3%	.0%	100.0%	
	% within Communication Channels a viable	50.0%	22.6%	14.8%	.0%	19.5%	
Total	Count	4	106	88	2	200	
	% within Age per Year	2.0%	53.0%	44.0%	1.0%	100.0%	
	% within Communication Channels a viable	100.0%	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-15 there was no association between Age communication Channels available at Chi-Square level of 0.05. The result shows that the Age range between 26-49 Years were well committed with communication channels, and they are on farming practice.

Table 4-3-16 Chi-square test for the respondent's participation according to Gender and Communication channels

Gender			Communication Channels a viable				Total	Asymp. Sig.
			R.Mmessages	F.V	O.V	Others		
male	Count	3	76	64	2	145	0.848	
	% within Gender	2.1%	52.4%	44.1%	1.4%	100.0%		
	% within Communication Channels a viable	75.0%	71.7%	72.7%	100.0%	72.5%		
female	Count	1	30	24	0	55		
	% within Gender	1.8%	54.5%	43.6%	.0%	100.0%		
	% within Communication Channels a viable	25.0%	28.3%	27.3%	.0%	27.5%		
Total		Count	4	106	88	2	200	
		% within Gender	2.0%	53.0%	44.0%	1.0%	100.0%	
		% within Communication Channels a viable	100.0%	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-16 there was no association between gender and Communication Channels a available at Chi-Square level of 0.05. By gender observed that the respondents use field and office visits as a way of communication methods.

Table 4-3-17 Chi-square test for the respondent's participation according to Social Status and Communication channels a viable for the project?

	Social Status		Communication Channels available				Total	Asymp. Sig.
			R.Mmassages	F.V	O.V	Others		
	single	Count	0	15	17	1	33	0.510
		% within Social Status	.0%	45.5%	51.5%	3.0%	100.0%	
		% within Communication Channels a viable	.0%	14.2%	19.3%	50.0%	16.5%	
	married	Count	1	4	1	0	6	
		% within Social Status	16.7%	66.7%	16.7%	.0%	100.0%	
		% within Communication Channels a viable	25.0%	3.8%	1.1%	.0%	3.0%	
	divorced	Count	3	83	63	1	150	
		% within Social Status	2.0%	55.3%	42.0%	.7%	100.0%	
		% within Communication Channels a viable	75.0%	78.3%	71.6%	50.0%	75.0%	
	widow	Count	0	4	5	0	9	
		% within Social Status	.0%	44.4%	55.6%	.0%	100.0%	
		% within Communication Channels a viable	.0%	3.8%	5.7%	.0%	4.5%	
	husband absence	Count	0	1	1	0	2	
		% within Social Status	.0%	.0%	100.0%	.0%	100.0%	
		% within Communication Channels a viable	.0%	.0%	1.1%	.0%	.5%	
Total	Count	4	107	89	2	200		
	% within Social Status	2.0%	53.0%	44.0%	1.0%	100.0%		
	% within Communication Channels a viable	100.0%	100.0%	100.0%	100.0%	100.0%		

Source: Data analysis

level of sig= 0.05

According to table 4-3-17 there was no association between social status and communication channels available at Chi-Square level of 0.05. By social status observed that the divorced use field and office visits as a way of communication methods, because they were well committed to the farm.

Table 4-3-18 Chi-square test for the respondent's participation according Education level and Communication channels a viable for the project?

Education level		Communication Channels available					Total	Asymp. Sig.
		R.Mmessages	F.V	O.V	Others			
illiterate	Count	1	9	14	0	24	0.617	
	% within Education level	4.2%	37.5%	58.3%	.0%	100.0%		
	% within Communication Channels a viable	25.0%	8.5%	15.9%	.0%	12.0%		
Khalwa	Count	2	27	25	0	54		
	% within Education level	3.7%	50.0%	46.3%	.0%	100.0%		
	% within Communication Channels a viable	50.0%	25.5%	28.4%	.0%	27.0%		
formal education	Count	1	46	28	2	77		
	% within Education level	1.3%	59.7%	36.4%	2.6%	100.0%		
	% within Communication Channels a viable	25.0%	43.4%	31.8%	100.0%	38.5%		
university	Count	0	22	20	0	42		
	% within Education level	.0%	52.4%	47.6%	.0%	100.0%		
	% within Communication Channels a viable	.0%	20.8%	22.7%	.0%	21.0%		
post-graduate	Count	0	2	1	0	3		
	% within Education level	.0%	66.7%	33.3%	.0%	100.0%		
	% within Communication Channels a viable	.0%	1.9%	1.1%	.0%	1.5%		
Total	Count	4	106	88	2	200		
	% within Education level	2.0%	53.0%	44.0%	1.0%	100.0%		
	% within Communication Channels a viable	100.0%	100.0%	100.0%	100.0%	100.0%		

Source: Data analysis

level of sig= 0.05

According to table 4-3-13 there was no association between education levels and communication channels available by locality at Chi-Square level of 0.05. By education level observed that the respondents to whom were educated either Khalwa or formal education, use field and office visits as a way of communication methods to gain benefits.

Table 4-3-19 Chi-square test for the respondent's participation according Social Status and the project previous training during the project cycle.

