INDIRA GANDHI NATIONAL OPEN UNIVERSITY

SCHOOL OF CONTINUING EDUCATION

VALUE CHAIN ANALYSIS FOR RICE (Oryza sativa L.) IN GURAFERDA DISTRICT, BENCH-MAJI ZONE, SOUTH WEST ETHIOPIA:

A Thesis Submitted to IGNOU in Partial Fulfillment of the Requirements for the Degree of **Master of Arts** in **RURAL DEVELOPMENT**

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(BSC Degree in Plant Science)

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Addis Ababa, Ethiopia

DECLARATION

I hereby declare that the research thesis entitled" VALUE CHAIN ANALYSIS FOR RICE CROP IN GURAFERDA DISTRICT, BENCH-MAJI ZONE, SOUTH-WEST ETHIOPIA" submitted for the partial fulfillment of the requirements of Degree of MASTER OF ARTS IN RURAL DEVELOPMENT to IGNOU.

It is my own original work and has not been submitted earlier either to IGNOU or to any other institution for the fulfillment of the requirement for any course of the study. I also declare that no chapter of this manuscript in whole or in part is lifted and incorporated in this report from any earlier work done by me or others.

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CERTIFICATE

This is to certify that Mr. Tadesse Abebe Engidaeshet, student of MA (RD) from Indira Gandhi National Open University, New Delhi was working under my supervision/advisory and guidance for his project work for the course MRDP-001. His project work entitled **VALUE CHAIN ANALYSIS FOR RICE** (Oryza sativa L.) **IN GURAFERDA DISTRICT, BENCH-MAJI ZONE, SOUTH-WEST ETHIOPIA which** he is submitting, is his genuine and original work.

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ACRONYMS

AVC	Agricultural Value Chain
AKIS	Agricultural Knowledge and Information System
BDS	Business Development Services
BoFED	Bureau of Finance and Economic Development
CBO	Community Based Organizations
CSA	Central Statistical Authority
Das	Development Agents
DAP	Die Ammonium Phosphate
DoARD	District office of Agricultural and Rural Development
EIAR	Ethiopian Institute of Agricultural Research
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
FHH	Female Headed Household
FTC	Farmers Training Center
GO	Governmental Organization
HH	Household
IPMS	Improving Productivity and Market Success
IRRI	International Rice Research Institute
MEDA	Mennonite Economic Development Associate
MoARD	Ministry of Agriculture and Rural Development
MoFED	Ministry of Finance and Economic Development
NARS	National Agricultural Research System
NERICA	New Rice for Africa
NGO	Non-Governmental Organization

OMFI	Omo Micro Finance Institute
PA	Peasant Association
SG-2000	Sasakawa Global 2000
SMSs	Subject Matter Specialists
SWOT	Strength, Weakness, Opportunity and Threat
SPSS	Statistical Package for Social Science
ToT	Transfer of Technology/ Trainer of Trainee
VCA	

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ABSTRACT

Rice (Oryza sativa L.) is a new crop for the country in general and the study area, Guraferda, in particular. There is an immense potential of rice production area and high consumer demand. However, the rice sector is not fully developed as compared to the potential. Many institutional, organizational and technological factors were attributed to existing inefficiencies in rice production and utilization. Thus, the study was undertaken in Guraferda District of Bench-Maji Zone, South-West Ethiopia and has been designed to throw light on the challenges, opportunities and entry points for infusing further innovation (technological institutional and organizational) for upgrading the rice value chain. Identification of actors, their role, attitudes, habits and practices in the value chain; and identifying recent innovation activities and their immediate outcomes in the district were the focus of this study. Primary data was collected from 100 randomly selected farm households and other rice value chain actors including input suppliers, marketing agents, consumers and support services. Data was collected using both qualitative and quantitative methods which incorporated semi-structured interview schedule, focus group discussions, key informant interview and personal observation. The main findings of the research revealed that, there are multiple public and non-public actors involved along the rice value chain, upstream from input supply to downstream consumers, playing different role. However, there is no mechanism to coordinate multiple actors together for effective and efficient functioning of the value chain. There is public sector actors' domination with limited private sector involvement in the value chain. A long tradition of limited responsiveness, top-down, hierarchical, non-participatory/ exclusiveness and less risk taking type of organizational culture and, habits and practices lead DoARD to have weak interaction, knowledge and information sharing with the various actors along the value chain. As to the linkage, weak and informal linkage between chain actors characterizes the rice value chain. Lack of post-harvest processing technology (rice polisher), limited access to and supply of inputs, severe termite attack, non-availability of well-developed rice market, high labor demand for crop management, absence of responsible body who works on actors interaction were some of the principal challenges identified for innovation at various stages of rice value chain. Absence of rice polisher machine was the most critical problem that affects the whole value chain. On the contrary, increased farmer's awareness about and availability of improved rice varieties, existence of favorable land and climatic condition, presence of high consumer demand, and increased institutional support from different GOs and NGOs were mentioned as opportunities for innovation. In order to address the existing problems and to increase competitive advantage of the rice production, plat forms and partnerships have to be created and/or strengthened between value chain actors

to create an enabling environment for sharing of information, knowledge and solve existing problems of shortage of rice polisher machine and input supply services. The existing extension service should also be strengthened in a way that enables working in harmony with relevant actors to bring about change for efficient and effective delivery of agricultural inputs/services.

Key word: value chain, actors, key informants, linkage, innovation

1. INTRODUCTION

1.1 BACKGROUND

Rice is a staple food for more than half of the world's population. In Asia alone, more than two billion people obtain 60-70% of their calorie from rice and its products. It is also the most rapidly growing source of food in Africa, and is of significant importance to food security and food self-sufficiency in an increasing number of low-income food deficit countries. Therefore, improving the productivity of rice systems would contribute to hanger eradication, poverty alleviation, national food security and economic development (FAO, 2004).

Among the developing countries in the world, Ethiopia is the one with high population and food insecurity. The country has been designing and implementing various types of strategies to achieve food security. Diversification of crops, increasing the availability of food through domestic production, and encouraging the production of early maturing and high yielding crops in different agro-ecologies of the country are some of such strategies. Rice is considered to be a highly productive crop next to maize in the country (CSA, 2003). The introduction and expansion of rice production in suitable agro-ecologies, therefore, could be an option to achieve food security and self-sufficiency.

Currently rice is becoming one of the most important cereals grown in different parts of Ethiopia as food crop. It is reported that the potential of rice production area in Ethiopia is estimated to be about 30 million hectare (MoA, 2010). According to FAO (2009), four rice ecosystems were identified in the country. These are; upland rice, which is grown on naturally drained soils and where the water table always remains below the roots and is entirely rainfed; Hydromorphic (rainfed lowland) rice, which is grown on soils where the roots are periodically saturated by fluctuating water table in addition to the rainfall; Irrigated lowland ecosystem, whereby crop water requirement is entirely satisfied from irrigation, and rainfall is not a limiting factor, and paddy rice(with or without irrigation) which is grown under water-logged or submerged environmental conditions.

According to Tareke (2003), even though rice is not a traditional staple food in Ethiopia, it is a high potential emergency and food security crop for the country.

Rice production is expanding rapidly and farmers are growing it in many places and over large areas and also have developed many Ethiopian recipes using rice including; injera, bread, porridge, soup, etc. and some local alcoholic drinks (tella, arekie, etc). Nationally the area under rice coverage increased

approximately from 100,000 ha in 2010 to more than 200,000 ha in 2012. And thus a total of more than 2.5 million qtls of rice was produced in the country in 2012. However, the amount of area under rice cultivation is low as compared to the potential (MoARD, 2012/13).

Rice is introduced in Ethiopia during the 1970's and has been cultivated in small pockets of the country. Ever growing demand due to population growth and urbanization, consumer preference and diet changes especially from city dwellers, increased consumption of food away from home, increased participation of women in labour force, convenience and ease of storage & cooking, etc. are forcing the government to spend large amounts of money on importing rice. The recent surge in demand combined with the skyrocketing import price, and availability of potential agro-ecologies for rice production, challenged the country's policy makers to seriously consider the country's potential to grow the grain for itself. Subsequently, successful lobbying has pushed rice to be classified as the fourth" National Food Security Crop" after wheat, maize, and the country's traditional most staple cereal crop, teff. This move favours rice research and promotion on a large scale (Nigussie et al., 2008).

The south-western low-land parts of the country particularly Guraferda and its surrounding areas have an immense potential to grow rice since the area is characterized by its low altitude, fertile soils and high temperature with sufficient rainfall. Cognizant of the stated importance of rice and existing potential for its production, Bonga Agricultural Research Center in collaboration with various stakeholders including NGOs(MEDA, SG-2000, etc), has tried to conduct multi-location adaptation trials so as to release locally adapted and high yielding varieties. Guraferda District is one of the study areas where adaptation trial is conducted.

To understand opportunities and constraints in addressing the existing problems and to increase competitive advantage of the rice production in the area, this study was designed to assess the performances of varies actors/stakeholders for upgrading the value chain as well as it would be used as a reference for another studies in the same area.

1.2 Statement of the Problem

Even though the country has 30 million hectares of potential rice production area, the amount of arable land under rice cultivation during 2012(more than 200,000 ha) is very small as compared to the potential (MoA, 2012/13). In addition, inefficient utilization of the rice production area, the same author illustrated that input supply, agronomic practices, pre-and post-harvest handlings, marketing, utilization and overall investment are some of the research and development gaps and priorities under the current situation of rice production in Ethiopia. Organizations that are working on rice development, however, mainly focus on adaptation and release of locally adapted varieties. They do not give importance to the other activities (input supply, post-harvest processing, marketing and utilization) across the value chain. Nigussie et al., argued that the rice production system in the country has focused mainly on the introduction of improved varieties from a range of different sources, including the International Rice Research Institute (IRRI), the African Rice Center, etc. Research centers in the country are also concentrating on the evaluation and release of new varieties for the local rice growers.

However, to increase production and productivity and to get competitive advantage from the development of rice sector, there should be innovation at every stage of the value chain. Bammann(2007) illustrated that the value chain concept helps to trace product flows; show value addition at different stages; identify key actors and their relationships in the chain; identify enterprises that contribute to production, services and required institutional support; identify bottlenecks preventing progress; provide a framework for sector-specific action; identifies strategy to help local enterprises to compete and improve earning opportunities and identify relevant stakeholders for program planning.

Recently, the demand for production and consumption of rice varieties is increasing tremendously by farmers in the study area (Guraferda) as well as neighboring ones. The main factors for the existing demand are availability of land with suitable soil characteristics for rice production and climatic condition, search for alterative cereal crops for consumption, crop rotation and diversification, and the need of crop residue for livestock fodder.

Considering such huge demand and potential agro-ecology; various research, development and non-governmental organizations put some effort to introduce and raise rice production in the area. Yet, farmers are still facing different problems like input supply (improved seeds, fertilizers, pesticides, etc), post-harvest management practices (particularly of shortage of rice harvester, thresher and processing machine), storage facilities and lack of market information for the seed as well as the grain, and its

utilization. Therefore, this entails the need for doing more comprehensive study which rigorously examines the rice value chain in the study area.

Rice is a new and recently introduced crop and lacks in-depth studies. Accordingly, very few studies have been done on rice (Getachew, 2000; Biruhalem & Desalegn, 2007; and MoA, 2010). However, most of these studies have focused on production (adaptation trials) or they are simple informal surveys. Rather there is no comprehensive study made so far to understand the whole rice value chain in the study area, Guraferda. This is the first study of its kind which analyses the entire value chain from input supplier to the consumer. This study has the benefit of applying a holistic/integrated approach that tries to analyze the dynamics of input supply, production, marketing, post-harvest processing and consumption of rice in the study area. Through such an approach, potential areas or entry points can be identified for infusing further innovation to upgrade the value chain. It also provides a holistic picture of the existing challenges and opportunities in the rice value chain; allowing, identifying and taking appropriate intervention measures for improvement.

1.3 Objectives of the Study

1.3.1. General Objective:

To identify and analyse challenges and opportunities for innovation along the rice value chain development in Guraferda District, Bench-Maji Zone, and South-West Ethiopia.

13.2. Specific Objectives:

- To identify the actors/stakeholders and assess their roles/functions, linkages, attitude, habits and practices in the rice value chain
- To analyze the institutional arrangements and enabling environment that affect the functioning of the rice value chain
- To identify and analyze recent innovation activities related to development along the rice value chain and assess their immediate outcomes/impacts

1.4 Research Questions

⇒ Who are the actors/stakeholders involved in the rice value chain? And what are their characteristics, roles/functions, linkages, attitude, habits and practices?

⇒ What institutional arrangements and enabling environment are affecting the functioning of the value chain?

⇒ What recent innovation activities are undertaken in development of the value chain and what outcomes are obtained?

⇒ What challenges, opportunities and entry points are available for infusing further innovation (technological, institutional and organizational) for upgrading the value chain?

⇒ What short-term actions/interventions should be taken to pursue opportunities and address constraints?

1.5 Significances of the Study

The study analyzes the entire value chain from input supplier to the consumer. It also provides a holistic picture of existing challenges, opportunities and entry points in the rice value chain. Therefore, it can shed light on required efforts to enhance the production and utilization of the crop at larger scale to ensure food security and self-sufficiency and bring about economic development in the area. The information generated will also help a number of organizations; research and development organizations, traders/processors, producers, policy makers;, extension service providers, NGOs/donors, etc to assess their activities and re-design their model of operations and ultimately influence the design and

implementation of policies and strategies. It can also help such actors and others to identify and analyze new ways of stimulating innovation.

1.6 Scope and Limitations of the Study

This study aimed at identifying challenges and opportunities for innovation along the rice value chain in Guraferda District, South-West Ethiopia. Due to time and unavailability of financial resources, the study is limited in its depth and coverage that fully addresses the aforementioned objectives of the study. Furthermore, since Ethiopia has wide range of diverse agro-ecologies, institutional capacities, organizational and environmental conditions, the result of the study may have limitations to make generalizations and make them applicable to overall country. However, it may be useful to undertake further research and dev't for areas with similar context with the study area.

1.7 Organization of the thesis

The thesis consists five chapters. Chapter one deals with the background, problem statements, objectives, scope & limitations, and significance of the study. Chapter two reviews related literatures appropriate for the research topic. Methodological issues including the study area description are presented in chapter three. The fourth chapter provides and discusses all the research findings. The final chapter includes conclusion and recommendations.

1.8. Concepts and Terms

Innovation is defined by many scholars in various ways as "Innovation is the profitable implementation of ideas" or "Innovation is implementing new ideas that create value.

Innovation system is defined as the network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect the system's behavior and performance.

Value chain is the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final customers, and final disposal after use, and it incorporates a range of activities within each phase, including both input supply and output marketing systems.

Chain actors are those involved in production, processing, trading or consuming a particular agricultural product.

2. LITERATURE REVIEW

2.1 Definitions and Concepts

To enhance understanding of the innovation and value chain concepts, key terms and conceptual issues are described as follows.

First, innovation is defined by many scholars in various ways as "Innovation is the profitable implementation of ideas" or "Innovation is implementing new ideas that create value" (Jjang, 2009). He defines it as the process by which organizations "master and implement the design and production of goods and services that are new to them, irrespective of whether they are new to their competitors, their country, or the world". OECD (1999) also pointed out that innovation is a new idea, practice, or product that is successfully introduced into and utilized in an economic and social process, which positively affects the competence, productivity, competitiveness, and livelihood of agents in the value chain. They could be technological, organizational, institutional and policy innovations.

Second, innovation system is defined as the network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect the system's behavior and performance. Innovation systems help to create knowledge, provide access to knowledge, share knowledge, and foster learning. The innovation systems concept embraces not only the science suppliers but also the totality and interaction of actors involved in innovation. In other words, the concept extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways (World Bank, 2006).

Third, a value chain is the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final customers, and final disposal after use, and it incorporates a range of activities within each phase, including both input supply and output marketing systems (Kaplinsky and Morris, 2000). A product moves in the value chain from one chain actor to another and in the process add some value; for example, flow of seed to farmers and grain to the market occurs along chains from producer to intermediary to consumer.

Fourth, actors can be defined from both innovation system perspective and value chain aspect.

From value chain point of view, KIT et al. (2006) and Hellin and Meijer (2006) mentioned chain actors as those involved in producing, processing, trading or consuming a particular agricultural product. They include actors which are directly and commercially involved in the chain (input suppliers, producers,

traders, processors, transporters, wholesalers, retailers and final consumers) and indirect actors which provide financial or non-financial support services, such as bankers and credit agencies, business service providers, government, researchers and extensionists.

On the other hand, from an innovation system perspective, actors are agents, individuals and firms as well as public institutions and non-state actors constitute the principle operating components of the system. Again, when we apply innovation system perspective to developing country agriculture; agents/ actors are those who are engaged in the generation, dissemination, or use of knowledge or technology. The primary focal agent in the literature is often the public sector research system: national research organizations, extension systems, state marketing agencies, institutes of higher learning, and international research centers are mentioned as primary actors. However, private firms are also increasingly important focal agents, and may include multinational and national agribusiness firms; small and medium enterprises engaged in agro industrial processing, marketing, and distribution; industry associations; and individual entrepreneurs. Civil society organizations are also important focal agents and include producer/farmer associations, nongovernmental organizations, consumer groups, and other types of community or solidarity groups. And, finally, agrarian agents are also critical focal agents; these include farmers, agricultural laborers, farm households, and rural communities that are engaged not only in the utilization of knowledge but in its production and diffusion as well (ibid).

2.2 Review of Literatures

2.2.1 Why innovation?

Available literature illustrated the rationale for exploring the utility of concepts of innovation, systems of innovation and the innovation systems perspective in the agriculture sector particularly of developing countries agriculture. Innovation is becoming central to the ability of farmers, agro-enterprises and countries to cope, exploit and compete in rapidly evolving technical and economic conditions. Innovation plays crucial role in the development of agriculture through promoting interactive learning between actors along the value chain. There by it eliminates the drawbacks of NARS and AKIS perspectives like; ineffective technology transfer, incorrect research priorities and weak demand for research products. The main reason for the problem is such systems do not allow all actors to make a link to identify their problems or needs and develop a technology to solve their problems. Accordingly, the demand for the technology developed will decrease since it is developed without taking clients real circumstance in to consideration (Hall et al. 2006).

