The Agricultural Knowledge System in Tigray, Ethiopia

Recent History and Actual Effectiveness

Mamusha Lemma
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This study was financed by DAAD

DAAD
Deutscher Akademischer Austauschdienst
German Academic Exchange Service

MARGRAF PUBLISHERS
Mamusha Lemma
The Agricultural Knowledge System in Tigray, Ethiopia
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edited by
Hermann Boland, Volker Hoffmann and Uwe Jens Nagel

Bibliographic information published by „Die Deutsche Nationalbibliothek“

Die Deutsche Nationalbibliothek lists this publication in the Deutsche
Nationalbibliografie; detailed bibliographic data is available in the
Internet at http://dnb.ddb.de.

Typesetting and Layout
Mamusha Lemma

Graphics
Mamusha Lemma

Printing and binding
f.u.t. müllerbader gmbh, Filderstadt

Kanalstraße 21; D-97990 Weikersheim
www.margraf-verlag.de; info@margraf-verlag.de

ISBN 978-3-8236-1496-8
ISSN 0947-0352
D 100

MARGRAF PUBLISHERS
Preface of the Editors

In times of information societies, it is no more satisfying just to investigate the introduction and diffusion of innovations. Because, by doing so, it quickly turns out that innovation processes are interlinked with many actors in the agricultural knowledge and information system (AKIS). It’s structure, size and efficiency finally limits and somehow determines the possible progress in agricultural and rural development. Researchers in Wageningen, especially Niels RÖLING and his scholars made this perspective popular. But empirical research on such a wide subject is quite difficult, and despite a proposed tool box for analysis (RAAKS, Rapid Analysis of Agricultural Knowledge Systems), most studies were mainly descriptive, and did not reach deeper levels of analysis. One instrument is mapping, e.g. used by BLUM to compare the agricultural knowledge systems between Israel and the Netherlands, or the conditions in the “Dreiländereck” Switzerland, Baden-Württemberg and Alsace. But mapping alone does not assess system efficiency and does not tell much about improvements.

A first step into progress could be done by SEIBOLD (1995) published in this series, who worked on the agricultural knowledge system in the Département Cher in France. But his main interest was about outstanding farmers (the 50 best Agri-Managers), from which then he got a personal evaluation of the sources of information and advisory services. The work of Mamusha LEMMA here joins in, and he now is the first one to assess structure and efficiency of a geographically large knowledge system, the Tigray region in Ethiopia, in a way that responds to the stage of theoretical development of that field of research. He could develop and apply a complete methodology that enables him to come to relevant results and highly useful conclusions and recommendations. Maybe, without his foregoing knowledge about the situation and connections, as a citizen of the region and staff of Mekelle University, that would not have been feasible.

The key to successful research in this case was the choice of two significant districts and the use of a cascade of mainly qualitative interview methods, starting with narrative interviews with old people, going into focus group interviews on village level and ending up by triangulating these results with expert interviews.

His study shows that the formal and local knowledge systems are not really connected and that the extension strategies created vast damages, as well in the well-being of farmers as in the image of the extension agents. The new strategy is promising, but seen from the long history of failures with extension approaches, there is doubt if the improvements can be implemented this time and will reach down to farmers’ level.

Besides extension, the education system up to university level is considered, and useful suggestions are made how Mekelle University can improve its outreach and extension functions, thereby enhancing the practice orientation of teaching and research.

Mamusha LEMMA presents here an outstanding piece of research, and we are glad to publish it in our series. It merits widespread reception.

For the editors, Volker Hoffmann
Acknowledgments

First of all and above all, I praise God the Almighty and exalt His name for strengthening me in times of hardship and blessing me and my family to see the fruit of my work.

I would like to express my heartfelt gratitude to all who have contributed in various ways to the successful completion of my study. The German Academic Exchange Service (DAAD) and the Center for Development Research (ZEF) of Bonn University deserve a special gratitude for awarding me the scholarship and supporting my fieldwork respectively.

My sincere gratitude goes to my supervisors Prof. Dr. Volker Hoffmann and Prof. Dr. Werner Doppler without whom it would have not been possible for me to accomplish the study in its present form. I thank Prof. Hoffmann for his intellectual stimulation, professional guidance, and unreserved encouragement in the course of my study. I am also very grateful to Prof. Doppler for taking his precious time in reviewing the thesis. His constructive comments and suggestions have greatly contributed in improving the thesis.