Social Status		Previous project training attendance			Total	Asymp. Sig.	
		Not at all (N/A)	yes	No			
	single	Count	3	6	24	33	0.603
		% within Social Status	9.1%	18.2%	72.7%	100.0%	
		% within Previous project training attendance	21.4%	9.8%	19.2%	16.5%	
	married	Count	0	2	4	6	
		% within Social Status	.0%	33.3%	66.7%	100.0%	
		% within Previous project training attendance	.0%	3.3%	3.2%	3.0%	
	divorced	Count	10	51	89	150	
		% within Social Status	6.7%	34.0%	59.3%	100.0%	
		% within Previous project training attendance	71.4%	83.6%	71.2%	75.0%	
	widow	Count	1	1	7	9	
		% within Social Status	11.1%	11.1%	77.8%	100.0%	
		% within Previous project training attendance	7.1%	1.6%	5.6%	4.5%	
	husband absence	Count	0	1	1	2	
		% within Social Status	.0%	100.0%	.0%	100.0%	
		% within Previous project training attendance	.0%	1.6%	1.6%	1 %	
Total		Count	14	61	125	200	
		% within Social Status	7.0%	30.5%	62.5%	100.0%	
		% within Previous project training attendance	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-19 there was no association between social status and Previous project training attendance by locality at Chi-Square level of 0.05. The result shows that divorced

respondents participation, and the project previous training during the project cycle. Not fully committed for the previous project training, they were from different areas in IDPs Camp today. Table 4-3-20 Chi-square test for the respondent's participation according Social Status and the project previous training during the project cycle.

		Education Level	Previous project training attendance			Total	Asymp. Sig.
			Not at all (N/A)	yes	No		
	illiterate	Count	2	4	18	24	0.097
		% within Education Level	8.3%	16.7%	75.0%	100.0%	
		% within Previous project training attendance	14.3%	6.6%	14.4%	12.0%	
	Khalwa	Count	1	20	33	54	
		% within Education Level	1.9%	37.0%	61.1%	100.0%	
		% within Previous project training attendance	7.1%	32.8%	26.4%	27.0%	
	formal education	Count	10	24	43	77	
		% within Education Level	13.0%	31.2%	55.8%	100.0%	
		% within Previous project training attendance	71.4%	39.3%	34.4%	38.5%	
	university	Count	1	11	30	42	
		% within Education Level	2.4%	26.2%	71.4%	100.0%	
		% within Previous project training attendance	7.1%	18.0%	24.0%	21.0%	
	post-graduate	Count	0	2	1	3	
		% within Education Level	.0%	66.7%	33.3%	100.0%	
		% within Previous project training attendance	.0%	3.3%	.8%	1.5%	
Total		Count	14	61	125	200	
		% within Education Level	7.0%	30.5%	62.5%	100.0%	
		% within Previous project training attendance	100.0%	100.0%	100.0%	100.0%	

Source: Data analysis

level of sig= 0.05

According to table 4-3-13 there was no association between education levels and Previous project training attendance by locality at Chi-Square level of 0.05. The result shows that educated respondents participation, and the project previous training during the project cycle. Not fully committed for the previous project training, they were from different areas in IDPs Camps nowadays.

Chapter Five

Summary of Results, Conclusions and Recommendations

5.1 Summary of results:

The Study Shows That:

5.1.1 Descriptive analysis for personal characteristics of the respondents:

72.5% of the respondents were male and 27.5% were female. This indication revealed that the agricultural inputs cost was increased, concern with inputs export, land rent and tools cost. Which currently reduce female number.

61% of the respondents were formally educated, and 27% were (Khalwa) traditional method of education, while 12% were illiterate.

75% of the respondents were married and 16.5% were single, if compared with other parameters 3% were divorced, 4.5% were widows and 1% husband was absence.

63% of the respondents were farmers, 28.5% were employees and 7.5% were working in the other field of works like trading, industry and handicrafts.

49% of the respondents which their ages had series between 26-41 years.

On the other hand 19.5% of the respondents their ages are above 50 years which mean that their participation in the work was gradually back warded.

Others from 18-25 are youth with 10%.

44.5% of the respondents were land owners and 54.5% were land renters 10% shared between crops shared and grand (not to give anything for the land owner). only 1% from the 10% was Grander in land use to cultivate without any commitment to give something to the land owner.

From the study the results observed that most of the farmer were male, and the weakness in the agricultural services to be given equally not to create gender gap in development between men and women.

In addition to obstacles that face the agricultural extension services within the project area since Darfur crisis in 2003.

5.1.2 Descriptive analysis for the respondents in:

Adoption and Diffusion of Improved Onion Seeds options

81% of the respondents had an idea about improved onion seeds and 19% did not hear about it.

44% of the respondents their source of information about improved onion seeds were other neighbor_farmers and 33.5% heard from agricultural extension units. In addition to 22.5% represent other source of information like media, crop protection unit and other private sector.

43.5% of the respondents were heard the new information about improved onion seeds in the year (1976) which indicated the preparatory-stage of the project implementation period and 33% of the respondents in the second stage of the project cycle (1984). Others were representing 23.5% were aware about it in the other project stages due to the project long run from (1980-1996).