Rajalahti et al. (2008) pointed out six major changes in the context of agricultural development which heighten the need to incorporate innovation systems concepts in the agricultural sector:

1. Markets, not production, increasingly drive agricultural development.
2. The production, trade, and consumption environment for agriculture and agricultural products is growing more dynamic and evolving in unpredictable ways.
3. Knowledge, information, and technology increasingly are generated, diffused, and applied through the private sector.
4. Exponential growth in information and communications technology (ICT) has transformed the ability to take advantage of knowledge developed in other places or for other purposes.
5. The knowledge structure of the agricultural sector in many countries is changing markedly.
6. Agricultural development increasingly takes place in a globalized setting (in contrast to a setting characterized predominantly by national and local influences and interests).

In line with this, World Bank (2006) also identified various important patterns in the agricultural sector of many developing countries which require the application of agricultural innovation system concept and framework. For instance;

- The delineation of new, dynamic, and very knowledge-intensive niche sectors, such as export horticulture and agro processing.
- Rapid evolution in production, consumption, and marketing conditions, driven by new technologies, globalization, and urbanization.
- Industrialization of the food chain.
- The importance of these new sectors as income sources for the poor—farmer-owners and laborers.
- An important role for organizations other than state organizations—particularly private organizations, but also cooperatives and civil society organizations.
- The need to compete in rapidly evolving international markets and the consequent importance of innovation as a source of competitive advantage.
- The importance of upgrading and innovating, not only in hi-tech sectors but also in sectors such as agriculture, which are considered more traditional and low-tech.

Besides, World Bank (2006) also pointed out the following distinguishing characteristics of innovation and innovation process from invention;

- Innovations are new creations of social and economic significance. They may be brand new, but they are more often new combinations of existing elements.
- Innovation can comprise radical improvements, but it usually consists of many small improvements and a continuous process of upgrading.
- These improvements may be of a technical, managerial, institutional (that is, the way things are routinely done), or policy nature.
- Very often innovations involve a combination of technical, institutional, and other sorts of changes.
- Innovation can be triggered in many ways. Bottlenecks in production within a firm, changes in available technology, competitive conditions, international trade rules, domestic regulations, or environmental health concerns may all trigger innovation processes.

Innovation is a process in which knowledge and technology are generated, disseminated and utilized by agents, whose interaction both condition and are conditioned by social and economic institutions. In its broadest sense innovation covers the activities and processes associated with the generation, production, distribution, adaptation, and use of technical, institutional and organizational or managerial knowledge. It does not mean new technology alone, but also the institutional innovations, that emerge as new ways of developing, diffusing and using technology (Anandajayasekeram et al., 2006). Furthermore, innovation is neither research nor science and technology, but rather the application of knowledge (of all types) in the production to achieve desired social or economic out comes. The knowledge might be acquired through learning, research or experience, but until applied it cannot be considered innovation (Hall et al., 2006).

Innovation is an interactive process. Innovation involves the interaction of individuals and organizations possessing different types of knowledge within a particular social, political, policy, economic, and institutional context. Innovation systems concept recognizes the importance of these activities but gives more attention to (1) the interaction between research and related economic activity, (2) the attitudes and practices that promote interaction and the learning that accompanies it, and (3) the creation of an enabling environment that encourages interaction and helps to put knowledge into socially and economically productive use (ibid). It is also described that innovation is to be understood as the result of cumulative dynamic interaction and learning processes involving many stakeholders. Here innovation is seen as a

social, spatially embedded, interactive learning process that cannot be understood independently of its institutional and cultural context.

As we can easily understand from the concept of innovation, interaction/linkage between different actors or agents, who have diverse knowledge across the value chain, is vital for the development and delivery of agricultural innovation. However, the linkage may take different forms; formal or informal partnership or network. According to Waring (1997) cited in Anandajaskaram et al. (2006), networking is process by which two or more organizations and/or individuals collaborate to achieve common goals. Networks potentially offer opportunities for taking advantage of economies of scale and for developing capabilities necessary to respond new challenges of change in context. Again, it provides opportunity to jointly address complex issues that cannot be effectively addressed by any one partner/institution; to improve the effectiveness and efficiency of resource use; and to avoid duplication of efforts, exploit complementarities and synergies. On the other hand, partnership is an alliance in which different individuals, groups, or organizations agree to a common goal; work together; share resources; share the risks as well as the benefits; review the relationships regularly; and revise their agreement as necessary.

Next, an innovation system includes those institutions that affect the process by which innovations are developed and delivered—the laws, regulations, conventions, traditions, routines, and norms of society that determine how different agents interact with and learn from each other, and how they produce, disseminate, and utilize knowledge. Institutions are also defined by Edquist (1997), are "sets of common habits, routines practices, rules or law that regulate the relations and interactions between individuals and groups". These are the factors that determine the efficiency and stability of cooperation and competition, and whether agents in an innovation system are able to interact to generate, diffuse, and utilize knowledge. An institution may be no more explicit than a traditional tendency toward (or away from) informal entrepreneurial behavior in agrarian society, such as farmer exchanges of seed and other planting materials; or it may be more codified in the laws that govern how private, knowledge based firms are established, licensed, and taxed, and the extent to which such firms can appropriate the rents from innovation.

2.2.2 Types of Innovation

As many literatures illustrated that there are numerous types of innovations, broadly; Product, Process, Service, Business Model, Value, and Market. However, here our main focus is on agricultural innovations along the value chain. In this regard, innovation may take form of technological, institutional, organizational and technical (World Bank, 2006; and OECD, 1999).

Traditionally, the focus in agricultural development has been on technological innovations such as varieties or breeds, type of equipment, or method of pest control. These can be growth increasing, cost reducing, quality enhancing, risk reducing, and shelf life enhancing. However, with the ever changing agricultural context; due to increased consumer demand and preference, globalization, quality, increased national/ international competitiveness, it recognized that social and institutional innovations can also be as important as technical ones. These include; innovations among producers and development of innovatory linkages/ networks between producers and service producers.

According to Conroy 2008, technological innovation is the technology itself (this can include the product, method, process etc). It may include improved varieties, breeds, type of equipment, method of pest control, etc. Similarly, they also described technical innovation as **use** or application of the technology (for example social networking as a technical innovation using the internet as a technology via cell phone as a technology).

Social and institutional innovation may take two forms (1) innovation among producers and (2) development of innovative linkages/ networks between producers and service producers. Social innovation among producers may be formal or informal and includes the development of cooperatives, farmer groups, and self help groups. The formation of groups of farmers can have a number of benefits, like; making the government research and extension service more client driven and efficient, strengthening farmers bargaining power with traders, reducing transaction costs for input suppliers and output buyers, economies of scale, facilitating saving and access to credit, and reducing public sector extension costs(ibid). Furthermore, institutional innovation includes both innovation in the structure of economic units and in the routines, norms and decision rules followed by these units. He also argued that shifts in the demand for institutional innovation are induced by changes in related resource endowments and by technical changes. On the other hand, Organizational innovation includes processes, systems, strategies or organization design.

2.2.3 Drivers of Innovation in a Value Chain

Innovation does not occur randomly rather there are a number of factors or conditions that trigger innovation at particular point of time and space. Accordingly, a number of theories have been developed that aim to explain what drives innovation. Conroy, (2008) described three of them as follows.

Science Push/ Transfer of Technology Model

The dominant view during the last few decades has been that scientific research is the main driver of innovation, creating new knowledge and technology that can be transferred to(and adapted to) different situations. The science push/TOT model of innovation mirrored the belief that'' basic science leads to applied science, which causes innovation and wealth.'' The policy implications of the science push model were simply- if you want more economic development, you fund more science. The people who would reproduce and use the technology were not seen as sources of innovation or ideas in their own right. In this model technology change is exogenous to the economic system, originating outside the agricultural system that is expected to benefit from it. The adoption of innovation by farmers that were developed on the basis of this model has generally been disappointing, particularly in the case of resource-poor farmers.

Population Pressure Model

Work by Boserup(1965) and Binswanger and Mclntire(1987) cited in Conroy(2008) identified increasing population density as the main drivers of the evolution of agricultural systems- from extensive hunter/gatherer system to slash-and-burn system to more intensive farming systems: population growth(and the consequent scarcity of land) provides the impetus for endogenous technological change. As agricultural land become scarcer, traditional practices like long fallow periods are abandoned, and intensification technologies (often labor intensive) tend to be applied on a large scale, resulting in average increased output per hectare.

Boserup also saw population growth as ultimately leading to cheaper transport, easier marketing, and more specialization, which in turn would lead to the growth of local towns and more profitable agriculture- provide there were no cheap imports of domestically produced agricultural goods. This model only addresses part of the process driving agricultural innovation and is not relevant to situations in which labor is the scarcest factor of agricultural production- situation that are in some ways more relevant today with the spread of HIV/AIDS and labor migration to urban centers.

Market Pull Model

With increased market integration and globalization, it has become more and more obvious that markets and output price can exert a major influence on agricultural innovation. Good product prices may provide an incentive to farmers to improve their production practices or their marketing arrangements, and the cash needed to do so. Models that assume that the primary drivers of innovation is access to markets for agricultural and livestock products can be described as '' market pull'' models of innovation. There has been a trend in recent decades towards economic globalization; i.e., increased economic integration between countries and a higher share of gross domestic product(GDP) being traded. This has provided

opportunities for farmers to export their products to the international markets, and "changing patterns of production".

2.2.4 Basic Concepts of Agricultural Value Chains and Value Chain Analysis

Although the value chain approach in general has a long tradition especially in industrial production and organization, its application in international development and agriculture, has gained popularity only in the last decade (Anandajayasekeram and Berhanu , 2009). The value chain concept has proven particularly useful for the identification and formulation of projects as well as in the development of strategies for improved agricultural and rural development. According to Anandajayasekeram and Berhanu (2009) in agricultural value chain, there are four major basic concepts: value chain, stages of production, vertical coordination and business development services.

2.2.4.1 Value Chain

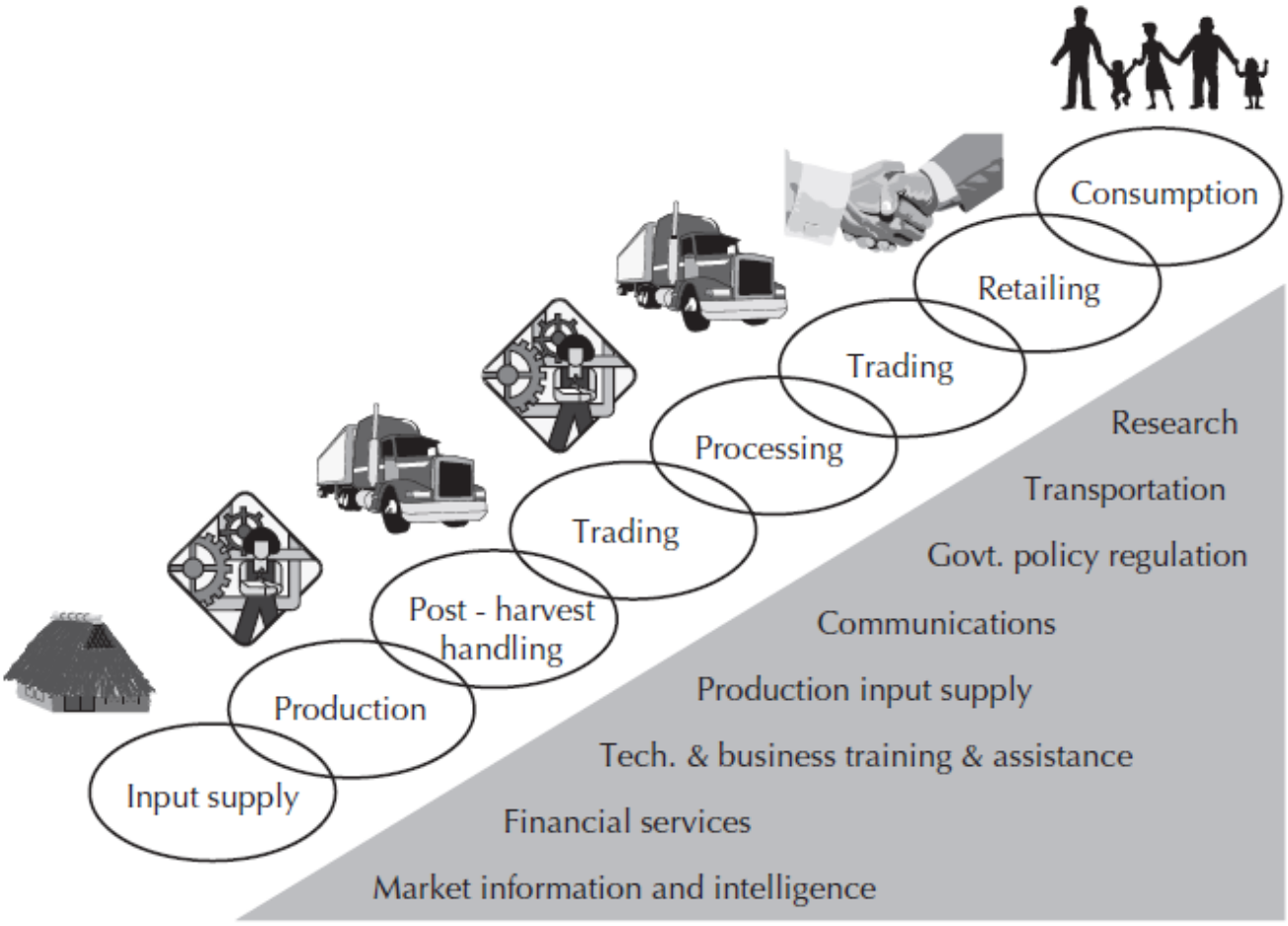
A value chain is the full range of activities required to bring a product from conception, through the different phases of production and transformation.

A value chain is made up of a series of actors (or stakeholders) from input suppliers, producers and processors, to exporters and buyers engaged in the activities required to bring agricultural product from its conception to its end use(Kaplinsky and Morris, 2001).

Bammann, (2007) has identified three important levels of value chain:

- Value chain actors**:** The chain of actors who directly deal with the products, i.e. produce, process, trade and own them.
- Value chain supporters: The services provided by various actors who never directly deal with the product, but whose services add value to the product.
- Value chain influencers: The regulatory framework, policies, infrastructures, etc.

The value chain concept entails the addition of value as the product progresses from input suppliers to producers to consumers. A value chain, therefore, incorporates productive transformation and value addition at each stage of the value chain. At each stage in the value chain, the product changes hands through chain actors, transaction costs are incurred, and generally, some form of value is added. Value addition results from diverse activities including bulking, cleaning, grading, packaging, transporting, storing and processing (Anandajayasekeram and Berhanu, 2009). See Figure 2.1 for a typical agricultural value chain.



Source: Adopted from Anandajayasekeram and Berhanu,2009

Figure 2.1 Typical agricultural value chains and associated business development services.

Value chains encompass a set of interdependent organizations, and associated institutions, resources, actors and activities involved in input supply, production, processing, and distribution of a commodity. In other words, a value chain can be viewed as a set of actors and activities, and organizations and the rules governing those activities. Value chains are also the conduits through which finance (revenues, credit, and working capital) move from consumers to producers; technologies are disseminated among producers, traders, processors and transporters; and information on customer demand preferences are transmitted from consumers to producers and processors and other service providers (ibid).

Value chains can be classified into two based on the governance structures: buyer-driven value chains, and producer-driven value chains (Kaplinisky and Morris 2001).

Buyer-driven chains are usually labour intensive industries, and so more important in international development and agriculture, which is our focus in this paper. In such industries, buyers undertake the lead coordination activities and influence product specifications. In producer-driven value chains which are more capital intensive, key producers in the chain, usually controlling key technologies, influence product specifications and play the lead role in coordinating the various links. Some chains may involve both producer- and buyer-driven governance (Kaplinisky and Morris 2001).

2.2.4.2 Stage of Production

In agricultural value chain analysis, a stage of production can be referred to as any operating stage capable of producing a saleable product serving as an input to the next stage in the chain or for final consumption or use. Typical value chain linkages include input supply, production, assembly, transport, storage, processing, wholesaling, retailing, and utilization, with exportation included as a major stage for products destined for international markets. A stage of production in a value chain performs a function that makes significant contribution to the effective operation of the value chain and in the process adds value (Anandajayasekeram and Berhanu,2009).

2.2.4.3 Vertical Coordination

The performance of an agricultural value chain depends on how well the actors in the value chain are organized and coordinated, and on how well the chain is supported by business development services (BDS). Verticality in value chains implies that conditions at one stage in the value chain are likely to be strongly influenced by conditions in other stages in the vertical chain, in direct and indirect ways, and in expected and unexpected ways. It should be noted that intra-chain linkages are mostly of a two-way nature. A particular stage in a value chain may affect and be affected by the stage before or after it.

Coordination refers to the harmonization of the functions of a value chain its conduct. The result of good coordination between the stages of a value chain may be reflected in a good match between buyer preferences and seller supplies. That is, better coordination in a value chain results in better matching of demand and supply between the chain stages, resulting in efficient and low-cost exchange, quality maintenance, and value addition. It should be noted that the coordination of activities by various actors within a value chain is not necessarily the same as chain governance. Coordination usually involves managing required parameters as exhibited in the bundles of activities undertaken by various actors performing specific roles in the chain. Coordination of value chains takes place at different places in the

linkages to ensure consequences of interactions are as required. Coordination also requires monitoring of the outcomes, linking the discrete activities between different actors, establishing and managing the relationships between the various actors comprising the links, and organizing logistics to maintain networks (Anandajayasekeram and Berhanu, 2009).

Coordinating mechanisms are the set of institutions and arrangements used to accomplish harmonization of adjacent stages of the chain. Coordination can be done in various ways. Firms at specific key stages of a value chain (e.g. wholesalers and processors) can be coordinating agents, by handling or processing large volumes of commodity, thereby coordinating assembly, transformation and distribution. Government and nongovernment agencies that provide needed services, and associations of producers and processors and traders may also act as coordinating organizations. Various forms of contractual arrangements, different forms of markets (spot, futures, and auction), various forms of information exchanges and vertical integration are other types of coordinating mechanisms. Uncertainty and risk, perishable nature of agricultural commodities, and increasingly stringent quality and safety standards by consumers provide strong incentives to develop effective coordinating institutions and arrangements (ibid).