The contribution of colleagues in the Institute 430A has also been very appreciable. I thank the Secretariat, Mrs. Nicole Flick and Mrs. Rosina Binder, for their unreserved support in administrative matters. My special thanks go to Dr. Maria Gerster-Bentaya and Dr. Helmle Simone for proof reading and translating the English summary into German. I also thank Helena Livitz, a visiting student from the University of Illinois at Urbana-Champaign, for her proof reading of the draft thesis.

I thank all the offices at different levels and the tabia administration and development agents for providing me the necessary information and assisting me in making appointments with farmers during the fieldwork respectively. My sincere thanks go to the farmers who willingly shared their knowledge and life experiences with me without it the study would have not been completed successfully. I would like to extend my special thanks to Mr. Alebachew Hagos of Kola Temben office of Agriculture and Rural Development for providing me secondary data and Mr. Illu Alemayehu of the Ministry of Agriculture and Rural Development (MoARD) for his hospitality and unreserved assistance during my visits in Addis Ababa. I am particularly grateful to Mekelle University for giving me a study leave and providing me with all the necessary support during my fieldwork in Tigray.

Finally, I wish to express my gratitude to my family to whom I had become a stranger in the house during my study. I dedicate this dissertation to my family with respect and appreciation.

Mamusha Lemma, Stuttgart-Hohenheim, February 2007
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<td>Agricultural Development-Led Industrialisation</td>
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<td>SG 2000</td>
<td>Sasakawa-Global 2000</td>
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<tr>
<td>BoARD</td>
<td>Bureau of Agriculture and Rural Development</td>
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<tr>
<td>REAC</td>
<td>Research-Extension Advisory Council</td>
</tr>
<tr>
<td>ATVET</td>
<td>Agricultural Technical and Vocational Education and Training</td>
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<td>FTC</td>
<td>Farmer Training Center</td>
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<td>AKS</td>
<td>Agricultural Knowledge System</td>
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<td>LA</td>
<td>Livelihoods Approach</td>
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<td>ISNAR</td>
<td>International Service for National Agricultural Research</td>
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<td>MPP</td>
<td>Minimum Package Project</td>
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<td>CPP</td>
<td>Comprehensive Package Project</td>
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<tr>
<td>PA</td>
<td>Peasant Association</td>
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<tr>
<td>MoA</td>
<td>Ministry of Agriculture</td>
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<tr>
<td>EMTP</td>
<td>Extension Management and Training Plot</td>
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<td>PADETES</td>
<td>Participatory Demonstration and Training Extension System</td>
</tr>
<tr>
<td>IAR</td>
<td>Institute of Agricultural Research</td>
</tr>
<tr>
<td>EPID</td>
<td>Extension Project Implementation Department</td>
</tr>
<tr>
<td>PADEP</td>
<td>Peasant Agricultural Development and Extension Project</td>
</tr>
<tr>
<td>RED</td>
<td>Research and Extension Division</td>
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<tr>
<td>RELC</td>
<td>Research-Extension Liaison Committee</td>
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<tr>
<td>TARI</td>
<td>Tigray Agricultural Research Institute</td>
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<td>CADLI</td>
<td>Conservation-based Agricultural Development-Led Industrialisation</td>
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<td>MoARD</td>
<td>Ministry of Agriculture and Rural Development</td>
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<td>PAP</td>
<td>Practical Attachment Program</td>
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<td>FAO</td>
<td>Food and Agriculture Organisation of the United Nations</td>
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<td>AKIS</td>
<td>Agricultural Knowledge and Information System</td>
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<td>AKIS/RD</td>
<td>Agricultural Knowledge and Information System for Rural Development</td>
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<td>TOT</td>
<td>Transfer of Technology</td>
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VIII
PTD  Participatory Technology Development
NGO  Non-Governmental Organisation
T&V  Training and Visit
TPLF  Tigray People’s Liberation Front
DoA  Department of Agriculture
BoANR  Bureau of Agriculture and Natural Resources
ESE  Ethiopian Seed Enterprise
CBE  Commercial Bank of Ethiopia
DECSI  Dedebit Credit and Savings Institution
EPRDF  Ethiopian People’s Revolutionary Democratic Front
EARO  Ethiopian Agricultural Research Organisation
FDANR  Faculty of Dryland Agriculture and Natural Resources
AISE  Agricultural Inputs Supply Enterprise
TAMSA  Tigray Agricultural Marketing Support Agency
Agricultural development is a social product. It is not the result of the work of farmers alone. It is a result of the activities of farmers and farm families, lawmakers, highway engineers, merchants, manufacturers, research workers, teachers, veterinarians, editors, and every citizen who participates in electing public officials and influencing the laws of his country.