5.1.3 Descriptive analysis for the respondents in:

Participation in the previous Project Training

37.5% of the respondents participated and attended the project training, 62.5% were not trained.

74% of the respondents were trained inside the state, and 22% in Zalingei the head quarter of the project, just 4% outside the state.

79.5% of the respondents had received five times trainings, and 12.5% trained more than five times while 6% one to four, but 2% did not receive any training.

88% of the respondents have been trained for one week, 9% one month, month and half, but less than 0.5% one year trainings.

54% of the respondents said that their knowledge & skills have improved, 46 % not yet and it matches with 62.5% not trained respondents.

51.5% of the respondents said their agricultural land was increased due to knowledge and skills improvement, and 19.5% of the respondents said they were practice agricultural extension message and their production was increase. 65% of respondents were aware about campaign and they knew the benefit of it.

5.1.4 Descriptive analysis for the respondents that concern:

Their Awareness about Campaign Definition

63.5% of the respondents answered, the definition of campaign is diffusion of innovations knowledge 17% of the respondents, to avoid any corps risks and strengthens of the new knowledge diffusion and 19.5% said others.

65.5% of the respondents measured the campaign as a method of transfer of new technology to the beneficiaries. And 34.5% their views on campaign are, decrease of the crops risks and train beneficiaries on new agricultural tools.

60% of the respondents their feedback on the campaign was very good, except 40% range from good to somehow.

87% of the respondents said well that the campaign was loss of time; this point could mean that the package of the message used were not effective on their views.

9% represent those whom they said it is, misuse of resources and complicate production tools. The rest of 4% had no comments.

5.1.5 Descriptive analysis for the respondents regarding:

The Role of Field Agents in Adoption & Diffusion of new technology

61.5% of the respondents received field agents, field visits, against 38.5% who did not received.

40.5% of the respondents received field visits one per week and some month, 30% some times, but 29.5% did not at all.

87% of the respondents their views positive on improved onion seeds, 13% negative on improved on seeds compared with the indigenous onion seeds.

62% of the respondents knew well about the economic impact of onion improved seeds, with these elements, increase of production, insect's resistance and early production.

83% of the respondent's practices, the types of improved onion seeds called Bafteam, American improved onion seeds with 69% and Ballade 56% respectively.

84.5% of the respondents continue using the improved onion seeds against 15.5% who did not.

94% of the respondents were aware about the impact of the improved onion seeds due to early production and high productivity instead of 6% resistance to insects.

94.5% of the respondents had negative views about improved onion seeds due to its special treatments, sources of new diseases communicable and not storable in addition to 5.5% others of the respondents views, it compete the indigenous seeds.

68% of the respondents

5.1.6 Descriptive analysis for the respondents on how to measure:

The Impact of improved onion seeds

84% of the respondents showed how they benefited from the improved onion seeds: continuous training joined with field demonstration activities and Suitable Agricultural inputs availability in time with, 16% who reported ineffective project activities.

65.5% of respondents were capable to transfer this knowledge to others without the intervention of the project, 22.5% of respondents said, somehow to not at all and 13% of the respondents were not mentioned.

82% of respondents had ability to deal with the improved onion seeds.

67.5% of the respondents had background about improved onion seeds and mentioned that; it is easy to fulfill the need locally within the season, storage able and accepted locally, but 32.5% of said the variety did not accepted.

5.1.7 Descriptive analysis for the respondents on how they were:

Aware About The Impact of agricultural extension services

52.5% of the respondents agreed about the extension unit presences in their areas, reduction of extension unit minimized due to Darfur crisis. 44.5% represent those respondents who were residence in IDPs camp and not yet under extension services coverage.

73% of the respondents mentioned that the real number of field agents was one per agricultural extension unit, except 12% they said two per unit.

60% of respondents showed that 1-2 villages were covered by one field agent and this should reflect that some villages were displaced within (Darfur Conflict, 2003).

55% of the respondents are used communication channels against 45% who did not used due the Darfur recent circumstances.

78% of the respondents used this communication channels: written messages, field visits and frequent office visits.

60.5% of respondents mentioned that the effective communication channels used as followed: training and field visits, 8.5% office visits and 28% no effective methods available, 3% did not answer.

95.5% of respondents mentioned that, they Progress on production by improved Onion seeds in the project area.

84% of the respondents mentioned that the area is suitable for Onion production; long life experience and inclusive project activities were factors which facilitated onion practice in the project area and 16% mentioned trade value.

5.1.8 Descriptive analysis for the respondents on how they were:

Knowledgeable About social services and infrastructure in the project area

67% of the respondents mentioned that the population density in their areas ranged from very high to high, against 33% who said it was medium in density.

81.5% of the respondents mentioned that the number of households in their areas were above one thousand and half in the area of study.

96% of the respondents mentioned that education situation in the area were increased.

77.5% of the respondents mentioned that the feeder roads which linked the villages and towns were not accessible.

74% of the respondents mentioned roads were not accessible, due to: many valleys, Bad roads, long distance, and scarcity of transports.