2.2.4. 4 Business Development Services (BDS)

Closely related to the concept of value chains is the concept of business development services. These are services that play supporting role to enhance the operation of the different stages of the value chain and the chain as a whole. In order for farmers to engage effectively in markets, they need to develop marketing skills and receive support from service providers who have better understanding of the markets, whether domestic or international. Local business support services are, therefore, essential for the development and efficient performance of value chains.

Business development services can be grouped into infrastructural services; production and storage services; marketing and business services; financial services; and policies and regulations. Basic infrastructural services include market place development, roads and transportation, communications, energy supply, and water supply. Production and storage services include input supply, genetic and production hardware from research, farm machinery services and supply, extension services, weather forecast and storage infrastructure. Marketing and business support services include market information services, market intelligence, technical and business training services, facilitation of linkages of producers with buyers, organization and support for collective marketing. Financial services include credit and saving services, banking services, risk insurance services, and futures markets. Policy and regulatory services include land tenure security, market and trade regulations, investment incentives,

legal services, and taxation. The roles of the business development services have hitherto been neglected. The neglect was a result of the mistaken assumption that profitable business development services will emerge as value chains develop or that the public will provide business development services where they are needed and when markets are insufficient to provide profitable niches for competitive services to develop (Anandajayasekeram and Berhanu, 2009).

2.2.5. The Agricultural Value Chain Analysis Approach and Purpose

2.2.5.1 What Is The Agricultural Value Chain Analysis Approach?

Agricultural value chain analysis can be viewed as a heuristic device or analytical tool (Kaplinisky and Morris 2001). The research can be descriptive, prescriptive and designed to provide operational guidelines to improve efficiency of vertical coordination. Agricultural value chain analysis systematically maps chain actors and their functions in production, processing, transporting and distribution and sales of a product or products. Through this mapping exercise, structural aspects of the value chain such as characteristics of actors, profit and cost structures, product flows and their destinations, and entry and exit conditions are assessed (Kaplinisky and Morris, 2001 and KIT et al., 2006).

Agricultural value chain analysis is a dynamic approach that examines how markets and industries respond to changes in the domestic and international demand and supply for a commodity, technological change in production and marketing, and developments in organizational models, institutional arrangements or management techniques. The analysis should look at the value chain as a set of institutions and rules; as a set of activities involved in producing, processing, and distributing commodities; and as a set of actors involved in performing the value adding activities. Value chain analysis focuses on changes over time in the structure, conduct and performance of value chains, particularly in response to changes in market conditions, technologies and policies (Kaplinisky and Morris, 2001).

Agricultural value chain analysis focuses on chain governance and the power relationships which determine how value is distributed at the different levels. Through the analysis of systems and power relations at different levels, value chain analysis enables a more comprehensive modeling of the effects of interventions at different levels. Such an approach can enable a better targeting of interventions aimed at poverty reduction. Hence, value chain aims at identifying how the productivity of chain activities can be improved, either through improved technologies, organizations or institutions to better coordinate the various stages of production and distribution, and meet consumer demand. The agricultural value chain approach accords due attention to the roles of business development services in enhancing the performance of value chains. Since final demand is the major driver of agricultural value chains, a strategy to improve the competitiveness of a value chain should consider the nature of products in relation to the type of markets where the product is sold for final usage (Kaplinisky and Morris, 2001 and Anandajayasekeram and Berhanu, 2009).

2.2.5.1 Purposes of Value Chain Analysis

Value chain analysis is conducted for a variety of purposes. The primary purpose of value chain analysis, however, is to understand the reasons for inefficiencies in the chain, and identify potential leverage points for improving the performance of the chain, using both qualitative and quantitative data. In general, agricultural value chain analysis can be used to:

- Understand how an agricultural value chain is organized (structure), operates (conduct) and performs (performance). Performance analysis should concern not only the current performance of the value chain, but also likely future performances, as well.
- identify leverage interventions to improve the performance of the value chain
- analyze agriculture–industry linkages
- analyze income distribution
- analyze employment issues
- assess economic and social impacts of interventions
- analyze environmental impacts of interventions
- guide collective action for marketing
- guide research priority setting
- conduct policy inventory and analysis

In sum, the concept of value chain provides a useful framework to understand the production, transformation and distribution of a commodity or group of commodities. With its emphasis on the coordination of the various stages of a value chain, value chain analysis attempts to unravel the organization and performance of a commodity system. The issues of coordination are especially important in agricultural value chains, where coordination is affected by several factors that may influence product characteristics, especially quality. The value chain framework also enables us to think about development from a systems perspective, similar to the innovation system perspective.

2.2.6 Innovation System Perspective in Value Chain Development

According to the World Bank (2006), Innovation systems and value chains often have many shared partners, and although they respond to different organizational principles, they are highly complementary and overlapping. From a value chain perspective, the key challenge is to link supply and demand in the most effective way, and information sharing is very important for enabling these producer-consumer linkages. Organizations that help to link producers, transporters, and distributors to consumer markets are vital if value chains are to function effectively. When participants in a value chain pass along information on demand characteristics, for example, or on standards and regulations affecting the market (such as sanitary and phytosanitary standards), at the same time they are providing important information to shape the direction of

the innovation process. If, in addition to well-functioning value chain, an effective innovation capacity exists, this market information will be combined with new and existing knowledge on technological opportunities and information, such as farming techniques, postharvest processes and marketing to innovate in response to these market signals. One of the innovation challenges with respect to sustainable agriculture is to expand opportunities and means for resource-poor farmers to become actors and stakeholders in these innovation systems.

In general, a value chain brings partners together in their desire to integrate production, marketing, and consumption issues in the most profitable way, both in the long and in the short run. For example, value chain partners may need to make organizational and technological changes, or they may need to agree on pricing practices or quality control systems. The innovation system perspective brings actors together in their desire to introduce or create novelty or innovation into the value chain, allowing it to respond in a dynamic way to an array of market, policy, and other signals. The innovation system perspective provides a way of planning how to create and apply new knowledge required for the development, adaptation, and future profitability of the value chain.

2.2.7 Conceptual Framework

In order to analyze innovation in agricultural value chain, innovation system framework is used. The conceptual framework comprises of the essential elements of a national agricultural innovation system, the linkages between its components, and the institutions and policies that constitute the enabling environment for innovation.

The conceptual framework consists of different actors; their role, linkage and interaction; attitude, practices and habits of the different actors, enabling environment including policies; institutional arrangements and incentives that affect the capacity and efficiency of actors to innovate across the value chain.

Actors: The innovation systems concept recognizes that (1) there is an important role for a broad spectrum of actors outside government (2) the actors' relative importance changes during the innovation process; (3) as circumstances change and actors learn, roles can evolve; and (4) actors can play multiple roles (for example, at various times they can be sources of knowledge, seekers of knowledge, and coordinators of links between others (Hall, 2006). The chain actors who actually transact a particular product as it moves through the value chain include input (e.g. seed suppliers), farmers, traders, processors, transporters, wholesalers, retailers and final consumers(Kaplinsky and Morris, 2000).

Linkage: Linkage can be both partnership and network. Partnership is condition in which two or more organizations pool knowledge and resources and jointly develops a product, or they can be commercial transactions, in which an organization purchases technologies (in which knowledge is embedded) or

knowledge services from another organization, in which case the relationship is defined by a contract or license. Whereas, network refers to networks, which provide an organization with market and other early-warning intelligence on changing consumer preferences or technology. These linkages and relationships govern the movement of commodities through value chains (ibid).

Attitude and practices: The common attitudes, routines, practices, rules, or laws that regulate the relationships and interactions between individuals and groups largely determine the propensity of actors and organizations to innovate. Some organizations have a tradition of interacting with other organizations; others tend to work in isolation. Some have a tradition of sharing information with collaborators and competitors, of learning and upgrading, whereas others are more conservative in this respect. Some resist risk-taking; others do not (World Bank, 2006).

Besides, it also illustrated that Attitudes and practices also determine how organizations respond to innovation triggers such as changing policies, markets, and technology. Because such attitudes vary across organizations and across countries and regions, actors in different sectors or countries may not respond in the same ways to the same set of innovation triggers.

Table 2.1: Attitude and Practices Affecting Key Innovation Processes and Relationships

Attitude and Practices Affecting Key Innovation Processes and Relationships		
Processes	**Restrictive attitudes and practices**	**Supportive attitudes and practices**
Interaction, knowledge flows, Learning organizations	- Mistrust of other -Closed to others' ideas - Secretiveness - Lack of confidence - Professional hierarchies between organizations & disciples - Internal hierarchies -Top-down cultures & approaches - Covering up of failures - Limited scope and intensity of interaction in sector	Trust - Openness - Transparency - Confidence - Mutual respect - Flat management structure - Reflection and learning from successes and failures - Proactive networking

	networks	
Inclusiveness of poor stakeholders & the demand side	-Hierarchies -Top-down cultures & approaches	-Consultative and participatory attitudes
Risk-taking and investment	-Conservative	-Confidence - Professional incentives

Source: World Bank, 2006

Furthermore, World Bank, 2006 mentioned the desire to develop attitudes that encourage dynamic and rapid responses to changing circumstances; for instance, external shock, or changing trade rules and competitive pressure in international markets—by building self confidence and trust, fostering preparedness for change, and stimulating creativity. This could also require creating partnership/linkage between actors or stakeholders to gain more competitive advantage.

Enabling Environment: it include infrastructure, effective governance of input and output markets, and a supportive policy and fiscal framework for science, technology, legal, advisory, and trade issues. Most developing countries lack an optimum enabling environment and must choose among the many options to improve it (World Bank, 2006).

Given that the enabling environment often influences how the actors in a sector can use their knowledge; the enabling environment is an important promoter of innovation capacity. Policies are integral to forming an enabling environment, but there is no single "innovation policy." A set of policies is needed to work together to shape innovation. The evidence suggests that policy interventions to create an enabling environment for innovation may remain ineffective unless they are accompanied by efforts to change prevailing attitudes and practices (Ibid). It is also indicated that Policy supports of innovation is

not the outcome of a single policy but of a set of policies that work together to shape innovative behavior. In evaluating the effectiveness of policies on innovative performance, investigators must therefore be sensitive to a wide range of policies that affect innovation and seek ways of coordinating them. Moreover, policies interact with attitudes and practices, and thus, effective policies must take account of existing behavioral patterns. For example, the introduction of more participatory approaches to research is often ineffective unless scientists' attitudes (and incentives) are changed. Similarly, food safety regulations might be rendered ineffective if the agencies charged with enforcing them have a tradition of rent-seeking behavior. Policies to promote innovation must be attuned to specific contexts.

The evidence also indicates that the ability to agree on the innovation challenges within a sector is much greater when effective value chain coordination is in place. Improvements in the enabling environment will thus be more effective if they are combined with activities to strengthen other aspects of innovation capacity, particularly the patterns of interaction among the main actors, and if the efforts to improve the enabling environment focus on identified needs for innovation and address the need for sector coordination (OECD, 1999).

2.3 Review of Empirical Studies on Value Chain

The literature that exists concerning the challenges and opportunities for innovation in agricultural value chain is too diversified to be exhaustively reviewed here. Therefore, only those studies that are directly or indirectly related to the variables or objectives of this study were reviewed.

The challenges and opportunities for innovation in a value chain are quite different depending on the nature of the sector or circumstance under which the sector operates.

For instance, a study conducted on innovations in banana value chain indicated that very limited sucker production and supply, low demand for locally available varieties, absence of improved varieties and limited knowledge of banana production in the area were some of the challenges for innovation in banana value chain to enhance its production and productivity. On the other hand, high market demand for improved banana varieties, production potential of the area, availability of irrigation water in the area, presence of enabling environment including policy support for irrigation agriculture, provision of technical advice from both government and nongovernmental organization to boost banana production and productivity in the area are also mentioned as opportunities for innovation in the value chain.

Other study conducted on whether public policies enhance or impede innovation in fish, banana and vegetable value chain in Uganda pointed out that policies have two dimensional influence on innovation in value chain irrespective of sectors; policies that constrain innovation and those that support innovation. The former include lack of favorable credit facilities and no subsidy policy, lack of infrastructure, lack

of government support in value addition of local products, stringent and ever changing international market demands, and weak enforcement of existing laws and regulations. On the other hand, policies perceived to enhance agribusiness innovation include: non-taxation of agricultural exports, liberalization of trade and service delivery enabling pluralistic service providers (Kibwika, 2006).

In India, Bhutan district, the status of the rice commodity chain was evaluated using the functional, flow and economic analysis methods. More over the study utilized SWOT analysis to identify the challenges and opportunities and chain mapping to show the flow of rice along the chain. The study identified the various actors in the value chain, strengthen, weakens and opportunities of each actors. Currently, the different agents or stakeholders in the chain include farmers, commission agents, extension agents, researchers, millers, exporters and urban retailers. The rice production is largely subsistence farming and not directly linked with the market. The CAs supply inputs such as seeds, fertilizers and herbicides to the farmers on a commission basis which requires revision. The current coverage and number of CAs is inadequate for inputs distribution. There are several gaps and weaknesses in the production, processing and marketing of rice. The low seed replacement ratio and use of modern varieties affects production. Farmers mostly rely on organic manures to supply nutrients to the rice crop, which is not sufficient for raising production. Irrigation water is a core input in rice cultivation, but the problem of inadequate water supply affects a large proportion of rice growers (Ghimiray, 2007).

Likewise, rice cultivation in Bhutan is labor intensive which due to the scarcity of labor adds to the cost of production. Farming tools and implements are still largely traditional with low use efficiency. Farm mechanization is limited, restricted by the availability of affordable machines and the inhospitable natural terrain. Ownership regulations also have a negative impact on productivity. Landowners often restrict the use of new crops and varieties, leading to low productivity and resource utilization. Crop loss due to wild animals is also substantial. The rice milling machines that are used at present are crude and damage the rice grain leading to breakage and low head and total rice recovery. Marketing of rice is quite limited with less than 15% of the harvest sold in the market (ibid).

Other rice value chain study conducted in Cambodia (Agrifood Consulting International, 2002) revealed that Rice plays an integral role in the economy of rural Cambodia. Over 80 percent of Cambodian farmers cultivate rice, primarily through traditional farming practices. For most of these farmers, rice is the major source of income and sustenance. Yet the rice sector faces a number of important constraints in Cambodia. Farmers lack consistent access to income generating activities and credit for the purchase of inputs to rice production. Further downstream, the rice processing and distribution sector faces a number of key constraints. Milling technology is often outdated, resulting in high levels of broken rice.

Furthermore, millers are fundamentally constrained by a lack of working capital that limits their ability to purchase paddy from farmers and update machinery. This contributes to the unofficial export of paddy to regional markets such as Vietnam and Thailand and prevents Cambodia from capturing the value-adding from rice milling. The lack of capital also perpetuates the low levels of technology implicit in the sector.

Institutional and infrastructural constraints also impede the sector. High costs in the provision of credit dampen private investment by farmers and millers, forcing farmers to seek unofficial sources of credit from moneylenders, often at usury interest rates, and millers to delay or reduce investments. Poor infrastructure, in the form of roads and irrigation dampen production incentives and reduce market access. In general, there is a fundamental lack of an enabling environment, in terms of infrastructure and institutions. This enabling environment needs to be developed in order to improve food security, alleviate rural poverty and generate export revenues from the rice industry (ibid).

The study argues that the role of the public sector in the future development of these markets should be to provide an enabling environment for the private sector to gain access to credit and improved marketing channels. The private sector should be encouraged to develop high valued niche markets, which will benefit those few farmers who are supplying high quality varieties of paddy.

3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was conducted in Guraferda District, one of the 10(ten) most existing Districts of Bench-Maji Zone. It is located at 700 km South-West of Addis Ababa and 260 km South of Jimma town. Guraferda is one of the West most district of the Southern Nations & Nationality People Regional State. Guraferda is found North of Surma, South of Bebeka State-owned Coffee Farm & Sheko District, West of South Bench District, and East of Yeki and Goderie Districts. The District is also sub-divided into 22(twenty two) kebeles, and its center namely called Biftu.

The altitude of Guraferda ranges from 850 to 1,995 meter above sea level while the minimum annual temperature ranged between 20°C to 39 °C. Daily temperature becomes very high during the month of February to May, where it may get to as high as 35 °C. Mean annual rainfall ranges from about 1,000 mm to around 1,450 mm. It has a unimodal-type with extended period of rainfall. The rainy season extends from end of April to the beginning of October. However, most of the rainfall is received during the months of June, July and August accompanied by its erratic distribution. The soils in the area are predominantly light black and reddish in color, and some are with vertic properties. During the heavy rainfall months, erosion of the soils is so high due to its rugged (up and down) landscape and creates some production problems. However, the soils in the area are believed to be fertile (forest soils) and consequently, farmers do not adequately apply commercial fertilizers.

According to CSA (2008) and updated Woreda Administration information, Guraferda has a total population of 45,028(more than 8,000 HHs) with an area of 228, 281.25 ha.

Table 3.1; Total area and population number & density of the study area

Description	Unit	
Total area of land	Ha	228,281.25
Total population of the Woreda	No	45,028
Male		23,500
Female		21,528
Population Density	HH/ km^2	3.50

According to the Woreda Agriculture Office, only 23% of the total area is under cultivation (52,250 ha). The area has also additional 27,100 ha of potentially cultivatable land. In addition, there are 146,652(64%) ha covered by forest trees and shrubs/grasses. Average land holding is about 5 ha, which is very high as compared to the highlands in the country.

The area is characterized by mixed farming system (combination of both crop production and raring of animals). Previously sorghum, maize and coffee were the dominant crops grown in the area. However, today the rice crop production accounts more than 60 % of the cultivated area of the area under cultivation. Even though the abundance of livestock diseases is found significant, animal husbandry is considered as an integral part of production system. Raring of cattle (milk, meat), goat (meat) and some poultry is a common practice.

3.2 Research Design

In this study, mixed methods were employed to access the detail and diverse information on the same issue. Use of mixed methods also helps to triangulate the reliability of information which was gathered. It is usual for researchers to employ mixed method designs to investigate different aspects of the same phenomenon (Sarantakos, 1998). In this study both qualitative and quantitative methods were used. Semi-structured interview, focus group discussion, key informant interview and personal observation methods were used to gather the required data. Cross-sectional type of research design was also utilized.

3.2.1 Sampling Procedure

The study area, Guraferda, is selected purposively since the area has high potential for rice production but not yet efficiently utilized. Initially actors who were involved in a value chain were identified using review of related literatures and interview of some key informants. Following this, samples were chosen from each segment of the chain to be included in this study using diverse sampling techniques.