— MOSHER 1966

1 Introduction

1.1 Background of the study

Agriculture is the basis of the Ethiopian economy. It accounts for over 50% of the Gross Domestic Product, 90% of the total export revenue, and employs 85% of the labour force. Despite its great potential, low productivity characterises Ethiopian agriculture. The average grain yield for various crops is less than one metric ton per hectare, and the productivity of the livestock sector is declining due to poor management systems, a shortage of feed, and inadequate health care services. Ethiopian agriculture has performed poorly and has failed to produce sufficient quantities to feed the rapidly growing population. As a result, Ethiopia has been a food-deficit country since the early 1970s, and food aid accounts for a significant proportion of the total food supply in the country (BELAY and DEGNET 2004). A host of factors contribute to this situation, such as inappropriate policy, weak infrastructure, decreasing size of farms, environmental degradation, drought, undeveloped support systems, and a low level of technological utilisation.

To improve this situation, the Government of Ethiopia designed an overarching development strategy known as the Agricultural Development-Led Industrialization (ADLI) which accords the highest priority to agriculture and the rural sector. Agriculture is the base for the overall development of the country, and central to this strategy is enhancing the productivity and income of farmers and improving food security through promoting the use of improved inputs and production methods. Within the framework of the ADLI strategy, the government introduced several policies and provided institutional and technical support to farmers. These policies included fertilizer and improved seed supply, credit provision, marketing services, development of small-scale irrigation, conservation of natural resources, and agricultural research and extension work.

The extension service is a key policy instrument which the Government uses to realise the objectives of its agricultural and rural development policy. Enormous efforts have been made to promote the use of improved technology packages along the lines of the Sasa-kawa-Global (SG) 2000 agricultural program in Africa. More recently, due to the prob-

1 ADLI is a long-term strategy in which agriculture and industry are brought into a single framework of development, wherein the development of agriculture is viewed as an important vehicle for industrialisation by providing raw material, a market base, surplus labour and capital accumulation. It depends on, among other key inputs, improved agricultural packages, proper use of land and water resources, access to improved rural finance, better functioning markets, better roads, basic health care and education, and improvement in the nation’s capacity to make these changes (PHELAN 2002).
lems and criticisms of the SG 2000-based extension program, new policy frameworks have occurred shaping the Agricultural Knowledge System (AKS) towards a more decentralised, coordinated and client-oriented system. This is because the policy reforms will bring changes in the mandate, organisation, working modalities, and cooperation scope of the AKS institutions.

Within the framework of the ADLI strategy, the Government issued a leading policy document entitled *Rural Development Policies, Strategies and Instruments* (FDRE 2001). The document advocates a market-oriented economic system and pursues the identification and development of commercialisation and export potentials based on the assets of the various regions and localities through an aggressive use of improved technology packages. In pursuance of this policy, new institutional developments have taken place to coordinate the efforts of different institutions at all levels. At the national level, the ministries of Agriculture and Rural Development have been merged to create an overarching Ministry of Agriculture and Rural Development (MoARD) that coordinates and oversees the activities of ministries and institutions involved in agricultural and rural development. Similarly, the Bureaus of Agriculture and Rural Development (BoARD) and their district offices coordinate and oversee the activities of various sectors and offices involved in agricultural and rural development at the regional level. Efforts are also made to organise farmers into service and producer cooperatives in order to enable them to demand and organise services effectively and efficiently.

Another key aspect of this new policy is human and institutional capacity building. A knowledge-based development strategy is central to developing the intellectual and institutional capacity to generate and harness knowledge in the pursuit of sustainable development and improved living standards. Research and education are integral parts of the overall development framework, and the Government is making enormous efforts to reform the education and training system and expand higher education in light of its contribution to the human capacity building of the country.