59.5% of the respondents mentioned that the social services were blow acceptable services in the area of study.

66% of the respondents mentioned that education situation in the area decreased, due to displacement and 9% reasons to increase of education cost and lack of work opportunity.

80% of the respondents mentioned that their practices depend completely on innovations mainly on improved seeds.

95.5% of the respondents had knowledge and background about the community practice in the area which depends completely on innovations and according to this reality, respondents were said: fertilizers and insecticides, improved onion seeds treated, animal traction tools used and advanced irrigation tools were introduced.

5.1.9 Descriptive analysis for the respondents to mentioned there:

The Prioritize when they filled the Questionnaire form

57.5% of the respondents recommended for improved onion seeds, the variety Bafteam was requested.

51 % of the respondents recommended for irrigation tools as agricultural inputs was requested.

91.5% of the respondents recommended for Agricultural Machinery tools and Insecticides was a priority.

Test of Significance:

* According to table 4-2-1 there was no association between gender participation in the project by locality at Chi-Square level of 0.05

* According to table 4-2-2 there was association between age by locality at Chi-Square level of 0.05.

* According to table 4-2-3 there was no association between education levels by locality at Chi-Square level of 0.05.

* According to table 4-2-4 there was no association between social status by locality at Chi-Square level of 0.05.

* According to table 4-2-5 There was no association between types of works by locality at Chi-Square level of 0.05.

* According to table 4-2-6 there was no association between agricultural land tenure system by locality at Chi-Square level of 0.05.

* According to table 4-2-10 there was association between social status by idea about improved seeds at Chi-Square level of 0.05.

* According to table 4-2-13 there was very strong association between villages covered and extension units by area at Chi-Square level of 0.05.

5.3 Conclusion: Jebel Marra area as described and documented in many reports (FAO1968, Mohamed1997, and Adam1998) which diversity in climate, soil, crops, animals and other livelihoods activities for the community. The high massif of mountains modifies its climate and increases the amount of participation, particularly on western slopes. Rainfall normally occurs during may- September with more than 60% of the rain occurring July-August. The variation in the amount of the annual rainfall is very limited. Temperature decreases by approximately 6 C per 1000metres rise (FAO1968). The average maximum temperature is about 30C while the minimum is around 6 C (Mohamed1997). The importance of Jebel Marra from an ecological view and from the great potential resources it has, makes it a rich area for studies, tourism and development. The total area of Jebel Marra is estimated to be about 2000km². Jebel Marra lies within a plain of semi-desert with desert to the north. The distinctive feature of Jebel Marra is high volcanic mountain up to 3042 m.a.s.l giving better soil, lower temperature and higher rainfall than the arid and savanna zones around the mountain. Fur tribes and some other different ethnic groups of settled farmers and nomadic cattle and camel owners, who practice different land use types, inhabit Jebel Marra since long time. At present, about 0.5 million inhabit Jebel Marra. Their activities concentrated on agricultural development thorough construction of well-designed terraces that spread all over the agricultural land on the slopes. They have been practicing agro forestry for over 200 years. But vegetables growing was started traditionally with local varieties particularly for onions known as: (Foria & Falatia). And when the Jebel Marra project was inherit its experience introduced the new varieties named as (Bafteam & Amreaki) under the agricultural technology packages transfer supervised by agricultural extension services techniques and community participation approaches.

5.3 Recommendations:

Base on the findings of the study , the researcher proposed the following:

Recommendations for National Federal Ministry of Agriculture:

Integrated rural development projects. The projects of this type address production, economic infrastructure, and social services constraints on a coordinated basis. Their design entails specification of various direct objectives and includes financing for two or more sectoral components. By their nature, these projects include as beneficiaries the rural population in marginal areas and endeavor to develop their productive potential and find the best way of incorporating them into the socioeconomic activities of the country.

- To update strategies and plans that will recover the needs of the grassroots development gap as agricultural inputs, mainly for vegetable production assets.
- To promote and activate the national plans that have tangible affect on Agricultural inputs priorities and fulfillments of the local needs.
- To engage national and state level plans with very close coordination and consider priorities to confirm matching with the project objectives.
- To encourage the investment by community base organization (CBOs) and government institution sector to promote vegetables production.
- To strengthen vegetable production marketing through boarder countries.

Recommendations for Ministry of Agriculture Central Darfur State:

Integrated agricultural development projects like JMRDP. These projects are aimed at removing more than one production and/or economic infrastructure constraint. Their design envisages financing for more than one sectoral component and includes low-income farmers with a potential for expanded production among the direct beneficiaries. Projects for concurrent investment in credit, technical

assistance, marketing, road building, energy and other areas are some that fit into this category.

-To assist and support adoption and Diffusion policies that related with the project recommended objectives, (Specific, Measurable, Attainable, Relevant, and Timely).[S.M.A.R.T]

-To encourage gathering efforts between ministry of agriculture and the project in order to manage resources through coordination plans and optimal used of assets.

- To coordinate and revise the project plans with continuous monitoring and evaluation system or tools.