The District has 22(twenty two) rural administrative kebeles. Among those kebeles, four of them (Otowa-1, Berji, Kuja and Semerta) will be chosen purposively based on their accessibility to transportation and relatively rich experience in rice production innovation. The farm households at the production stage of the value chain were tried to be stratified in to two groups; rice producers and non-rice producers. In order to have gender disaggregated data at least 15% FHHs were incorporated in the sample for this study. Finally sample of respondents were selected using probability proportional to size method. Simple random sampling technique would be used to choose the ultimate sample of households. A total of 100 sample households will be chosen for the study.

In addition to farm households, sample respondents shall also be selected from the other value chain actors including; input suppliers, market agents, consumers, and supporting actors like research centers, cooperatives, agricultural extension service delivery institutions(gov't offices, NGOs, etc.). Such key informants will be selected purposively at various levels like selected sample kebeles/PAs of Guraferda. One private input supplier from each sample PAs and one from Guraferda District were selected as input suppliers. Here primary cooperatives at each sample PAs, Andinet Union at Mizan Teferi town, and Guraferda District Agriculture Office were also interviewed as input supplier. Regarding the post-harvest processors, out of the 10(ten) total grain millers in the sample PAs, only four will be selected based on their relatively good experience in rice polishing service provision. The consumers were selected from both the study sites and Biftu. The key informants from District Agriculture Office, BARC, primary cooperatives, Andinet Union, and Bench-Maji Zone Agriculture Department were selected and interviewed too. Detail breakdown of selected sample of respondents in the value chain is mentioned below.

Table 3.2 Sample respondents in rice value chain in Guraferda District

Actors	Selected Samples
Rice producing farmers	100
Input suppliers	5
Retailers	8
Processors after harvest	4
Consumers	10
Supporting services	16
Total	**143**

3.2.2 Methods of Data Collection

Both primary and secondary data were collected for the study. The secondary data were gathered from various sources including Guraferda District Agriculture Office, Farmers Training Centers, BARC, primary cooperatives in the selected PAs, and NGOs(MEDA Ethiopia & SG-2000) working on rice research and development activities in the study area. Besides, relevant literatures, official reports and memos were also reviewed as secondary data source.

Primary data were collected from sampled actors/stakeholders who have been involving in inputs supply, production, marketing, post-harvest processing, consumption and supportive services (research, extension, finance, and facilitation) along the rice value chain in the District, Guraferda. Household surveys, Focus Group Discussions (FGD), Key Informant Interview (KII) and personal observation methods were also employed to gather the information required from such actors. Pre-tested interview schedule and checklists (topical guideline) were used as survey instruments.

Pre-tested semi-structured interview schedule was used to collect data from farmers. The interview schedule was pre-tested on non-randomly selected households. Some modifications were made based on the outcomes of the pre-test. Interviewers, who know the study area very well, were carefully recruited and advised/trained about the objectives of the study, methods of data collection and interviewing techniques & ethics. Then they (MEDA project field staffs) collected the data from sample farmers with the supervision of the researcher, myself. Along with the survey, four FGDs were conducted in the selected kebeles (one FGD per each PAs) with composition of 8-10 participants in each session for in-depth understanding on the selected key issues like input supply, production, marketing, post-harvest processing and consumption as well as constraints vs opportunities, enabling environment and potential intervention to remove/reduce the constraints and take the advantages of the opportunities.

Apart from farmers, primary cooperatives, farmers and some retailers who participated in rice marketing, grain millers as a post-harvest processor, and supportive actors(Agriculture Office, BARC, NGOs, and other stakeholders) were also interviewed to get a thorough understanding of all the issues at all levels in the chain. Finally, a few numbers of consumers in the town areas, Biftu and Mizan were deeply interviewed too.

3.2.3 Method of Data Analysis

Both qualitative and quantitative techniques of data analysis were used. The study was largely qualitative in nature. System of thematic analysis was used for the data that are collected through FGD, KII, personal observation and secondary document analysis. Functional analysis was also used to identify the various actors and their roles in the value chain. Partnership and linkages, which are central to innovative performance in value chain, were analyzed in their historical and contemporary context to understand their strengths and weaknesses. During analysis, a number of tools were employed. Actor time line was used to identify recent innovation activities undertaken and their immediate outcome along the rice value chain in the study area.

Besides, SWOT (strength, weakness, opportunity and threat) analysis was applied to analyze the challenges and opportunities for technological, institutional and organizational innovation across the value chain.

Regarding the quantitative analysis, simple descriptive statistics such as simple measures of central tendency, mean, standard deviation, frequency, percentages and cross-tabulation were used for the survey data gathered from sample farm households. The analysed data were presented using tables, graphs and charts.

4. RESULTS AND DISCUSSION

4.1 Demographic Characteristics of Sample Households

The total sample population of farmers who involved/ handled during the survey was 100. Of the total 88 %(88) were male-headed households and only 12 %(12) female-headed ones. Out of the total sample respondents 72(72%) have used improved rice seed varieties since their introduction in 2001. Out of these, respondents who have used the improved rice varieties, 64(64%) were males and the remaining 8(8 %) were females. Whereas, out of 100 sample respondents, 28(28%) were not using improved rice varieties. Of these, 24(24%) and 4(4%) were male and female headed households respectively. The value of the chi-squire test (23.405) indicates that there is significant relationship between sex of the household heads and use of improved rice varieties (table 4.1). The male-headed households are more likely to use improved varieties of rice than female ones in the study area. This might because female-headed households have limited access to improved seeds, extension services, credit and land as compared to male ones. In addition, they have limited availability of family labor to undertake the required farm operation.

As indicated in table 4.1, most (50%) of the total sample respondents were literate and attended grades 1 to 8, 17% attended adult education and 22% illiterate. On the bases of use of improved rice varieties, 20% and 20% of users of improved rice varieties were attended grade 1-4 and grade 5-8 respectively. Likewise, 5% and 5% of non-users of improved rice varieties attended grade 1-4 and grade 5-8 respectively. It was also found that, 12% and 10% of users and non users of improved rice varieties were illiterate. There was highly significant level of relationship between level of education and use of improved rice varieties at 99% level of significance. This shows households with better educational background are more likely to use improved rice varieties. Many studies revealed that there is strong and significant relation between household head level of education and use of improved varieties in particular and farm technologies in general (Degnet et al, 2001; Kidane, 2001; Tesfaye and Shiferaw,2001 and Dessalegn, 2008). Besides, Dessalegn (2008) indicated that the presence of literate people in the household means better access to information and resources, and better social networking. Thereby leads to better adoption of improved technologies at household level.

The survey also showed that the majority of respondents were married (80%); with 10% being single and 10% were either widowed or divorced. The mean age of total sample of respondents was 43.71 ranging from 18 to 70 years. The average age of users of improved rice varieties and non-users was 45.30 and 38.33 years respectively. This shows there is mean age difference between these groups. There is also

highly significant relationship between mean age of head of households and use of improved rice varieties. According to focus group discussion participant farmers, since land has not been redistributed, most of the youth farmers have no their own land. They have been using rent in land that is far away from their homestead and not favorable for rice production. Thus, elder farmers are more likely to use improved rice varieties than youth farmers in the study area, Guraferda.

Table 4.1: Demographic characteristics of sampled respondents

Variables	Total Sample	Use of improved seed varieties		χ2/t-test	Sig.
		Yes	No		
Age				45.078	***
Mean	43.71	45.2951	38.3333		
Sex (%)				23.405	***
Male	88.00	64.00	24.00		
Female	12.00	8.00	4.00		
Total		72.00	28.00		
Marital status (%)					
Single	10.00	5.00	5.00		
Married	79.00	60.00	19.00		
Divorced	9.00	5.00	4.00		
Widowed	2.00	2. 00	0		
Level of education (%)				8.585	***
Illiterate	22.00	12.00	10.00		
Adult education	17.00	10.00	7.00		
Grade 1-4	25.00	20.00	5.00		
Grad 5-8	25.00	20.00	5.00		
Grade 9-10	4.00	4.00	0		
Religious education	7.00	6.00	1.00		
Total(N)	**100**	**72**	**28**		

Source: computed from own survey 2015

*** Significant at 1% probability level

The average family size of the total sample respondents was found to be 5.19 persons. The largest family size was 14 and the smallest was 1. As shown in the table 4.2, there was mean family size difference between users (5.42) and non- users (4.61) of improved rice varieties. There was also statistically significant relationship between household family size and use of improved rice varieties in the study area. Dessalegn (2008) confirmed that as the number of household members increase, the probability of the household to make contact with different social networks improve and hence better access to inputs (labor, seed and information). Moreover, since labor is the single most important and expensive input in the lowlands of the country in general and the study area in particular, larger families with their greater supply of labor are expected to adopt a technology than the smaller family size. Improved rice varieties require higher labor especially for weeding and harvesting activities. In this regard, households with larger family size were likely to use the improved rice varieties than those who have lower family size.

Table 4.2: Household family size and use of improved rice varieties

Variable	Use of improved seed varieties	N	Mean	St. dev.	t-value	sig.(2-tailed)
Number of Household Members	**Yes**	**72**	**5.4167**	**1.85950**	**16.282**	****
	No	**28**	**4.6071**	**1.87260**		
	Total	**100**	**5.1900**	**1.88934**		

Source: Computed from own survey 2015

** Significant at 5% probability level

Farming was the main occupation and source of livelihood for all sample farmers (100%). They have been practicing mixed crop-livestock production. However, in addition to the farming activities, some respondents (12%) have also earned their income through engagement in small trading activities and 6% were government employees (table 4.3).

Table 4.3: Source of livelihood (occupation) of sampled farmers

Source of livelihood(occupation)	Total sample	
	N=100	%
Farming(crop + livestock production)	100	100
Trading	12	12
Gov't employment	6	6

Source: Computed from own survey 2015

4.2 Livestock Ownership

Livestock production is an integral component of the farming system in the study area and contributes very much to rice production in particular and to crop production in general. Important animals kept by the sample farmers are cattle, sheep, goats, donkey and poultry. Oxen are the main source of farm power for plowing, harrowing, and threshing. About 37% of the respondents owned one pair of oxen, 32% owned one, 19% owned three, 5% owned four, and the rest owned 5. The sample respondents have, on average, a pair of oxen with highly significant difference between users and non-users of improved rice varieties. Similarly, donkeys are also important animals kept mainly for transportation of the crop produces.

The survey discovered that the difference in the ownership of number of oxen has implication on the use or adoption of improved rice varieties. Farmers who have high number of oxen are more likely to use improved rice varieties than those with small number of oxen.

4.3: Overview of Rice Production in Guraferda

Rice is a new crop in the country as well as in the study area, Guraferda. It was introduced very recently. According to elder farmers and experts of Guraferda District ARDO, rice production has been introduced to the area since 2001. Its introduction started as an adaptation trial by immigrants who came from the northern part of the country some years ago. In the meantime, farmers were exposed to the adaptation trial and trained about various techniques of improved rice production. Through time, most of the farming community in the local area showed high interest to obtain and produce the seed. Even if the adapted and productive varieties were not accessible enough, based on farmers demand, the already adapted varieties had been then released informally and delivered to farmers for on-farm demonstration purpose in various sites by some institutions(like BARC, African Rice Dev't Project, SG- 2000, etc).

According to the Woreda ARDO, after 2001, the seed varieties used for demonstration trial were well accepted and widely grown by many farmers in some areas like Otowa, Berji, Kuja and Semerta PAs of the study area. Then after, some rice polishers have been established in different sites where all rice farmers bring and polish their paddy rice. Thus, it encouraged farmers to produce more and to adapt rice feeding, and the expected number of farmers who enabled to produce rice increased yearly. Farmers were getting the service charged with 1.0 Birr / kilo of paddy rice. However, the polisher was not found enough to polish the whole rice produced by farmers; as a result the growers were discouraged to grow rice and even some dropped rice production.

Based on the interview of some key informant farmers and gov't staffs, it is pointed out that absence of continuous supervision about polisher service provision, lack of assigned responsible person, shortage of

budget and technical person to maintain at times of technical failure were some of the challenges for less effective/ efficient rice polisher service provision. Furthermore, the information gathered during farmers' focus group discussion, there was problem of efficient service delivery especially quality of polisher service. The number of farmers who brought their production to the polisher was too small. Accordingly, they were forced to leave their production in the polishing center until some more rice came to it. That was to save fuel and wastage of other potential resources (like time, money, etc.) as well as effort of farmers thereby discouraged to grow rice. The polisher has also high crack percentage which was not the preferred quality for market purpose.

Following the launching of MEDA/EDGET Rice Value Chain Development in 2011, the project took initiation to make rice as one of its target commodity and facilitates market oriented crop production through creation of partnership with respective stakeholders; it started to work together with Bonga Agricultural Research Center. Collectively, these conditions might then encourage farmers to grow rice widely. Then after, a number of interventions have been undertaking with the facilitation and budget support of EDGET project. The innovative activities which were made so far and their immediate outcomes are briefly described in a subsequent section which discuss about innovations in rice value chain development.

4.3.1 Land Holdings and Area Allocated to Rice Production

The average land holding size of the respondents was 5.88 ha which is higher than the national average holding size per household and holder 1.25 and 1.21 ha respectively (CSA, 2007). Out of the total sample respondents (100), 70(70%) have their own arable land, 48(48%) have rented land and 3(3%) rented out their land to others (table 4.4). The result of the study also shows strong and statistically significant relationship between average land holding size and use of improved rice varieties. This highlights as the amount of own and rented in land increases the probability to use improved rice varieties also increased. This in turn improves the chance to get a land with favorable soil characteristics for rice production.

Table 4.4: Land ownership and amount of land allocated for rice production (2012-2014)

Variables	Total sample		Use of improved varieties				t-test	Sig.
			Yes		No			
	N	Mean	N	Mean	N	Mean		
Land ownership(ha):								
Owned arable land	70	5.8893	58	6.3017	12	3.8958	1.527	***
Rented-in arable land	48	3.5260	31	3.4677	17	3.6324		
Rented-out arable land	3	2.0833	3	2.0833	0	0.000		

Source: computed from own survey 2015

*** Statistically significant at 1% probability level

4.3.2 Type and Source of Inputs Used for Rice Production

According to the current study, all sample of respondents (N=100) interviewed have awareness about the presence of improved rice varieties that can grow in their surroundings at different points in time (since its introduction in 2001 up to the time of the survey). As indicated in table 4.5, out of 100 samples of respondents, 72 (72 %) households have produced/used the improved varieties since the year of its introduction, 2001; but the remaining 28% are not producing rice. Households used modern inputs (commercial fertilizers, chemicals/herbicides and farm implements) for rice production. Cooperatives, neighbor farmers, and ARDO staffs (like supervisors & DAs) were identified as source of those inputs mentioned by most of the respondents.

Table 4.5: Type and source of input used in rice production in Guraferda

		Type of inputs used							
		Seeds		Fertilizer		Herbicides		Farm tools	
Did you use improved agricultural inputs?		N	%	N	%	N	%	N	%
	Yes	**72**	**72**	**45**	**62.5**	**58**	**80.6**	**6**	**8.3**
	No	**28**	**28**	**27**	**37.5**	**14**	**19.4**	**66**	**91.7**
Total		100							

Source: computed from own survey 2015

Type and source of improved seed varieties used

Since rice is a new crop for the country as well as in the study area, there is no local variety grown in the area. Various improved varieties like NERICA-3, NERICA-4 and SUPARICA-1 were introduced in to the area at different point in time starting from 2001. Farmers in the study area used multiple sources to get improved seeds like neighbors, cooperatives, District ARDO, etc. Besides, Bonga ARC was also mentioned as potential source of seed by some farmers. These might be host for different varieties of improved rice seeds demonstration and popularization of its intervention in the study area. According to FGD, farmers obtained the seeds through exchange either in the form of cash or in kind. They also obtained it as a gift from their neighbor farmers, friends/relatives within or outside their village. In general, the survey result showed that farmers are obtaining the improved varieties from informal sources like neighbor farmers, friends/relatives, etc. Therefore, strengthening farmer-to-farmer seed exchange will contribute greatly for better dissemination and diffusion of rice varieties in the study area, Guraferda.

Fertilizer use

It is evident that commercial fertilizer could boost both production and productivity. Out of 72 sample respondents who grow rice varieties, 45(62.5%) used the inorganic fertilizers, and the other 27(37.5%) was not using fertilizers (table 4.5). High fertility of soils coupled with high price of fertilizer was the main reason reported during the focus group discussion with farmers. Primary cooperatives are sources of fertilizer for all respondents who used chemical fertilizer.

Chemicals (herbicides) used

In Guraferda, the level of weed infestation is very high. During the focus group discussion farmers reported weed as a serious problem not only for rice production but also for whole crops grown in the area. Hand weeding is highly labor intensive. Nonetheless, due to harsh environmental condition (prevalence of various human diseases like mosquitoes) labor shortage is highly pronounced. Some key informant farmers identified weed problem as one of the major factors that affect the amount of land allocated for rice production. Accordingly, the demand for herbicides is very high. This is because use of herbicide helps them to reduce both labor and production costs and amount of time spent for weeding. The survey result, as indicated in table 4.5, showed that out of 72 sample respondents who grow improved varieties 58(80.6%) used herbicides for rice production. This implies increasing the availability and supply of herbicides might increase the intensity of its adoption or use of improved rice varieties.

Farm implements (tools)

As indicated above(table 4.5), out of 72 sample respondents who used improved varieties, only 6(8.3%) uses farm implements in rice production, and the majority 66(91.7) are not using farm implements. All

respondents who used farm implements mentioned MEDA and ARDO as the potential sources for the supply of such farm implements/tools like rotary weeders, row makers and some tractors with different energy capacity.

4.4 Actors; their Role, Attitudes, Habits and Practices in Rice Value Chain

4.4.1 Actors and their Role

This section presents the actors and the role they play in the rice value chain in the study area. In the same way as to Ghimiray et.al (2007), actors and their role is assessed along the different stages of the value chain as; input supply, production, marketing, processing and consumption. According to KIT et al. (2006), the direct actors are those involved in commercial activities in the chain (input suppliers, producers, traders/processors, retailers, consumers) and indirect actors are those that provide financial or non-financial support services, such as credit agencies, business service providers, government bodies, NGOs, cooperatives, researchers and extensionists.

In the study area, there are multiple public and non public actors involved along the rice value chain, upstream from input supply to downstream consumers, playing different role. They were; input suppliers, producers, traders, consumers and supporting (indirect) actors. Some functions or roles are performed by more than one actor, and some actors perform also more than one role.

4.4.1.1 Input Supply Stage

At this stage of the value chain, there are many actors who are involved directly or indirectly in agricultural input supply in the study area. Currently, DoARDO and some primary cooperatives are the main source of input supply. To some extent private input suppliers, rice growing famers, and Bonga Agricultural Research Center are also participated in such activity. All such actors are responsible to supply agricultural inputs like improved seed varieties, fertilizers, herbicides/pesticide, and farm implements which are essential inputs at the production stage.

District office of Agriculture and Rural Development (DoARD)

Regarding the delivery of inputs like; chemical fertilizers, herbicide/pesticide and farming tools, DoARD is the only actor responsible for the supply of such inputs in areas where there is no primary cooperatives. According to District Cooperative Promotion experts, out of the total 22 Kebeles of the study area, only 10 kebeles have primary cooperatives. Besides, it also plays a role in provision of improved varieties through purchasing either from research centers (BARC), seed multiplication agencies, farmers' cooperatives who are working in rice growing areas out of the study area, and individual rice producer farmers (investors). It distributed the purchased seed directly to farmers or primary cooperatives on a cash base by adding a transport cost.

Development agents are the main players in input supply activities at grass root level. Their role is different depending up on the presence or absence of primary cooperatives. In areas where there are primary cooperatives, they are playing facilitation role in collecting farmers' inputs demand and submitting it to the primary cooperative in their respective kebeles and DoARD. They also play the same role during input distribution. Whereas, in areas where there are primary cooperatives, besides collection of input demand, they are also fully responsible to distribute the input supplied and collect the money with the support of kebele administrations.

Primary Cooperatives / Union

In Guraferda, there are 10 primary cooperatives and one cooperative union at Mian Teferi town (center of Bench-Maji zone) that has been giving service to the farming community. The maximum number of primary cooperatives in two PAs is one. Primary cooperatives are playing an important role in the supply of input required for rice production. Fertilizers, herbicides/pesticides and improved seeds are the main inputs delivered. These inputs are supplied either in cash or in loan base. Officials from those primary cooperatives in the sample PAs indicated that, by considering the prevailing high rice seed demand among farmers and nearby DoARD in to consideration, they enter in to supply of improved rice varieties very recently by collecting seed from individual rice producing farmers. This was just to facilitate the diffusion of improved rice varieties. Based on input demand from primary cooperatives and DoARD, it undertakes input purchase following an auction process. Ultimately, it distributes the purchased inputs to the respective primary cooperatives and DoARD again to distribute to farmers.

Private Input Suppliers

Private input suppliers are also playing a limited role in the supply of agricultural inputs particularly of herbicides, accessories of pest controlling tools, etc. These suppliers are situated both at local and urban centers. As per farmers expression, due to problem of seasonal labor shortage and high wage rate especially at times of weeding, they have been using herbicides namely; 2-4-D. This helped them to reduce weed infestation and cost of labor both for land clearing and weeding. Hence, those suppliers provide them timely supply of herbicides on a cash base without moving longer distance at the required quantity.

Bonga Agricultural Research Center (BARC)

Even though BARC has no mandate to supply input directly, it was involved in such activity particularly of supply of improved seeds either directly to farmers (for demonstration and on-farm seed multiplication) or to DoARD to distribute among farmers in potential rice growing areas.

The regional food security office has also played role indirectly through provision of budget to the center so as to make researcher managed station-based seed multiplication. Accordingly, during 2012/13 cropping season more than 100 qtls of improved upland rice seed varieties namely SUPARICA-1, NERICA-3 and NERICA-4 were multiplied and delivered to Guraferda DoARD to scale up the production of rice in appropriate areas.

4.4.1.2 Production Stage

The small scale farmers are the key actors who are directly involved in rice production activities.

The farmers are largely found subsistence producing with very little rice for household consumption and for market. Thus, the scale of production is too small as per the potential of the area. According to MoARD (2012/13) the trend in the number of rice producing farmers, area allocated and production in the study area shows high increase rate especially since some six years ago.

4.4.1.3 Marketing Stage

In the area, there is no well-developed rice marketing system rather it is informal in type. The marketing actors are very limited in number. Currently, some primary cooperatives, farmer themselves and retailing farmers are identified as market actors. Primary cooperatives in sample PAs of this study are involved in purchase of improved rice seed varieties from rice producing farmers in their area and resell it to other farmers by adding some cost of transportation and storage. Furthermore, primary cooperative officials in Berji and Kuja PAs reported that they also sell the collected rice seed to other nearby areas (Dima, Mizan, Bonga and Jimma).

Out of the total sampled rice farmers (72) at the time of 2013/14 cropping season, 46 (63.9%) of the households sold their paddy rice in the local market, and the remaining 26(36.1%) of the respondents did not sell to the market. It is believed that these farmers consume what they produce and stored their produce for seed use. As can be seen in the table 4.6, from the total average amount of production (12.1154 qtls.), of 8.53 qtls (70.45%) was used for consumption and 4.21 qtls (34.78%) was sold. Total amount of rice that is marketed per household in 2013/14 was on average 193.86 quintal. This implies that farmers are producing rice mainly for consumption purpose.

Table 4.6 Average amount of rice produced, consumed and sold at a household level

Descriptive measures	Total amount of rice produced(qtl)	Amount used for consumption(qtl)	Amount of rice sold(qtl)
N	72	72	46
Mean	12.1154	8.5357	4.2143
Minimum	3.50	2.50	1.00
Maximum	24.00	24.00	14.00
Std. deviation	7.24613	6.35629	4.04168
Sum	872.31	614.5704	193.8578
%	**100**	**70.4533**	**34.78**

Source: computed from own survey, 2015

Farmers sold their production (paddy rice) to cooperatives, other farmers and some retailing farmers in their vicinity. Besides, some farmers also replied they sold to some urban consumers (restaurant owners). Among those farmers who sold rice, 52.17% replied that they sold to other farmers. The other 36.96%, 6.52% and 4.35% sold to primary cooperatives, retailer farmers and urban consumers (restaurant owners) respectively (table 4.7). According to farmers' focus group discussion participants, a kilo of rice seed was sold at 5-8 Birr/ kg at the local market in different seasons. When it was exchanged, farmers exchange one kilo of rice with 0.5 kilo of white teff or 2 kilo of sorghum. However, rice was not largely sold like any other crop in the market yet.

Table 4.7 Buyers of rice in Guraferda

Buyers of paddy rice	N=46	%
Famers	24	52.17
Cooperatives	17	36.96
Retailing farmers	3	6.52
Consumers	2	4.35

Source: computed from own survey, 2015

In addition, some private cereal traders and rural village petty shops were also involved in rice marketing. However, the rice that they sale is imported from other nearby areas like Jimma.

4.4.1.4 Post harvest processing (polishing, transportation, parboiling, storage, etc)

After harvesting, the paddy rice should be separated from its husk. Otherwise, it could not be used for consumption as well as market purpose. However, there were no enough/very few rice polisher machines

in the study area. Currently, grain/flour millers are the only actors who are involved in providing rice-polishing service by substituting the formal rice polishers. Farmers pay 1 Birr per kilo of paddy rice for the service they have. According to owners of millers, they polish the rice at zero gear and resulting in high percentage of broken milled rice. Thereby, the quality of rice milled is very poor. Hence, it is not used for market rather they used it for household consumption. This highlights a need to ensure the availability and installation of proper rice polishers near to potential production areas. In doing so, farmers will be encouraged to produce more and the produce can then be brought to market in sustainable way. Farmers use back of animals and manpower to transport rice in to the millers found in their surroundings.

Fig 4.1: Grain/flour mill used for rice polishing at Guraferda (photo by author)

Regarding storage of rice, the survey result shows that most of the sampled farmers store their paddy rice in; locally made storage bins called "gotera" which is made of bamboo tree plastered with mud. Other respondents used sack/bag in their home.

Parboiling of rice which is a hydrothermal treatment given to raw paddy, has been becoming well understood and common in traditional rice processing practiced in Guraferda with the help of MEDA Ethiopia. The parboiling techniques for paddy originated in India. It is now widely employed all over the world. It involves a hydrothermal treatment by soaking, steaming and drying before milling. Basically, this is done to gelatinize the starch, remove air voids from the kernel and heal the cracks. This process reduces milling breakage, facilitates disintegration of protein bodies, impacts hardness to the grains and makes them more resistant to pest. Parboiling is also important in reducing the losses of starch, vitamins, and minerals in cooking, destruction of infestation molds and insects, and inactivation of lipases to improve the shelf life of rice bran. As farmers and other value chain actors in the study area believed & told that, parboiled rice has developed some important characteristics like texture, flavor, colour, taste,

and ease of cooking. Farmers were given consideration on the sizes of the grains of paddy to be parboiled. It should be uniform and also from the same variety. This is important because the grain size determines the depth of which the water penetrates into the grain. The major material used for parboiling is the readily available 200 liters metal barrel made of galvanized sheet metal of 1.5 mm thickness (as shown in fig below).

Fig 4.2: Rice parboiling by model farmers at Guraferda to upgrade its market value (photo by author)

4.4.1.5 Consumption Stage

Rice consumers were two types; rural and urban consumers. The former includes producing farmers and other farmers those who did not have their own produce. Those farmers who did not have their own rice produce get it through purchase of paddy rice from other farmers or polished one from rural petty shop who retail imported rice from other areas. Among the total sample of respondents 89% responded that they have been using it for consumption. Majority (75%) of sampled households respond own production as a source of rice consumed.

The remaining mentioned either purchase of paddy from producer or polished one from rural petty shops (table 4.8). According to key informant farmers, the amount purchased is limited in quantity since the price is too high especially when purchased from rural shops. It cost about 12 Birr per kilogram of polished rice. They also indicated that they frequently use it to make various locally prepared foods such as soup, porridge, injera, bread, etc.

Table 4.8 Status and source of rice consumption

Variables	N=100	%
Rice consumption:		
Yes	89	89
No	11	11
Source of rice consumed:		
Own production	72	72
Purchased paddy rice from farmers	13	13
Purchased polished rice from rural petty shops	15	15

Source: computed from own survey, 2015

Currently majority of producer farmers use it for household consumption and little for the market mainly of as seed. They use it to make traditional Ethiopian foods like; "Injera" and " Dabo" either mixing with sorghum or alone, soup "Shorba", and couscous "Kinche". According to women key informants, before the introduction of rice, they utilized cereal (mostly sorghum and barley) for malt making. They obtained the barley from highland areas at high market price. Women farmers also explained that it helps them to save their time and energy consumption. Again, it is highly preferred for its high palatability, color (white) and good taste as compared to sorghum for household consumption. Sorghum is the most staple food in the area. Furthermore, they also used the rice straw for house construction (mixing of the chopped straw with mud) and for livestock feed or fattening. The urban consumers were very small in number since there was no polished rice in the study area. This is due to unavailability of rice polisher in the vicinity. Some restaurant owners in urban centers were also consumers of rice produced in the area.

4.4.1.6 Supporting actors

Such actors are those who provide supportive services including training and advisory, information, financial and research services. According to Martin et al. (2007), access to information or knowledge, technology and finance determines the state of success of value chain actors. DoARD, primary cooperatives, Omo MFI, Bonga agricultural research center and MEDA Ethiopia are the main actors who play a central role in the provision of such services.

Training and Advisory Service

DoARD, research centers and NGOs were the main source of rice training in the study area. The survey result revealed that 25% of sample respondents participated in rice training that was organized in the last

three years. Key informant DAs and SMSs from DoARD indicated that MEDA EDGET project was also played great role in facilitation of the training via provision of budget support.

Regarding advisory service, among the total sample farmers who used improved rice varieties (72), 37(51.39%) have been getting advisory service in the rice value chain. DoARD through its DA backed by the district subject matter specialist is the major actor who provides information and advisory service on rice production and management practices. Besides, Bonga agricultural research center, MEDA project field staffs and neighbor farmers/friends were also mentioned as source of information, advice and experience. Furthermore, farmers during the focus group discussion indicated that they are getting information particularly of input availability and price from primary cooperatives.

Sample of respondents also identifies the way how they have got the service. Majority of respondents mentioned farm-to- farm visit by DAs, visit to demonstration / model farmers' site and farmer- to- farmer information exchange around homestead as mechanism of getting the service.

Table 4.9 Advisory and technical information dissemination method

Mechanism of Advisory Service Provision	**Total**	
	N=37	**%**
Farm-to-farm visit by DAs	29	80.6
Visit to demonstration/model farmers sites	19	52.8
Training	11	30.6
Field day/experience sharing tour	9	25.0
Farmer-to-farmer exchange around homestead	16	44.4

Source: computed from own survey, 2015

Financial services

In the study area, primary cooperatives, and Omo Micro Finance Institute (OMFI) have been identified as a potential source for credit both in kind or on a cash base. The survey result showed that only 48% took credit but the rest did not take credit.

Table 4.10 Credit availability to the sample farm households

Did you get credit before?	Pas					
	Otowa-1	Berji	Kuja	Semerta	Total	%
Yes	12	6	12	18	48	48
No	11	17	14	10	52	52
Total	23	23	26	28	100	100

Source: computed from own survey, 2015

With regard to credit source out of 48 sampled farmers who took credit, 27.08% of the farmer get credit from Omo MFI, 85.4% get credit from service cooperatives. From a sample of 48 credit users, about 83.3% used the obtained credit to pay for hired labor and the other 41.7% and 47.9% used the credit to purchase plough oxen and to pay for rented in oxen respectively. About 16.7% used for seed and fertilizer purchase.

Table 4.11 Source and purpose of credit used by sample of respondents

Credit Source	N=48	%
Omo MFI	13	27.8
Primary Cooperatives	41	85.4
Neighbors	22	45.8
Credit Purpose		
Payment for hired labor	40	83.3
Purchase of fertilizer/seeds	8	16.7
Purchase of plough oxen	20	41.7
Payment for rented oxen	23	47.9

Source: computed from own survey, 2015

4.4.2 Attitude, Habit and Practices of Value Chain Actors

The prevailing attitude, habits and practices among actors have a significant influence on the patterns of interaction between them and tendency to innovate. Habits and practices also determine the way organizations respond to innovation triggers such as policy changes, or changing market and

technological conditions. Because habits and practices vary across organizations and across countries and regions, the identification of these habits and practices helps to tailor appropriate policies and incentives accordingly (Hall et.al, 2006). Besides, understanding of attitudes, habits and practices of actors is critical to designing effective intervention strategies as well. Hence, this section highlights few attitudes, habits and practices of factors that influence patterns of interaction, information and knowledge sharing, inclusiveness, and risk taking among main rice value chain actors in Guraferda.

Attitudes, habits and practices that lead to weak interaction, knowledge and information Sharing among actors

Organizations may fail to meet new objectives that require interaction because their traditional attitudes, habits and practices prevent interaction, and knowledge & information sharing (World Bank, 2006). A long tradition of limited responsiveness, top-down, hierarchical, non-participatory/ exclusiveness and less risk taking type of organizational culture, habits and practices lead DoARD to have weak interaction, knowledge and information sharing with the various actors along the value chain. They also influence its inclusiveness and risk taking habit and practices.

Bonga agricultural research center, primary cooperatives, and farmers in the study area do have negative attitude towards the extension services particularly, DoARD and DAs in their respective areas. For instance, farmers during focus group discussions and key informant interviews pointed out that long tradition of limited response to their needs, interests and services demanded; inability to keep the promises and commitments made; and absence of collective problem identification, planning, monitoring and evaluation opportunities were some the major reasons for their loss of trust in the DoARDO (SMSs and DAs). They also indicated that the advisory services that they provide are top down, irrelevant and infeasible, and both the experts and DAs have limited capacity to provide services. They often perform their duties ad hoc and there are no predetermined and agreed time frames for the execution of their activities. All such habits and practices of the extension poorly affect its interaction, and knowledge and information sharing with the mentioned actors.

Some key informants from DoARD indicated that the less responsiveness habits and practices emanate from its hierarchical and top-down/non-participatory approaches.

The planning process is top-down. The DoARD uses previous year plan as a benchmark to prepare current year annual plan without considering previous year implementation gaps, lessons learnt, and dynamic farmers need and interest. Then, the plan is submitted to Zonal Dep't of ARD. Based on new development direction and particular activities given by the regional government, the plan of the District

is also modified by the zone without considering the needs and interests of farmers, capacity of the DoARD and appropriateness of the task to the area.

This again put its own challenge on execution of the plan. Without knowing the potential of the area, needs of farmers, applicability and acceptance of the activity/technology to the area, the approved plan has been distributed to each kebeles. The DAs are also evaluated against the activities assigned to them and they are also forced to accomplish it. They in turn force the farmer to execute it. Thereby, it affects their interaction, knowledge and information sharing with farmers. Furthermore, there was no habit of joint planning and review, and share of responsibility with the presence of respective actors/stakeholders at a predetermined constant period. Every actor goes individually in their way to successes their mission as if they have different mission. Hence, lessons are not well taken to use them as a clue for the future directions. Everything is accomplished occasionally in a campaign form.

Similarly, both research and DoARD have awful attitude with each other. The linkage between research and DoARD is somewhat informal. Otherwise there is a need to get perdiem from research up on doing some collaborative activities in their mandate area. However, there is no room to entertain such a request from the side of research. Up on such a condition researchers were not reluctant to make a contact with the DoARD to incorporate and make research work participatory and interactive. There is limited awareness in the District experts about joint activities which are undertaken in their mandate area are their own responsibility. In turn this emanates from the shortage of budget in DoARD to pay perdiem for any work done with the request of others or plan of individual expert. Besides, they assume that research is in a better position than their host organization in terms of budget availability. Both in research and extension organizations there is bad traditions or effort made so far to work with the private sector.