Recommendations for Jebel Marra Rural Development Project:

- Attention should be given to women in agricultural programmes that enable them to contribute effectively in improving living standards and welfare.
- To strengthen agricultural extension services and cooperate with agricultural research centers to promote transfer of innovation, in order to encourage adoption diffusion entirely.
- To accommodate and encourage the possibility of improved onion seeds to produce locally.
- To provision of irrigation tools mainly water pumps and providing of concrete wells.
- To provision of insecticides and agricultural machineries, furthermore creation of awareness among farmers is necessary to know how to manage it usages.
- To rehabilitate the experimental centers to strengthen vegetable research.

These are projects that endeavor to improve the social and organization conditions of low-income rural communities, such as health, sanitation, rural education, community organizations, training, etc.

Recommendations for Credit institutions in Central Darfur state:

Fields of Activity: Through its lending and technical assistance operations, the Bank will assist in national efforts to identify appropriate rural development solutions compatible with the specific circumstances of each period and place. Special emphasis will be **placed on three complementary fields of activity:**

- Strengthening the national capacity to identify and prepare better programs and projects, including support for the formulation of policies for improving the general framework of rural development and efforts to link the analytical and research capacity of the region more productively with the search for and formulation of operational solutions.

-Mobilizing the efforts of rural populations, which entails encouraging their participation in decision-making, organizational activities, training and rural education, social communications, including, where appropriate, the development of associative-type economic organizations that can open the way to socially and economically feasible solutions.

-Financing programs and projects that will contribute to capitalizing and galvanizing the rural economy, and that will act on the mechanisms for the retention and reinvestment of surpluses generated in rural areas, including support for towns operating as service and marketing centers. In this regard, **the Bank grants loans for:**

-Rural production projects for low-income farmers. Their purpose is to help increase the production and raise the income of small farmers by allocating resources for a single activity that deals with a specific constraint preventing or hindering development.

-To provision of fund facilities supporting the community base organizations to implement their activities in socio-economic base mainly on agricultural production.

-To cooperate and work together in partnership with grassroots organizations to encourage community participation process depending on their priorities.

References

Primary Sources: [Direct contact with JMRDP Department Directors] in December, (2014).

- Agricultural services Department
- Agricultural Extension Services Department
- Agricultural Research Department
- Community Development Department
- Horticulture and Forestry Department
- Monitoring & Evaluation Department

*** Published Studies:**

- Badry, A.A.K. 1984. Horticultural production in the Sudan, past, present and future. *Acta Hort.* 143:25-29.
- Castro, A. P.; Taylor, D.; Brokensha, D. W. Climate change and threatened communities: vulnerability, capacity and action 2012 pp. 81-92
- Castro, A. P. ;(2012), *Climate Change and Threatened Communities vulnerability, capacity and action* - practical action publishing Ltd.UK
- Duflo, E., M. Kremer, et al. (2009). *Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya*, Harvard University Department of Economics working paper.
- *Diffusion of Agricultural Innovations: (An Organization of the Ministry of Agriculture, Govt. of India First Published: 2007*
- Dearing, J.W., & Meyer, G. (2006). Revisiting diffusion theory, In A. Singhal & J.W. 6/ Dearing, J.W. *Communication of innovations: A journey with Ev .Rogers* (pp. 29-60). Thousand Oaks, CA: Sage

- Satti, Y. H., and Castro, A. P.; (2012) “Climate Change and the Future of Onion and Potato Production in West Darfur, Sudan: A Case Study of Zalingei. - State Ministry of Agriculture, and Animal Wealth- Khartoum, (2004).
- Working paper, (April 2012), Market Intelligence system baseline Data for potato and onion, - **INDIA**.
- World Bank (2010), Agricultural Growth for the poor: An Agenda for Development (www.worldbank.org).
- WORLD BANK (1996), Participation *Sourcebook* Washington, D.C.: The World Bank.

*** M.Sc. & Ph.D. Thesis not published:**

- **Abaker**, N.M.(2015)Impact of the Development Net on rain fed cultivated crops in Edd Elfursan & Rehaid Elberdy locality. Ph.D. degree in Sudan University of Sciences and Technology, Khartoum, Sudan.
- **Abdalla**, y.A.(2005) The assessment of community forest **activities at Jebel Marra Area**, M.Sc. degree in forestry University of Khartoum, Sudan.
- **Osman**, E.O.(2009)Impact of community participation on natural resources (forest & range) management A cause study of white Nile State ED-Daweim Project, Ph.D. degree in Sudan University of Sciences and Technology, Khartoum, Sudan.

- أمونه عبدالله إدريس (2013) مشاركة المرأة الريفيه في مشروع (إيفاد) للتنميه الريفيه وأثرها في تعزيز قدراتها – محليه بارا ولاية شمال كردفان , رسالة دكتوراه (غير منشور) في الإرشاد والتنميه الريفيه – جامعة السودان للعلوم والتكنولوجيا – الخرطوم- السودان.

*** Documents:**

Jebel Marra Project

- Annual Report 1989-1990 Annex 1* Agricultural Services October 1990.

- Act Horticultural Technical Communications of International Society for Horticultural Science Eighth African Symposium on Horticultural Crops Wadmadani, (ISHS) Sudan 20-24 March 1983 No143 April 1984.
- JMRDP Annual Report 1987/88 Annex1Agricultural Services.
- JMRDP Annual Report 1987/88 Annex 11 November 1988 monitoring & evaluation Department march 1990.
- JMRDP WET Season Research Annex 1 A Dry Season Research Annex IB 1990/91.
- JMRDP Annual Report 1981-82 Annex 11 M & E Department August 1982.
- JMRDP Annual Report 1980-81.
- Ministry of Agriculture & N.R. JMRD Project 90/1991.
- Vegetables Report P39 Onion Annual Report 90/1991 Main Report.
- 1991 تقرير الأداء 91/9/1 إلي منتصف ديسمبر 1991 .

**** Documents:**

- Draft proposals for consideration in future Darfur peace Agreement peace research Institute U o k 19 May 2010- Berlin.
- Central Darfur State investment mapping leaflet book, 2012.
- (JRDP), Annex 1V Agriculture, December 1977).
- (J.M, Date posted: April 23, 2014).

**** Secondary sources:**

Books:

- Ali Abdelgadir (2006), the Challenges of poverty reduction in post conflict, Sudan- Arab planning Institute Kuwait.
- Bello, A.S.bdelraouf & Daoud, A.M. Shadia (2009), Rural Development Developing Countries, Ahfad University for Women.

- Burkey, S. 1993. People first. A guide to self-reliant, participatory rural development. London: Zed Books.
- Bhasin, K. (1976). Participatory Training for development, FFHC\ AD, FAO-Bangkok.
- Blomstrom.m. and hettne.B.(1984), Development theory in transition. Zed Books: London.
- McDonough, M.H. & C.W. Wheeler (1998). Toward School and community collaboration in social forestry. Lesson from the Thai Experience. Washington: USAID
- Chambers, G.H.(1983). *Rural Development: Putting the last First*. London: Longman.
- Chambers, R., spacey, A., and Thrupp, L.A.(1989). Farmer first: Farmer Innovation & agricultural research. London: Intermediate technology publications.
- Chambers, R.(1974). Managing rural development. Uppsala: Scandinavian Institute of African Studies.
- Clayton, P; Oakley, P. and Pratt, B.(1988). Empowering people: A Guide to participation, New York: UNDP.
- Cohen, J.M. and Uphoff, N.T. (1977), Rural Development participation: Concepts and measures for project design, implementation and evaluation. Monograph series No.2.Rural Development Committee- Cornell University, Ithaca - NY.
- Elsiddig, E.A. (2007). Jebel Marra the potentials for Resources and Rural Development in Darfur, Khartoum: Q.P. for print. & pub. Sudan.
- Fischer, R. , Byerlee, D., & Edmeades, G.(2009, October 12). Can technology deliver on the yield challenge to 2050? Paper presented at the High level Expert Form on How to feed the World in 2050, Food and Agricultural Organization, Rome, Italy.

- Sundar Raj (2006). 'People's Participation in Rural Development.' in 'Rural Development Reforms.' (ed.) S. B. Verma, U. P. Singh and S. K. Jiloka, Deep and Deep Publications Pvt. Ltd., New Delhi.
- Helen Young,(2005). Darfur - livelihoods under siege, Tufts University International Famine Center.
- Munzoul A.M.Assal (2005), Annotated Bibliography of social Research on Darfur, centre for development studies, University of Bergen- Norway.
- Oakley, P.(1991). Projects with People: The practice of participation in rural development. International Labor office, Geneva, Switzerland.
- Pretty, J.N.(1995). Regenerating agriculture: Policies and practice/ or sustainability and self-reliance. London: Earth can publications; and Washington Dc: National Academy press.
- Rogers, E.M. 1995. Diffusion of Innovations. The Free Press.
- Rogers, D.H. and F. R. Lamm. 2006. Criteria for Successful Adoption of SDI Systems. Proceedings of the Central Plains Irrigation Conference. Colby, KS February 21-22, 2006. Pp 57-66.
- Rogers, 1962, 1983, 1995; 2003; Singhal & Dearing, 2006). Also began prior to the institutionalization of communication study in university units.
- Rogers, E. M.(2003). *Diffusion of innovations* (5th Ed.). New York: Free Press.
- Rogers, E. M., & Kincaid, D. L. (1981). *Communication networks: A new paradigm for research*. New York: Free Press.
- Rogers, E.M., & Seidel, N. (2002). Diffusion of news of the terrorist attacks of September 11, 2001. *Prometheus*, 20(3): 209-219.
- Rogers, E.R.(1962).*The Diffusion of Innovations*. Glencoe, ILL: The Free Press.
- Rogers, E. M., and Shoemaker, F F 1971, Communication of Innovations, Free Press, New York.