Developmental activities specifically of agriculture have been undertaking in campaign form with the direction given from District cabinet. Here, according to key informants from DoARD, accomplishment of activities in campaign form might have a benefit from point of view of resource conservation and ability to reach maximum areas and target beneficiaries. However, the difficulty is nonagricultural professionals (like health, education, administrative, etc.) were included in the campaign team to execute agricultural activities without any prior knowledge particularly about the activity to be performed and agriculture in general. As a result, it discourage farmers and DAs, and loss their trust on such actors. These actors with their poor knowledge may lead farmers to take wrong decision and in turn lose faith on the agricultural professionals. On the other hand, even though there have been some recent efforts to make research work participatory, it is less participatory during problem identification and designing research agenda. This is the habit and practice mentioned for the existence of weak interaction,

knowledge and information sharing and participation. However, different participatory approaches were used at the implementation stage. Recently, research extension farmers' linkage advisory council (REFLAC) has been established at the zonal level. However, farmers, DAs as well as experts have limited representation. In the newly established BPR (Business Processing Re-engineering) experts are assigned to work on farmers' problem identification and communicating it with research.

In general, from the key informant interview with the different actors, internal hierarchies, top down cultures and approaches, absence of joint planning and review, limited scope and intensity of interaction among actors in sector, less responsiveness were mentioned as habits and practices that influence interaction, knowledge and information flow, learning and participation of possible stakeholders.

Attitudes and practices support good forms of interaction

In contrast to the above cases there were some attitudes, habit and practices that promoted good forms of interaction, knowledge and information sharing and participation of stakeholders among value chain actors. Research participant farmers have developed an encouraging habit of sharing of improved seeds, knowledge and information among farmers within and outside of their group and enhance their interaction in the area. Accordingly, the result of focus group discussion and key informant interview with various actors revealed that farmers have good habit and practice regarding knowledge and information sharing with other farmers in their vicinity. The survey result also confirms the validity of this. As described before, farmers were mentioned as main source of input particularly of improved varieties through farmer to farmer seed exchange mechanism.

BARC has tried to practice multidisciplinary, commodity based and participatory approach to incorporate all stakeholders in the development and demonstration of improved technologies in a way of farmers research and extension group, and participatory farmer-researcher managed research trial evaluation (both research and development activities). Hence farmers have good attitude towards research activities. Farmers have also good attitude to primary cooperatives. Focus group discussion participants reported that they have participated in planning, monitoring and evaluation of activities of the cooperative at a pre-determined period of time.

4.5 Innovations in Rice Value Chain and Their Immediate Outcomes in Guraferda

On-farm demonstration of improved rice varieties with their full extension package

The demonstrations of two improved rice varieties (i.e. SUPARICA-1 and NERICA-4) with their production package were conducted in Guraferda by BARC for three consecutive years from 2011/12-2013/14. The study aimed at introducing and giving awareness about the improved varieties with their

production package to farmers and extension personnel, and to collect farmers' feedback on the varieties as well as production package. Improved varieties with and without their production package (i.e. with and without fertilizer) were demonstrated on eight host farms with representative sites. The improved varieties without production package were used as a check since rice is a newly introduced crop to the area, there were no local varieties. Yield and economic data and farmers' feedback were collected from all sites.

The simple statistical analysis, partial budget and sensitivity analysis across all sites indicated that the improved varieties with their production package revealed higher yield advantage; percent yield increase and marginal rate of return over the check. Suparica-1 and Nerica-4 varieties with their production package showed 19.03 Qt/ha, 12.50 Qt/ha and 51.88 %, 39.06% yield advantage and yield increase over the standard checks respectively. The use of improved varieties(Suparica-1 and Nerica-4) with their production package gave a net benefit of 5,255 and 4,346 ETB/ha while the net benefit for the improved varieties without production package (without fertilizer) were 2,268 and 2,636 ETB/ha. The marginal rate of return for Suparica-1 variety against the standard(Suparica-1 without fertilizer) check were 382% and that of Nerica-4 variety showed 219% over the Nerica-4 variety without fertilizer. This implies that for one birr additional cost on the use of Suparica-1and Nerica-4 varieties an additional birr of 3.82 and 2.19 can be obtained after paying the input cost (BARC, 2013).

Field days and personal observations were undertaken to collect farmers' feedback. Improved varieties with their production package were preferred by the farmers since use of production package, especially fertilizer, helped minimize weeds' infestation in addition to yield increase.

Besides, the absence of rice polisher and termite production were the threats of the farmers for future wide dissemination of the technology (ibid).

However, farmers showed high interest to get and grow these improved seed varieties asking the availability of rice polisher in their surrounding as a prerequisite. In the meantime, by understanding the high yield of rice, the high potentiality of the area for upland rice and existing problems of the community, BARC had undertaken NERICA and other elite upland rice variety multi-location adaptation trials for three years with the collaboration of Ethiopia Institute of Agricultural Research. Among those released varieties NERICA -3, NERICA- 4 and SUPARICA-1 varieties have high yield advantage over the previously grown types. Based on the previous year's adaptation trial at Guraferda, the varieties gave yield of 45, 42 and 37 qt/ha respectively.

In order to fulfill local farmers' seed demand and address the problems immediately, and to enhance a sustainable rice production in the study area, team of researchers from BARC was focused and given

priority to increase farmers' access to their preferred variety through participatory on-farm seed multiplication and farmer-to-farmer seed exchange; deliver training on production package, and post-harvest handlings. Ultimately, it would result in a faster rate of adoption and diffusion of rice technology and increase farmers' income.

Participatory on-farm seed multiplication and dissemination

Though farmers showed high interest to grow rice, limited availability of and access to improved seed variety was one of the main problems identified to boost rice production in the area. Since there is no public or private organization, who were involved in rice seed multiplication and dissemination in the area, participatory on-farm seed multiplication and dissemination was used as a strategy to create appropriate and sustainable seed supply system and enhance farmers' access to improved seeds. In the process series of steps were followed; formation of farmers research and extension group as seed grower; delivery of training to farmers, DAs/supervisors and SMSs; and facilitation of seed dissemination via farmer-to-farmer exchange and primary cooperatives.

Training of SMSs, Supervisors/DAs and Farmers

Following the selection of rice growers, members of DoARD (SMSs, supervisors, DAs) and farmers were trained about quality rice seed production, management of both pre-and post-harvest activities. This enabled actors to provide technical backstopping when required. Prepared brochures and handout were also distributed to all participants.

Subsequently, the trained supervisors and DAs delivered training to other farmers at their respective FTC with the facilitation and support of DoARD, MEDA/EDGET project and BARC (ibid).

Meanwhile, various felt needs and problems of farmers which were related to rice production and dissemination were identified and discussed thoroughly. Besides, in an attempt to enhance farmers participation and ensure their involvement in all various phases of technology innovation process, joint planning was conducted on how and when to implement, monitor and evaluate project activities. Hence, host farmers, who are directly involved on seed multiplication activities, number and time of field days, and seed dissemination mechanisms were identified and agreed between members of each group in their respective locality.

Supply of Inputs (Fertilizer and Improved Seed) to Selected Seed Growers

Seeds of three improved rice varieties; NERICA- 3, NERICA-4 and SUPARICA-1; Urea and DAP were supplied freely to those farmers who are selected as a host for the seed multiplication activity. As a result, 5.4 quintals of seed were distributed to 37 farm households and 6.75ha of land was covered by those improved varieties. The seed growing farmers had got advisory service from both DAs and

responsible researchers on a periodic base. Accordingly, the data collected from all the sites showed higher yield performance of such improved varieties with their production package. NERICA-4 gave yield range of 28.6 - 38.3 qt/ha with an overall mean of 34.325 qt/ha. While NERICA-3 and SUPARICA-1 gave yield rage of 24.6- 32.5 and 24.2- 32.1 qt/ha with an overall mean of 30.425 and 28.325 qt/ha respectively. Hence, on average 30.425 qt. NERICA-3, 163.04 qt. NERICA-4 and 28.325 qt. SUPARICA-1(total of 221.79 qt.) seed could be produced.

Table 4.12 Mean grain yield of improved varieties in all seed multiplication sites, Guraferda district (2013)

Location	Mean grain yield of improved seed varieties		
	NERICA-3	NERICA-4	SUPARICA-1
Otowa-1	32.5	34.2	24.2
Berji	32.1	38.3	32.1
Kuja	32.5	36.2	28.6
Semerta	24.6	28.6	28.4
Overall mean	**30.425**	**34.325**	**28.325**

Source: BARC 2013

Promotion and Awareness Creation via Field Days

In order to assess farmers reaction about the improved varieties and practices associated with them, field days were organized at various cropping stages, specifically at vegetative and full maturity stages. In the meantime, farmers' feedback and reaction about the improved varieties and their production package were collected for better adoption. Performance of each variety was evaluated and selection criteria and preferred varieties were identified and documented. Participant farmers of all sites identified selection criteria mainly of spike length, tiller capacity, early maturity, seed color and grain yield. Based on such criteria farmers gave high preference to NERICA- 4. But they show high demand to have all the varieties. They also strongly commented that the amount of seed rate they used per hectare of land (68 kg) is very low. As to farmers explanation bird attack is severe during time of sowing since most of farm lands in Guraferda are in side forest and thereby trees are main shelter for birds. Accordingly, the effect of minimum seed rate was highly observed on most of seed multiplication sites.

In addition, farmers illustrated that a farm plot which was previously cultivated with sorghum will not be appropriate for rice rather plot previously cultivated with sesame and cotton will be conducive for rice production. According to their explanation in former case termite attack will become sever since the bulk sorghum/maize straw that left on the plot help the termites to stay and reproduce on the plot and then it

will attack rice seedlings. Whereas in the later case, the plot is a little bit clean and termite will not get favorable condition to stay on that plot and damage rice seedling. In general they determine what shifting cultivation they need to use with respect to minimum termite attack (**sorghum- sesame/haricot bean-rice)**. On the other side, both the farmers and DAs identified chronic problems that will hinder an effort to boost rice production and dissemination. Among them weed infestation, unavailability of rice polisher and sever termite attack were some of problems that the farmers need quick solution so as to increase rice production and dissemination.

Experience sharing tour

With financial support by MEDA Ethiopia, experience sharing tour was conducted for ten days (from 20-30 October 2013) at Chewaka District (low land rice producing area, Illubabur Zone). Consequently, 44 farmers, 12 DAs/supervisors and 4 SMSs were attendants of the experience sharing tour. The tour was aimed at sharing of experience on rice production, management, marketing and utilization of both the grain and its by-products. Accordingly, farmers from both areas exchange different ideas, knowledge and skill concerning about upland rice production system and package, rice polisher related issues like price of polishing machine, service charge and availability of spare parts, post-harvest handling, food preparation, utilization of byproducts of rice. Besides, farmers thoroughly discuss on pests (such as termite and bird) protection and management and various sorts of indigenous knowledge were shared among themselves.

Facilitation of provision of rice polisher

Since the absence of rice polisher was mentioned as a main bottleneck to expand rice production and hinder the value chain development repeatedly by all value chain actors, recently two rice polishers were given to two traders with the financial support in the form of subsidy (70%) by MEDA. Although the polishers are installed, it cannot yet start to provide service due to problems related to electric power access.

Scaling-out and up of rice technologies

Up on getting the multiplied seed and experience from all the aforementioned interventions, the District were engaged in scaling out of improved rice varieties in line with expansion of best practices strategy of the government. Currently the number of PAs which grow rice increase widely from seven (7) to sixteen (16), and the number of farmers growing rice increased dramatically. Besides, successive training in rice production, post-harvest practices and food preparation was given to farmers in various kebeles by different development partners.

4.6 Challenges, Opportunities and Entry Points for Innovation in Rice Value Chain at Guraferda

A number of challenges, opportunities and entry points for further technological, institutional and organizational innovation for upgrading the rice value chain in the study area were identified by the different value chain actors (input suppliers, producers, marketing actors, post-harvest processors" flour millers" and consumers) and key informants (extension workers, experts and officials, researchers, and NGOs) during the focus group discussion and key informant interview. In this subsection, the major constraints and opportunities are briefly discussed below.

4.6.1 Challenges:

This section looks at a comprehensive list of value chain constraints that were identified and easily observed by various chain actors

4.6.1.1 Producers

Lack of post-harvest processing technologies (rice polishing and threshing machines), severe termite attack, limited access to and supply of inputs(improved seed and herbicides), limited knowledge about post-harvest handling were identified as the main constraints for innovation by the farmers who uses improved rice varieties.

Lack of post-harvest processing technology

Many farmers during survey time expressed an interest in growing rice, but their interest to engage in it is closely tied with the presence of rice polisher. Currently, farmers use grain/flour millers or traditional mortar called "Mukecha" and stone mill "Wofcho" to polish paddy rice for their household consumption. During the focus group discussion, farmers pointed out that use of traditional mortar or stone mill will take much time and effort to polish, and also difficult to polish larger quantity at once. The flour millers could not also provide the rice and husk separately and the polished rice is fully crushed. This all have high wastage during processing and low quality product for market purpose. Thus, it highly influences the rice market development and consumers demand.

Limited access to and supply of agricultural inputs

The most important physical inputs for rice production are improved seeds, fertilizers, and herbicides. Research and extension services, information and appropriate technological support are non-physical inputs that are equally important for higher yields.

The ability to ensure maximum outreach of essential inputs to the producers will determine the success of an increase in rice yields and address food security (Ghimiray, 2007).

Farmers who participated both in interview schedule and focus group discussion identified limited supply of improved seeds as a major input related problem in their area. Among the total sample of respondents, 63.9% replied limited access and supply of improved varieties seed as their production problem. This caused mainly due to absence of responsible rice seed multiplying and distributing agency. According to focus group discussion participants and some key informants, even though an effort was made to distribute the seed via farmer-to-farmer exchange mechanism, it could not satisfy the increasing demand of farmers. Limited production coupled with late farmers' seed collection after they consume much of their paddy rice production were also cause for short supply of improved seeds.

Regarding the supply of fertilizer and herbicides, shortage of supply, high input price, inappropriate delivery mechanism and delayed supply were also reported as main obstacles. For the delayed supply of input particularly of chemical fertilizer and pesticide and herbicide, farmers criticized DAs for their delayed input demand collection from them. On the other side, DAs explained inability of farmers to reflect their input demand on time and prolonged input supply process/ chain as the main reason for the delayed delivery of inputs. As to DAs, delayed farmers input demand request emanate from lack of farmers skill to plan what to produce and how much to produce. In other words they did not know type of crop to be grown and type and amount of input they require. According to farmers explanation during focus group discussion, availability of plow oxen since they sold their oxen during off-season in fear of theft, unable to know the rain fall pattern since the existing rainfall condition affect farmers production and input utilization decision, unable to know exact input delivery price at a time of farmers input demand collection by DAs and cooperatives, were the main problems of farmers regarding delayed reflection of their input demand.

Sever termite attack

In the area there is problem of termite attack. It attacks the rice seedlings at early stage. The problem is more sever in red and drained type of soil. According to farmers, its incidence also associated with the intensity of rainfall. If there is high rainfall during early seedling stage of rice, its damage becomes a bit moderate.

However, if the rain stopped for some time it automatically started to damage the rice seedling. Out of 72 farmers who used improved rice varieties, 44(61.1%) identified severe termite attack as their production challenge. Currently, farmers tried to use their personal integrated experience/ traditional and indigenous knowledge to minimize its damage.

Some of the FGD participant farmers expressed that they tried to minimize its prevalence by leaving the weed in the furrow after weeding, and the others leave all the waste and weed out after weeding. The first group confirms that leaving the weed inside collect the termites and they use it as a feed so they will not go to the rice. The second group said it attract the termites and lead to damage of rice. On the other side, they also use appropriate crop pattern. Thus, the result highlighted that appropriate termite protection technology needs to be researched. In addition, the indigenous termite control mechanisms of farmers should also be studied in a more scientific way to come up with best recommendation.

Market problem

Almost all rice producers respond that there were market problems in the area. The major rice marketing constraints are related with non-availability of market/limited access to market, small number of market actors, low quality product (polished rice using flour mills) that can meet consumers demand, and absence of rice polisher. Furthermore, poor linkage with and less awareness of possible market actors (consumers, retailers and whole seller) about rice production in the area, etc,..were the other challenges identified by some key informants and focus group discussion participants for rice market development.

As a result, major portion of the total production was consumed and very little was sold as seed informally in the local market. In general, absence of rice polisher and inaccessibility of market information are the main causes for the existence of all the aforementioned market related problems.

Complex credit supply and repayment condition

Regarding credit utilization, farmers indicated that the credit obtained is not only used for rice production but also other crop production activities. Rice production requires high cost of production. Farmers used credit obtained for payment of hired labor, rented oxen, purchase of plough oxen and seed and fertilizer**.** They indicated that their sources of credit are Omo MFI, friends/relatives, and primary cooperatives. In order to see problems and importance of these credit institutions to farmers' situation, some analysis was done by taking into consideration criteria like interest rate, collateral requirement and the availability of the required amount of credit.

Omo MFI is one of credit institutions found in the District. FGD participants reported that the interest rate is so high and unaffordable to them. Besides, all farmers also complained on group collateral system. They explained group collateral problem as when some group members left away or failed to pay the loan, the group is forced to pay the loan made available for those group members. Out of the total 46 sample respondents who took credit, 32.6%(15) and 21.7% (10) respondents mentioned high interest rate and need of group collateral as a challenge in accessing credit from this institution. On the contrary, some

farmers during the FGD indicated that Omo MFI provides better amount of credit than other sources mentioned above. It provided up to ETB 5000.

4.6.1.2 Input Suppliers

As briefly discussed before, primary cooperatives, DoARD, private suppliers and farmers are the actors involved in supply of seed, fertilizer, pesticide/herbicide and farm implements. The main problems perceived by the key informants from all these actors are late supply of input, lack of transport, absence of adequate amount of capital to supply the input required, limited access to input market information, extended or prolonged input supply process. Key informants from Guraferda cooperatives and DoARD illustrated that lack of storage and transport facility and suitable road condition are the major constraints that they face to distribute to each PAs once the required inputs reach at the center (Biftu).

In the study area, input markets are relatively undeveloped, with inputs are not available at the right time, in the right quantities or at the right quality. During the key informant and FGD with input suppliers along the value chain; lack of timely input and output market information, inability to get farmers farm input demand on time like fertilizer, improved seeds, insecticide and pesticides, lack of on time input supply from high level suppliers, low access to some agricultural inputs were identified as the most pressing challenges.

4.6.1.3 Marketing agents

The numbers of marketing actors are very limited and they mainly participate in informal seed marketing. In case of primary cooperatives as marketing actor, limited capital availability, sometimes lack of information or linkage with potential rice seed buyers, unable to maintain seed quality (seed mix during purchasing) were the problems recognized. The absence of rice polisher was mentioned as the main obstacle to bring rice as tradable crop in the local market.