- Rogers, E. M, 1995, Diffusion of innovations Fourth Edition, Free Press, New York effects
- Rogers, E. M. (1962). *Diffusion of innovations* (1st ed.). New York: Free Press.
- Rogers, E. M.(1983). *Diffusion of innovations* (3rd ed.). New York: Free Press.
- Rogers, E. M.(1994). *A history of communication study: A biographical approach*. New York: Free Press.
- Rogers, E. M.(1995). *Diffusion of innovations* (4th ed.). New York: Free Press.
- Robb, J.D. (1998), pp. 52-53) Grace Agyapoma Akanke gakukwe@aed.org (Ghana). youngrobb@gmail.com
- Sanginga, N. and Woomer, P.L. (eds.). 2009. Integrated Soil Fertility Management in Africa: Principles, Practices and Developmental Process.
- Zed Books Ltd, (1993), people first - Fourth impression (2000) USA.
- Roll, N., J. (1988). Extension science information system in agricultural development, Cambridge University Press.

2.2 Journals:

- Rogers, E. M.(2004).A prospective and retrospective look at diffusion model. *Journal of Health Communication*, 9(1), 13-19.
- www.ccsenet.org/jسد Journal of Sustainable Development Vol. 4, No. 1; February 2011.
- Zhang, T., Gensler, S. and Garcia, R. 2011, 'A study of the diffusion of alternative fuel vehicles: An agent-based modeling approach', *Journal of Product Innovation Management* 28: 152-168.

2.3 Seminar Papers:

- Report of Horticultural Year,(April, 2012), for Small Famers Agribusiness Consortium (SFAC), New Delhi- India.

3. Website Sources:

[Http: //www.](http://www.)

- [http:// www.ccsenet.org](http://www.ccsenet.org), February 2011).

-<http://www.hrhc-drhc.gc.ca/community>.

-<http://www.neareast.org>

-<http://www.jfmorton.co.uk>, March 2008). James Morton & Co Ltd for more information, please contact: Stephanie A Bradfield, Director, Public Affairs, Washington State Hospital Association, 190 Queen Anne Avenue North, Third Floor, Seattle, WA 98109. Phone: (206) 281-7211. (Robb, 1998, pp. 52-53) Grace Agyapoma Akukwe gakukwe@aed.org (Ghana)

- <http://www.hrhc-drhc.gc.ca/community>.

-<http://www.new-agri.co.uk/07/06/focuson/focuson5.php> (November 2007.)

-<http://www.fao.org/docrep/t0060e/t0060e02.htm>

-<https://www.onions-usa.org/all-about-onions/history-of-onions>

المراجع العربية:

- الأفندي, عبدالوهاب وآخرون (2013م), دارفور حصاد الأزمة بعد عقد من الزمان, مطابع الدار العربية للعلوم, بيروت, ط1, مركز الجزيرة للدراسات, الدوحة- قطر.
- * جامعة الدول العربية- المنظمة العربية للتنمية, الكتاب السنوي للإحصاءات الزراعية- المجلد رقم (28) - الخرطوم- 2008م.
- * عباس, محمد عباس (2010م), زراعة الخضر في السودان, دارجامعة الخرطوم للنشر, الخرطوم – السودان.
- * عوض صالح أحمد (2005) الإرشاد الزراعي المفهوم والتطبيق في دول العالم الثالث, ط1, دار السداد للطباعة, (ص159), جامعة سنار-السودان.
- * محمد, سيد, يوسف حسن(2013م), تاريخ ما أهمله التاريخ, مطبعة جامعة الخرطوم, ج1, الخرطوم -5 السودان.
- الخارطة الإستثمارية - مفوضية تشجيع الإستثمار – ولاية وسط دارفور, 2012م.*

خريطة جمهورية السودان Republic of The Sudan





Onion Harvesting Period Zalingei(Field Visit,2013)



New Technology Introduced In Onion Farms Zalingei



**Potato Beside Onion Farms is Necessary
To Avoid Market Risks(Crops Diversity)**



Traditional Irrigation System Called (Alrambaih)



**(Shadouf)Traditional Irrigation Methodology
for Small Farm Usage**



Women Participation in Onion Farm North Zalingei,2014



Improved Variety Called Amreaki, Field Visit-2015



**Urea Fertilizer Distribution, but its approximately
dose given (cost problems)**



Traditional Onion Seeds Collection for the next Season

by Small Farmers Zalingei,2013



APPENDIX

- Maps, pictures and Questionnaire

- Nome's

In the name of Allah the Merciful

Sudan University for Science and Technology College of Graduate Studies

Impact of grassroots participation on adoption and distribution of improved onions seeds- Jebel Marra Project

Structured Questionnaire

My brother, my sister \ respondent \ researched data contained in this Form find confidential and used only for the purposes of scientific research:

Sub Unit:..... Locality:.....State:.....

The name:Date: /... /201 time clock (am) / (pm)

General questions:

*Put appropriate or expression that fit the required answer for each question mark?

1/ Gender: Male () Female ()?

18-25	26-33	34-41	42-49	Above 50
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2/ Age series per years old box above?

3/ Education level? 1/ illiterate () 2/ Khalwa () 3/ formal education ()

4/ University () 5/ post Graduate()?

4/ Marital status? 1/Single ()2/Married ()3/widow ()4/abandonment()?

5/ type of work or activity? 1/Farmer ()2/breeding animal() 3/trade()

4/Industry() 5/Handcrafts () 6/ Employee ()?

6/ agricultural land owning? 1/Owning ()2/rental()3/All your () cropping share ()?