4.6.1.4 Consumers

Lack of rice polisher here also mentioned as the main challenge to rice for consumption. During focus group discussion with farmers, they believed and had developed the food habit for rice. In addition, the productivity was also very high and the market value was good enough to encourage production. However, the absence of rice polisher hinders the production and utilization of rice by farmers as well as by urban consumers.

4.6.1.5 Supportive actors

DAs in the sample PAs, and SMSs & officials from DoARD identified lack of technical skill on rice production and management, shortage of manpower who are specialized /have experience on rice production, absence of rice training and production manual, high work load with non- agricultural

extension activities (mostly of political), and lack of transportation and material facilities as main challenges faced to provide quality extension service. Lack of adequate budget and high staff turnover were also perceived as challenge by such actors. According to interviewed SMSs from DoARD, lack of incentives and flat management coupled with harsh environmental condition of the area are the main causes for high staff turnover.

From the side of research, key informant researchers from BARC mentioned presence of small number of experienced researchers who are working on rice research as a challenge to develop appropriate rice technologies and deliver technical back stopping for respective end users. Currently, there is only one researcher in BARC who is working on rice breeding research. The protection and agronomic research activities have been undertaken by researchers from cereal research program as a part time. Moreover, the key informants reported that, since rice is recently introduced crop and the researchers are also young and recently recruited, there is limited knowledge among the researchers about pre-and post-harvest handling of rice.

Officials from primary cooperatives in the sample PAs and Guraferda cooperatives also identified the major challenges that they encountered in carrying out of their role like; lack of adequate capital to supply input, participate in rice seed marketing and provision of rice polishing service; lack of transport facility to distribute input to each PA, and absence of storage facility. Furthermore, low educational level and managerial skill of primary cooperative committee members and their biasness to their personal business were pointed out as a cause for inefficient service provision of such cooperatives.

Table 4.13: Major challenges faced by rice producers at Guraferda

Challenges faced during rice production:	N	%
Production aspect (N=72)		
Sever termite attack	44	61.1
Absence of rice polisher	72	100
Absence of market demand	10	13.9
Crop diseases	55	76.4
Problem of input supply	30	41.7
Input supply aspect(N=72)		
Unavailability	5	6.2
Shortage of supply	17	23.6
High input price (costly)	15	18.8
Delayed supply	50	69.4
Inappropriate delivery mechanism	**10**	**13.9**
Marketing aspect (N=72)		
Non-availability of market/limited access to market	35	48.6
Lack of rice polishing machines	72	100
Low quality product (polished rice) that meet consumer demand	**72**	**100**
Institutional aspect (N=46)		
Limited supply of credit(in case of primary cooperatives)	46	100
Huge bureaucracy to access credit (Omo MFI)	5	6.2
High interest rate(Omo MFI)	15	32.6
Need of group collateral(Omo MFI)	10	21.7

Source: survey result, 2015

4.6.2 Opportunities

Increased awareness about and availability of improved rice varieties

The survey result, as discussed in the earlier sections, shows majority of sample of respondents have awareness about the availability of improved varieties. Due to improved farmer's awareness, the number of households involved in rice production and its yearly area coverage shows an increasing trend.

Accordingly 19.4% farmers respond the awareness and availability of high yielding and adapted varieties as an opportunity for innovation. Because of increased awareness, the number of farmers who grow rice also increased.

Favorable land and climatic condition

Guraferda is one of the potential areas of rice production in South-West Ethiopia. The survey result highlight 36.1% of respondents mentioned the availability of favorable land (nature of soil with its high water holding capacity) and climatic condition as an opportunity to grow rice in the area.

The area also possesses favorable environmental conditions for rice production. It has an altitude of ranging from as low as 850 to 1,995 m above sea level, annual temperature ranged between 20-39$_{o}$C, and mean annual rainfall more than 1,000 mm which is appropriate for rice production.

Presence of high consumer demand

Even though rice marketing has not been fully developed yet in the area, there is high rice demand for seed and grain both from farmers in the study area or neighboring areas. There is a growing demand for food self-sufficiency and food security since Guraferda is one of the main area under which resettlement activities are taking place. Furthermore, there is a change in awareness on the food value of rice in the study area as well as throughout the nation. Among the sample of respondents 25.0% and 79.2% reported the presence of high market demand and preference for household consumption respectively.

High productivity potential of rice

As indicated in table 4.14, high productivity potential of rice was mentioned as an opportunity for innovation by 62.5% of sample respondents. During focus group discussion, farmers compare rice productivity and food quality with sorghum and they prefer to grow rice. Farmers reported that rice has high productivity (more than 30 qt/ha) as compare to 15 qt/ha productivity of sorghum.

Ghimiray et.al (2007) confirms that higher yield potential is considered as an important factor particularly for farmers' innovation not only because it provides food security at household level but also because surplus production can be sold to generate cash for other expenditure.

Increased institutional support

The existence of various governmental, non-governmental and community based organizations, who are involved in the rice sector development in the area, is an opportunity for innovation. The availability of DAs at each PA and possibility of promoting rice technologies through FTCs' is a good opportunity. Use of active-model farmers in rice technology dissemination particularly of rice seed multiplication and diffusion is another opportunity to bring about organizational innovation. Following the decentralized

research system of the country, BARC is mandated to provide research service to the area. One of the main rice research stations of the center is placed here in the district and this is a good opportunity for continuous research service provision. The other opportunity is the existence of none governmental organizations like MEDA/ EDGE project. The project plays a great role in provision of budget support for various actors. It also facilitates experts and farmers training, and experience and knowledge sharing within and outside the district. Furthermore, existence of primary cooperatives at the grass-root level is another opportunity in provision of input, credit and market information.

Table 4.14 Opportunities/reasons for farmers to produce rice in Guraferda

Reasons for production decision	Respondents	
	N	%
Awareness and availability of improved rice varieties	14	19.4
Favorable land and climatic condition	26	36.1
Presence of high market demand	18	25.0
High preference for household consumption	57	79.2
Existence of technical and material support from GOs and NGOs	5	6.9
Need of crop diversification	11	15.3
Crop potential to provide straw for livestock feed	51	70.8
High productivity of the crop	45	62.5
High profitability of the crop	14	19.4

Source: survey result, 2015

4.7 Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis of rice Value Chain Development in Guraferda

Strengths

- Large number of farmers involved in cultivation
- High consumer demand of rice seed and grain
- Exchange of improved rice seed, knowledge and information among farmers and stakeholders
- Availability of some of rice varieties in the hands of farmers

Weaknesses

- Lack of knowledge of cultivation and post-harvest handling
- Lack of market information
- Poor market access
- Small number of market actors
- Low quality product(polished rice)
- Poor quality of input supply
- Poor and inefficient supply chain
- Limited infrastructure and electricity supply
- Lack of skilled people for the sub-sector
- Lack of post-harvest processing technologies (rice polishing and threshing machines)
- Limited access to and supply of input particularly of improved seed and herbicides
- High labor demand for crop management (weeding, harvesting and threshing)
- Late supply of input
- Lack of transport facility
- Absence of adequate amount of capital for cooperatives to supply input required
- Extended or prolonged input supply process

Opportunities

- Increased awareness about and availability of improved rice varieties
- Favorable land and climatic condition
- Presence of high consumer demand
- High productivity potential of rice
- Increased institutional support from GO/NGO
- Placement of DAs at the kebele level to provide technical backstopping to farmers

Threats

- Aggravated deforestation of the natural vegetation
- Severe termite, birds and diseases attack
- Higher weeds infestation rate
- Prevalence of trypanosome disease against livestock production

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This study tries to identify challenges, opportunities and entry points for infusing further innovations (technological, institutional and organizational) for upgrading the rice value chain; and the actors involved, their role, attitude, habit and practices, and linkage in the rice value chain in Guraferda, South West Ethiopia. It also analyzes the enabling environment and institutional arrangement that affect the functioning of the value chain, and recent innovation activities and their immediate outcomes in the study area. The study result revealed that there are multiple public and non-public actors involved along the ;rice value chain, upstream from input supply to downstream consumers, playing different role. They were; input suppliers, producers, traders, post-harvest processors, consumers and supporting (indirect) actors. Some functions or roles are performed by more than one actor, and some actors also perform more than one role. Their role is also changing over time. Farmers, DoARD, primary cooperatives, private herbicide/pesticide suppliers, and Bonga Agricultural Research Center were the main actors involved in the production, extension and research activities. Among these actors, BARC is the champion at the early stage of the rice development activities in the area. The center was involved in input supply, research undertaking, and seed multiplication & delivery of trainings. However, recently, the DoARD take the leading role in most of the scaling-up activities. Besides, new actor like MEDA/EDGET project was also evolved in the rice value chain at different times. As a whole, there is a dominantly acting by public sectors. The involvement of private sectors is very limited with the only involvement of private herbicide suppliers.

Findings also show that, though public service providers play what might be termed the central role in the rice value chain development, they mainly concentrate on the input supply and production stages. Significant innovation activities/ interventions were not taken so far at the other stages of the chain (post-harvest processing, marketing and consumption) by any of the supportive actors to upgrade the value chain.

The linkage between value chain actors is somewhat weak and informal in type. There is no any plat-form or responsible body who is working for effective and efficient linkage between value chain actors. However, there is strong linkage among some actors like; farmers with farmers, and farmers with primary cooperatives. Similarly, there were good and weak attitude, habit and practices.

Farmers have high trust to other farmers, cooperatives and BARC for their timely service provision and share of experience, input and information. In contrast, they do not have trust and good attitude towards DoARD staffs due to their efficiency, inability to hear about farmers demand, encourage farmers to

participate and make a decision on the development interventions which will take place in their surroundings.

Absence of rice polisher was the most prominent constraint in all phases of the value chain; production, marketing, post-harvest handling and consumption. Currently, rice is processed using the flourmill or traditional stone mill; resulting in high percentage of broken milled rice, high processing loss and low quality product. This in turn leads to low consumer demand, decreased farmers' income and ultimately discourage farmers to produce more.

Therefore, acquiring the actual rice polisher near to production areas can benefit the farmers and help the value chain to develop. Accordingly, the value chain is not yet developed and still young. Sever termite attack, shortage of improved seed and limited availability and delayed supply of inputs specifically of herbicide and fertilizers were also the main challenges faced in the area. On the contrary, increased farmers interest and awareness about rice production system, availability of high yielding-adaptive seed varieties, potential soil and climatic conditions and presence of high attention and support from both GOs and NGOs were the available opportunities that encourage the development of rice value chain in the area.

5.2 Recommendations

Given the potential of the area for rice production and its significant contribution to ensure food security and self-sufficiency as well as source of additional income for farmers in the study area, these major findings suggest several points for further consideration

Encourage the involvement of private sector in the development of rice sector in the area: the rice value chain in Guraferda is highly dominated by the public and less efficient CBOs. The service delivered by such organizations could not satisfy the needs of farmers and other value chain actors. More precisely, there is less efficient serv;ice provision in the area of rice polishing and input supply. Hence, the public sector should play a role in creating an enabling environment (long-term credit availability, policy support, etc.) for the private sector to entertain in such areas.

Development of rice processing facilities: absence of rice polisher is the most frequently cited problem by all actors in the locality. Currently, rice is processed using the flour mill or traditional stone mill; resulting in high percentage of broken milled rice, high processing loss and low quality product. This in turn leads to low consumer demand, decreased farmers' income and ultimately discourage farmers to produce more. Acquiring the actual rice polisher near to production areas can benefit the farmers and help the value chain to develop. Its presence significantly increases the demand for rice and can attract thousands of farmers to cultivate rice and increase their livelihood. The polishers can also act as rice collection, whole selling and retailing centers. This, again, will help the rice market to develop, to increase the participation of various market actors (retailers, whole sellers, etc) and consumers to get and consume polished rice. Ultimately, all chain actors benefit from the development of the sector.

Intervention to increase production and productivity of rice: The quantity of rice produced at the farm level affected marketable supply, household income, and it contribution for food security and self-sufficiency positively and significantly. It can also affect profitability of rice polisher service provision. Accordingly, increasing production and productivity of rice should go hand in hand with development of processing facilities. Thus, all stakeholders especially the agriculture extension needs to carry out more aggressive on promotion or scaling out/up of improved rice technologies for visible impacts through development of appropriate mechanism for input delivery.

Promoting on farm seed production and farmer-to-farmer exchange mechanisms: since there is no seed multiplying agency in the area, it is better to engage in on-farm seed multiplication and dissemination via farmers seed grower group organization and facilitating farmer-to-farmer seed exchange mechanism.

Enhanced capacity building activity: Continuous training should be arranged and delivered on rice production, management, pre-and-post harvest handling and food preparation techniques to farmers and service providers to create sustainable technical backstopping when required. Furthermore, some effort should also be exerted to improve the leadership ability, knowledge management and information/data documentation and management of officials and staffs especially actors at grass root level (DoARD and cooperatives).

Strengthening the linkage/interaction among value chain actors: There is a need to change the mindset of actors, i.e. developing a wide set of attitudes & practices. In particular, positive attitudes toward partnership, interaction, networking and learning need to be nurtured among main actors in the value chain. In line with changed attitude and practices of actors, there should also be plat form or partnership that holds all actors together to interact.

6. REFERENCES

1. Agri-food Consulting International (2002) Rice Value Chain Study: Cambodia. A Report Prepared for the World Bank. Phnom Penh, Cambodia. Agrifood Consulting International.
2. Anandajayasekeram P, Dijkman J and Workneh S. 2006. Innovation Systems Approach and Its Implication to Agricultural Research and Development. Presentation made at the Southern and Eastern African association for farming systems research-extension(SEAAFSRE), Lilongwe, Malawi, 19–21 September 2006.
3. Anandajayasekeram P and Berhanu Gebremedhin. (2009).Integrating Innovation Systems perspective and value Chain Analysis in Agricultural Research for Development: Implications and Challenges. Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project Working Paper 16. ILRI (International Livestock Research Institute), Nairobi, Kenya.
4. Anteneh Girma. 2008. Dairy Services Delivery in Debrezeit Milk shed of Ada'a District, Central Ethiopia: Analyzing Options to Develop Pluralistic Service Delivery in the Dairy Sector. M.Sc Thesis. Department of Rural Development and Agricultural Extension, School of Graduate Studies, Haramaya University.
5. Azage Tegegne, Tesfaye Mengistie, Tesfaye Desalew, Worku Teka and Eshete Dejen. 2009. Transhumance Cattle Production System in North Gondar, Amhara Region, Ethiopia: Is It Sustainable? IPMS (improving productivity and market sucess) of Ethiopian farmers' project.Working paper no. 14. ILRI(international livestock research institute), Nairobi, kenya.
6. Biruhalem Kassa and Dessalegn Molla. 2007. Pre Extension Demonstration of Improved Rice Varieties (Kokit and Tigabie) with Their Full Extension Package in Metema. ARARI, Bahir Dar.
7. Bammann, H. 2007. Participatory Value Chain Analysis for Improved Farmer Incomes, Employment Opportunities and Food Security. Pacific Economic Bulletin, Vol 22, No. 3, Apia.
8. Bonga Agricultural Research Center, 2013. Establishment of Rice Seed System Thorough Participatory On-Farm Seed Multiplication and Dissemination in Guraferda Woreda, South-West Ethipia. Progress report, Hawassa.
9. Conroy,C. 2008. The Nature of Agricultural Innovation. In: Sieglinde S. S and Barry P (eds) Agricultural Systems: Agro Ecology and Rural Innovation for Development. Academic press Inc., London.
10. CSA (Central Statistics Authority). 2003. Statistical Report on Area and Production of Crops.Part II-A. Addis Ababa, Ethiopia

11. CSA. 2007. Federal Democratic Republic of Ethiopia. Central Statistical Agency. Agricultural Sample Survey 2006/2007. Addis Ababa Ethiopia.
12. Degnet Abebaw, Belay Kassa and Aregay Waktola. 2001. Adoption of High Yielding Maize Varieties in Jima Zone: Evidence from Farm Level Data. Ethiopian Journal of Agricultural Economics, Vol 5, No. 1&2, 2001.
13. Dessalegn Molla. 2008. Social Networks and Diffusion of Agricultural Technology: The Case of Sorghum in Metema District, North Gondar, Ethiopia. M.Sc Thesis. Department of Rural Development and Agricultural Extension, School of Graduate Studies, Haramaya University.
14. Edquist, C. 1997. Systems of Innovation Approaches: Technologies, Institutions and Organizations(eds). London
15. FAO (2004). Production Yearbook, Volume 50, Rome.
16. FAO (2009). National Rice Development Strategy in Ethiopia. Paper Presented on Workshop, Kampala, Uganda.
17. Getachew Afework(2000). Rice Adaptation in Metema District, North Gondar Zone of ANRS, BoA, Bahirdar.
18. Ghimiray M., Wangdi K., Chhetri B.G., Bockel L. and Punjabi M. 2007. Rice Commodity Chain Analysis. FAO, Rome.
19. Hall, A.J., L.K. Mytelka, and B. Oyelaran-Oyeyinka. 2006. Concepts and Guidelines for Diagnostic Assessments of Agricultural Innovation Capacity. UNU-MERIT Working Paper Series 2006-017. Maastricht: United Nations University–Maastricht Economic and social Research and training centre on Innovation and Technology.
20. Hellin J. and Meijer M(2006). Guidelines for Value Chain Analysis
21. IPMS (improving productivity and market success) of Ethiopian farmers project. 2005. Metema Pilot Learning Site Diagnosis and Program Design. Available on. http://www.ipmsethiopia.org/Pilot-Learning-Sites/Metema.asp. Accesed on March 2010
22. Jjang j(2009). Innovation as a Key Factor for SMEs Development.
23. Kaplinsky R and Morris M. 2001. A Handbook of Value Chain Analysis. Working Paper prepared for the IDRC, Institute for Development Studies, Brighton, UK.
24. Kibwika P**.** 2006. How Public Policies Enhance or Impede Agribusiness Innovation: A Study of Fish, Banana and Vegetables Value Chains in Uganda. Uganda.