Specific Questions:

1/ Do you have any idea of improved onion seeds? If the answer is yes ()

Explain from any quarter obtained by mentioning the period of time during the project cycle? 1/ Other Farms () the introductory period () 1/

Radio () The initial period () 3/ Agricultural Extension () the second period 4/ Plant Protection () the third period () at the end of the project cycle fourth period () 5/ Others ()

2/ Have you ever been involved in previous training sessions during the project cycle Mount visits to rural development? If the answer is yes () Explain where? How many times? () How much the period of the training course..? 1/ One week () 2/ month () 3/ month and half () 4/ years () 5/ more of the above mentioned ()?

3/ from your point of view personal training courses attended raised your cognitive abilities of agricultural skills and knowledge? If the answer is yes () take one of the following options: 1/ increase agricultural skills 2/ applied per the instructions provided by the agricultural project 3/ crop productivity increased 4/ All of the valid was correct? 5/ others mentioned?

.....
.....

4/ Do you have an idea of the indicative campaigns? If yes () Take from the options given?

A/ is a mechanism for disseminating information on the newly created information? B/ a certain consolidation of the concept under the spreading C/ is a tonic to avoid the risk of coming crops (the case of the emergence of diseases and pests D/ Others remember.....

.....

5/ Are you over your business through agriculture agricultural field guide as a visitor or as an agent of change? If answer is yes ()? Take the following options: 1/ transfer of new information () 2/ ward off any risk of crop damage () 3/ training beneficiaries of the new means of production () In the case of the campaign it is useful specify Why ()? Not useful ()? To some extent useful () in case of the campaign is not useful? The options are: 1/ a waste of time 2/ depletion of resources 3/ complexity means of production 4/ others

6/ how many times have you come across Visits field regularly ? 1/ One by week () 2/ once a month () 3/ somehow (a) Not at all ()

7/ Are improved seeds for onions feasible more than you have known for old varieties (Baladi)? If the answer is yes () Explain how? 1/ Is the Net effort to increase productivity () 2/ resistance to pests () production speed () 3/ is not feasible () 4/ Others remember

8/ named varieties of onion seeds planted by now regularly? 1/...2/...3/...?

9 \ Do you have the desire to continue in the cultivation of new varieties? If yes? Point of the following options: 1/ production speed () 2/ resistance to pests () 3/ High productivity () 4/ If you do not continue to be cultivated specify reasons? 1/ complex () 2/ source of new lesions ()

3/ is capable of being stored () 4/ others mentioned.....

.....
10/ is the project activities were meaningful and influential in increasing the productivity your abilities? If the answer is yes? Explain how through the appropriate choice of options? A/ frequent training sessions () B/ connect activity to work Demonstration () C/provision of agricultural inputs at the right time D/ Activities of the project were not effective (). Others mentioned?

.....
11/ Is the project now, with no interference? You are unable to continue the transfer of new information and ideas to others and to encourage its practices? 1/Yes () 2/ No () 3/ somehow () 4/ Not at all ()?

1 2/ Do desired varieties and planted in every season easy to constantly deal with them or difficult? If the answer is yes or no () tick on the options that suit your chose? 1/ easy and available locally every year () 2/ desirable locally () 3/ bear the storage 4/ Unwanted items (other) remember? 1/ 2/..... 3/.....

13/ Is the region and the agricultural extension unit? If yes, explain how many agricultural extension workers loneliness () How many villages () Covered by the unit through its activities?

14/ Is between you and the project any means of communication services? If yes Take from the following options: A/ typed messages () B/ field visits () C/ visit the office on a regular basis () D/ Others ().

15/ from your point of view any way instrumental in the increase of agricultural acquaintances during the project period? Take one of the following options:

A/ Training () B/field visit () C/ periodic visits to the office () D/ there is not any effective way the project () E/ Other Remember:

.....
16/ in your area do you notice any progress in agricultural work is concerned particularly with the cultivation of onion crop? If yes take the following options:

A/ nature of the area suitable for the cultivation of onions () B/ Old accumulated experience () C/ intensification project programs in the region () D/ commercial value of the onion crop () E/ Others mentioned

.....
1 7/ Are roads linking the project area under the chairmanship of good? If the answer is no () point on the options that suit you? 1/ multitude of waterways () 2/ rugged roads () 3/ good roads () 4/ distances () 5/ scarcity means Movement () Others remember.....

.....
18/ social services (water, health and education) are excellent in the region (Good) () without level ()?

19/ a very high number of people in the region () High () Medium ()
How many families of the region.....

20/ Education in the region continues to increase each year?
Education is on the rise () However, if the lower rates take in the point
on the options that suit you? 1/ displacement conditions () 2/ rising costs
of education () 3/weak jobs () Others Remember:

.....
21/ agricultural activity in the region depended entirely on innovative
modernization and agricultural inputs? If the answer is yes () Take the
following options: A/ fertilizers and pesticides () B/ improved seeds ()
C/ animal-drawn vehicles () D/ advanced irrigation means () and other
() No () On the update did not adopt agricultural inputs?.

Write three of the recommendations that it deems suitable to support
agricultural innovations locally? 1/2/.....
3/.....

Allah grant us success

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