25. KIT, Faida MaLi and IIRR. 2006. Chain Empowerment: Supporting African Farmers to Develop Markets. Royal Tropical Institute, Amsterdam; Faida Market Link, Arusha; and International Institute of Rural Reconstruction, Nairobi
26. MoARD(Ministry of Agriculture and Rural Development), 2010. National Rice Research and Development Strategy of Ethiopia, Addis Ababa, Ethiopia.
27. MoARD 2012/13. National Crop Productivity vs Area Coverage (annual report), Addis Ababa, Ethiopia
28. MoFED(Ministry of Finance and economic Development), 2002. Ethiopia; Sustainable Development and Poverty Reduction Program, Addis Ababa.
29. MoFED . 2005. Ethiopia: Building on Progress; A Plan for Accelerated and Sustained Development to End Poverty. Addis Ababa, Ethiopia.
30. Nigussie Showatatek Zena, Zewdie G/Tsadik, and Tareke Berhie(2008). Moving Up in Ethiopia Rice Today, October-December, 2008.
31. OECD(1999). Managing National Innovations Systems, Paris, OECD.
32. Rajalahti R, Janssen W and Pehu E. 2008. Agricultural innovation systems: From diagnostic toward operational practices. Agricultural and Rural Development Discussion Paper 38, World Bank, Washignton, DC, USA
33. Sarantakos S(1998). Social Science Research.
34. Tareke Berhie(2003). Rice: A High Potential Emergency and Food Security Crop for Ethiopia. Report no. 2, SG-2000/guinea agricultural project/, Republic of Guinnea.
35. World Bank (2006). Enhancing Agricultural Innovations: How to Go Beyond Strengthening Research Systems, World Bank, Washington DC, USA.
36. World Bank (2009). Gender in Agriculture Sourcebook. Washington, DC, USA

7. APPENDICES

7.1 Interview Schedule for sample farm household

Instruction/guide:

- ⇒ Make a brief introduction to each farmer before starting the interview; greet them in the local way, know each other and ask his/her name, tell them about the purpose of the study
- ⇒ After greeting, please ask each question so clearly and patiently until the interviewee well understand
- ⇒ Please fill up the interview schedule according to the farmer's reply(avoid putting personal opinions)
- ⇒ Do not try to use technical terms, please while discussion with farmers and do not forget to use/record the local unit
- ⇒ Prove that all questions are asked and filled in the interview formats
- ⇒ Finally leave farmers with words of thanks

General information:

Name of respondent: ----------

Woreda/district: ----------

Peasant Association (PA):----------

Name of village/got: ----------

Date of interview: ----------

Name of enumerator: ----------

Signature of enumerator: ----------

Questionnaire code: ----------

1. Demographic characteristics of sampled respondents:

No	Name of HH members(use the first name only & start with the HH head)	Relation with the head of HH	Sex	Age	Marital status	Education level	Occupation
1							
2							
3							
4							
5							
6							
7							

HH= house hold

2. Farm characteristics and rice production condition

2.1 Farm size:

2.1.1 Do you own arable land? Yes ……. No……. (Make a right mark)

2.1.2 How much hectare of land do you have? Arable land…… Grazing land……

2.1.3 How much you have hectare of rented in (cash/ share) arable land……rented out arable land……..

2.2 Livestock ownership:

Types of livestock	Number
Cattle(ox, cow, bull, heifer)	
Equines(donkey, mule, horse)	
Goats/sheep	
Poultry(hen, coke, chickens**)**	
Bee colonies	

2.3 Rice production

2.3.1 Are you aware of the existence of improved rice seed varieties which can grow in your environment? Yes…..No….

2.3.2 When did you first hear about the improved seed varieties?

2.3.3 Have you ever used such varieties before? Yes……No….

2.3.4 If yes, why did you decide to produce rice?

- Awareness and availability of the improved rice varieties
- Favorable land and climate condition
- Presence of high market demand
- High preference for household consumption
- Existence of technical and material support from gov't and NGO's
- Need of crop diversification
- Crop potential to provide straw for livestock feed
- High productivity and profitability of the rice crop
- Others (specify)……

2.3.5 How much land have you allocated for rice production from your total owned/sharecropping/rented land in the previous cropping seasons?

Production year	Total land holding size(ha)	Arable land covered by rice(ha)	Seed varieties used	Average yield(qtl/ha)
2012				
2013				
2014				

2.3.6 What are the challenges that you faced in producing and using rice seed varieties before?

……

……

……

……

……

……

2.3.7 If you are aware of the existence of improved rice varieties and still you have not been used it, do you plan to produce the rice in the coming cropping season? Yes……..No……

2.3.8 If yes, why will you produce?

2.3.9 If the answer for above question is no, why have you decided not to produce the improved rice crop?

- Unavailability and low access to improved rice seeds
- Limited knowledge about rice production since the crop is new to the area
- Non-availability of rice thresher and polishing machines in the area
- Absence of land with suitable soil properties for rice production
- Fear of pest attack(termites, ants, etc)
- Low access to inputs(fertilizers, pesticides, etc), credit and extension service
- High labour required for farm management activities
- Non-availability/limited access of market
- Others (specify)……..

2.3.10 what suggestions do you have to tackle such challenges and enable you to produce & benefit from rice production?

……

……

……

……

3. Production Services:

3.1 Input supply:

3.1.1 Have you ever used agricultural inputs (improved seeds, fertilizers, pesticides, farming tools, etc.) for the production of improved rice crop? Yes….No……

3.1.2 If no, what was the main reason behind?

3.1.3 If yes, which type and from which source did you get such agricultural inputs in the rice production process?

No	**Type of inputs used**	**Sources**	1. Cooperatives/unions 2. Local market in/outside the village 3. Research centers 4. NGO 5. Private suppliers	6. Neighbor farmers 7. Friends/relatives 8. Others(specify)
1	Improved seeds			
2	Fertilizer			
3	Pesticides			
4	Farming implements			

3.1.4 Why did you prefer the chosen sources to get the needed inputs?

3.1.5 How did you get the input from the mentioned sources?

No	Type of inputs used	How	1. Through purchase 6. Others(specify) 2. On credit bases 3. In kind 4. As a gift 5. Through exchange
1	Improved seeds		
2	Fertilizer		
3	Pesticides		
4	Farming implements		

3.1.6 Do you always get inputs at the right time? Yes…….No…….

3.1.7 If no, what are the reasons?

3.1.8 Do you always get inputs in the quantities that you need every year? Yes…….No…….

3.1.9 If no, why?

- ✓ Unavailable I am not sure of the benefit
- ✓ Too much expensive Not available in time
- ✓ Shortage of cash Others (specify)

3.1.10 Have you encountered problems in accessing these inputs? Yes…….No……..

3.1.11If yes, what are the problems?

No	Type of inputs used	Problems
1	Improved seeds	1. unavailability 2. Supply shortage 3. Costly 4 Remoteness of inputs market 5. Others(specify)
2	Fertilizer	
3	Pesticides	
4	Farming implements	

3.1.12 How did you solve these problems?

3.2 Access to credit:

3.2.1 Did you borrow money for rice production before? Yes……No……..

3.2.2 If yes, from where and for what purpose did you collect the credit?

Source of credit	**Reason for loan received and used**
Omo Microfinance Institute	1. Payment for hired labour
Cooperatives/union	2. Purchase of seeds, and fertilizers
Banks	3. payment for farm implements and other inputs
NGO's	4. Payment for rented oxen
Private money lenders	5. Others(specify)
Relatives, neighbors	
Idir, Iqub, etc	

3.2.3 If your answer for the above question is yes, have you paid the loan? Yes……No……

3.2.4 If the answer is no, what is the reason?

3.2.5 Did you face any problem in accessing credit? Yes……No…….

3.2.6 If yes, what was the problem?

- ✓ Limited supply of credit
- ✓ Huge bureaucracy
- ✓ Limited access to transportation
- ✓ Others(specify)

3.2.7 How did you solve the problems?

3.3 Information/Knowledge flow:

3.3.1 Training:

3.3.1.1 Have you ever participated in rice production system training in the last three years? Yes…….No……

3.3.1.2 If no, why?

3.3.1.3 If yes, on which aspects, by whom and for how long you have got the training?

No	**Type of training**	**By whom**	**How long**	**Year**
1	Rice seed multiplication			

2	Pre-harvest farm mg't practices of rice production			
3	Rice market dev't			
4	Rice food preparation techniques			
5	Post-harvest handling of rice crop			
6	Utilization of rice byproducts			
7	Others(specify)			

3.3.1.4 Was the training you get easily understandable and practicable? Yes……No…….

3.3.1.5 Was the information/knowledge you got through training useful? Yes…….No……

3.3.1.6 Which aspects were not useful?

3.3.1.7 Were you able to employ the new knowledge you acquired? Yes……No…….

3.3.1.8 If yes, what? If not, why?

3.3.2 Advisory service:

3.3.2.1Did you get advisory service on rice production practices before? Yes……No……

3.3.2.2 If no, why?

- No service provider agency in the nearby area
- Possessed the required information
- Availability of contact farmers
- Do not have time to get the service
- Others(specify)

3.3.2.3 If yes, for how long do you get the service?

3.3.2.4 Who provides the advisory services?

Development agents/Woreda agriculture office

- Research centers
- NGO's
- Neighbors/friends
- Others(specify)

3.3.2.5 How do you get the advisory service?

- ✓ Farm to farm visit by DA's/experts

- ✓ Visit to demonstration sites for model farmers
- ✓ Training
- ✓ Field day/experience sharing tour
- ✓ Others(specify)

3.3.2.6 How frequent were you visited by DA's/gov't experts last year?

- Once per month
- Twice per month
- Three times a month
- Weekly basis

3.3.3 Research:

3.3.3.1 Source of rice production, marketing and consumption research/innovation in your area?

- ✓ Bonga/Tepi Agricultural Research Center
- ✓ Zonal/Woreda Agriculture offices
- ✓ Projects/NGO's
- ✓ Others(specify)

3.3.3.2 Have you ever participated in problem identification and/or research-planning? Yes……No…….

3.3.3.3 If yes, specify the organization and year?

3.3.3.4 What are the technology types/services that you get from BARC?

- o Provision of improved seed varieties
- o Training
- o Advisory services
- o Information
- o Others(specify)

4. Marketing

4.1 Did you sell improved rice seeds/grains before? Yes…….No…….

4.2 If no, why you did not sell?

4.3 If yes, how much and to whom did you sell your production?

	Quantity for HH	**Amount sold(Qtl)**	**To whom sold**	**Where it sold**

Total production(Qtl)	**consumption (Qtl)**	Seed	Grain		
				• Other growers as seeds/food grain • Consumers • Intermediaries/traders • Retailers/wholesalers • Others(specify)	✓ Farm gate ✓ In the market to whole sellers/retailers ✓ Retailing yourself ✓ Others(specify)

4.4 Why have you preferred the mentioned consumers/markets to sell your production?

4.5 Distance of market center from you home/farm? And the time it will take?

4.6 Means of transportation

- ✓ Vehicles
- ✓ Back of animals
- ✓ Manpower
- ✓ Others(specify)

4.7 If you were used vehicles, was it easily accessible? Yes……..No……

4.8 If you were not used vehicles, why?

4.9 Was there any other problem you faced in rice marketing? Yes…….No……..

4.10 If yes, what was the problem?

- Lack of market information
- Poor linkage with other value chain actors(retailers, traders, consumers, etc)
- Low consumer demand
- Non-availability/limited access to market
- Low quality product that meet consumer demand
- Absence of rice polisher
- Market distance

- Absence/limited access to transportation
- Others(specify)

4.11 How did you solve these problems?

4.12 Are there market related opportunities that motivate you to produce rice before and in the future time?

- High consumer demand for rice grain consumption
- High demand for rice seed by farmers in the surrounding area
- Presence of market demand out of the region
- Others(specify)

4.13 Linkage with commercial value chain actors

- ✓ Retailers
- ✓ Whole sellers
- ✓ Consumers
- ✓ Others(specify)

4.14 Are there marketing cooperatives/farmers organizations who are working on rice? Yes……..No…….

What kind of services do they provide?

4.15 Source of market information (both for input-and output marketing)

5. Consumption

5.1 Have you ever used rice for household food consumption? Yes……No……

5.2 If no, what is the main reason?

- ◊ Lack of skill/knowledge on how to prepare food recipes from rice
- ◊ Absence/ low access to rice
- ◊ Absence of sufficient production
- ◊ Lack of training
- ◊ Low preference as food (why?)
- ◊ Expensive to use it as household food consumption
- ◊ Others(specify)

5.3 If yes, how did you use it?

5.4 Why you prefer rice for food consumption?

5.5 Is there a rice polisher in your area?

5.6 If yes, how much is the distance from your farm/home to the processing center? How much time it will take to travel?

5.7 How did you transport the rice production from farm/home to the polishing/processing center?

- ✓ Vehicles
- ✓ Back of animals
- ✓ Manpower
- ✓ Others(specify)

5.8 If you were used vehicles, was it easily accessible?

5.9 If you were not used vehicles, why?

5.10 What were the main problems that you faced in using rice for food consumption?

5.11 What suggestions do you have to avoid those problems and enable you to use rice for food consumptions?

7.2 Interview Checklists for Focus group Discussion, FGD

7.2.1 Rice producers:

- ✓ When you did first introduce about improved rice seed varieties in your location?
- ✓ From where these improved varieties came from? Who first introduce you them?
- ✓ Trends of annual rice production (increasing, decreasing, etc)?
- ✓ Why you decide to produce/not to produce rice in your area?
- ✓ What are the challenges you faced in implementing the rice farm management practices (both pre-and post-harvest handlings)?
- ✓ How do you adapt the recommendation given by the extension or research institutions?

Input supply:

- ◊ Have you got the required agricultural inputs in quality, adequacy, timeline and price?
- ◊ From where and how you get improved rice seeds, fertilizers, pesticides and farming tools
- ◊ Which sources do you like to get those inputs? And why?
- ◊ Where do you get the rice seeds from? (If multiple sources, why?). Where do you prefer to get the rice seeds from? Why?
- ◊ What information do you have about the rice seeds?(Variety name, source, production vs consumption traits, etc)

- ◊ Is there a problem in getting these inputs?
- ◊ What do you recommend/suggest to alleviate the problems and get the service required?

Credit service:

- ⇒ From where you have got credit (formal vs informal sources), and which source is good for you and why?
- ⇒ What are the requirements/criteria to get credit from formal institutions (collateral requirement)? And what is your suggestion on the criteria?
- ⇒ In what condition you obtained the loan (individual, group, collateral bases), which one is good for you?
- ⇒ Which credit institutions are implementing group lending system?
- ⇒ What are the pre-determined criteria for group formation?
- ⇒ What is the interest rate? Is it good for you? If not why? Is there any difference in interest rate levels of these institutions?
- ⇒ When and how do you repay the loan you get (terms of repayment period)?
- ⇒ If not repaid on the due date, what actions did the formal lending institution take on you? What is your opinion on the action?
- ⇒ What limitations/challenges you encountered to get credit? And what alternative solution do you suggest?

Information/ knowledge flow:

- Where and how do you get information/knowledge and advisory services (training, demonstration, experience sharing tour, farm visit, etc) ?
- How do you evaluate the knowledge you acquired during such sessions?
- Have you adapted the suggested management practices to adjust to your farm and economic condition and also to the availability of inputs? If yes how?

Research:

- o What is your role in problem identification, prioritization and planning of research agenda in your area?
- o Which research center is working with you? What services have you got from the center?
- o What problems you observe from the work of research centers? What do you suggest to improve the quality of service delivery?

Marketing:

- ✓ To whom do you typically sell your rice seeds?
- ✓ How you sell your production as a seed or grain (specified market price, gift, exchange, etc)?
- ✓ From where do you get for both input and output market information?
- ✓ What are the challenges and opportunities you faced in input and output marketing?
- ✓ What alternative solutions do you suggest to alleviate the problems and use the available opportunities?

Consumption:

- ◊ Do you have enough knowledge about the rice food preparation and consumption? If yes, from where do you get such information/knowledge?
- ◊ What do you think about feeding quality rice in your area?
- ◊ If you are using rice for HH food consumption, how do you use it?
- ◊ What problems you encountered to use rice for HH consumption (for sale and food)?
- ◊ What do you feel about availability/absence of rice polisher and thresher?
- ◊ Have you attempted to get rice polisher in group by taking credit? If not, why?
- ◊ What alternative solutions do you have to improve the development of rice in your area?

7.2.2 Supportive Actors:

Organizational profile:

- Name of the organization
- Location and contact information
- Type of the organization(private, public, NGO)
- Mandate area/target groups of the organization
- Type and manner of the services provision

Role of the organization:

- What is the role of your organization in rice value chain dev't in the area?
- How you undertake those roles assigned to you (jointly with others or independently)?

Challenges and opportunities:

- What are the challenges you faced in undertaking those roles assigned to your organization (like shortage of supply of improved technologies, technical skill, human resource, finance, transport facility, field/office equipments, leadership, incentives, etc.) ?

- Opportunities available to execute your role and achieve good result in the dev't of rice in your area(high demand for rice technology, availability of improved production technology, institutional support, etc)

Patters of interaction:

- Linkage/interaction/partnership/coordination between actors
- Forms of linkage mechanism
- Strength of linkage(strong, medium, weak, and non-existence)
- Why linkage is strong/weak/ non-existence
- Linkage arrangement employed
- Factors constraining linkage between actors (policy, organizational, attitudinal and motivational)
- Are sector coordinating bodies present or absent? If present, are they effective?

Attitude and practice:

- Is there a habit of working with other organizations (private, public, NGO's, CBO's)? If there is, how you characterize the existing relationships(is there mistrust, competition, apprehension, distain, etc)
- How do you share knowledge with others?
- How you incorporate the needs and problems of your clients/target groups/ stakeholders?
- How you perform the planning process? Is it participatory/consultative/top-down?
- How you monitor and evaluate the performance of your activities? Is there a joint monitoring and evaluation program or not?
- How decisions are passed (with the participation of responsible bodies, managers decisions are made in isolation with others, etc)?
- How does the organization treat failure? As a learning opportunity or as something to be covered up? Is the organization very hierarchical?
- Is there a professional incentive like award for good work, promotion, etc? Are the criteria for promotion acceptable by the employees? Is it motivating or discouraging the employees?
- How do you feel about the work of other partner organizations/individuals who are working with you (mistrust, trustworthy, mutual respect, etc)?

Interventions conducted, time & executing organization, and immediate results obtained:

- What interventions you undertake in rice value chain development?
    - When did you intervene and what outcomes obtained?