### 1.2 Research problem

The background to this study established that ensuring effective institutional coordination and integration is the utmost important development strategy, as well as a critical challenge in Ethiopia. The agricultural support infrastructure has not typically adopted participatory approaches and also has not realised all the potential synergies which close collaboration among various rural development actors may bring. Inherent to this problem is a lack of an explicit national AKS policy and strategic plan that would provide an overall direction to oversee the activities and approaches of different institutions at every level. All too often what is seen in the field as a lack of coordination in implementation is a result of uncoordinated policy and planning (WIGGINS 1986). Presently, this problem seems to be recognised, and new policy frameworks and institutional arrangements are in place.

---

2 Diversified and integrated household extension packages have been introduced to promote intensive production systems developed through agro-ecology based area specialisation and diversification in order to increase the productivity and incomes of farm households.
to coordinate and integrate agricultural and rural development efforts at all levels of government.

Although it is recognized that the links and relations among the AKS institutions are poorly understood (GOSHU 1994; EARTO 1999; ZEWdie 2004), empirical research on the subject only began recently in Ethiopia. Previous studies focused on individual knowledge system institutions (HABTEMARIAM 1997; BELAY 2003; BELAY and DEGNET 2004). While such studies have helped understand specific situations and inform subsequent actions, they generally fail to provide a systemic perspective for a better overview that highlights the linkages and information flows between policy, service, support and client systems. Detailed analyses of partial systems are less useful if the relations within the system as a whole remain unclear. Put another way, understanding only one of the components of a system does not adequately predict the behaviour of the system as a whole since the whole is more than the sum of the parts (METTRICK 1993, 48). How the main actors (policy, education, research, extension, the private sector, and farmers and their organisations) interact with each other, and how they can complement one another needs to be clearly understood and promoted.

The study tries to fill this gap by looking at what is particular and unique in the AKS of the Tigray region, with a particular focus on the extension service as a core component of the system, and its links to farmers and the wider system actors (policy, markets, input supply, research, education and training, information and communication services, etc.). This is because, out of all of the government agencies, the extension service is the only one reaching all the way down to the village level, so messages, as well as material goods, have to pass through extension if they are to get to farmers and their farm families. More specifically, the extension service is the one that facilitates the interplay and nurtures the synergy within the AKS, and this function makes it a central focus of this study.

AKS analysis offers a holistic view for understanding the factors that impede or enhance the flow of knowledge and information among the components that constitute the system. However, the holistic frame of the study does not allow a specific and deeper analysis of the functional performance of the components within the system.

1.3 Objective of the study

The overall objective of the study is to generate knowledge on the history, current status and future direction of the AKS in the Tigray region by reviewing and analysing its recent developments as a basis for assessing its actual effectiveness and formulation of recommendations for its improvement. The study inquires into the past and analyses the present situation, providing the basis for determining what AKS policy and strategy could be designed, and how it should be implemented in the Tigray region and elsewhere in the country. Having the perspective of the whole AKS, policymakers can specify the objectives and goals of sub-systems, indicate possible interactions, coordinate interventions, and institute a strong feedback loop.
Based on the problem described above, the study has the following specific objectives:

- To explore the history of local agricultural systems in order to identify influencing factors and interconnections, and explain implications for extension.
- To analyse the current situation of the extension service in order to identify factors affecting its effectiveness, and provide suggestions for its improvement.
- To assess the institutional collaboration and linkage situation in order to identify its weaknesses or strengths, and provide suggestions to improve its effectiveness or draw lessons that can be used elsewhere in the country.
- To assess the contribution of agricultural research, education and training in the AKS, and provide suggestions for its improvement or draw lessons that can be usefully used elsewhere in the country.

To fulfil these objectives, the following research questions are addressed:

- What are the forces affecting farmers’ past situation, and how do they influence the current situation? What are the implications for extension?
- How do farmers participate in the current extension program? What are the things that farmers consider when deciding whether or not to participate in the extension program?
- What are the major problems and challenges affecting the functioning of the extension program? How have these problems and challenges changed over time?
- How do farmers view development agents? What does this mean for the role and knowledge of development agents?
- How do farmers view model farmers? What does this mean for the selection and use of model farmers?
- To what extent can Research-Extension Advisory Councils be considered useful to improve the institutional coordination and linkage situation?
- To what extent do agricultural research, education and training contribute to improve the performance of the AKS? How can this contribution be enhanced?

Answers to these questions provide a better understanding about the existing situation and direction of the AKS in the Tigray region and will help policymakers design ways to improve its effectiveness. Farmers will ultimately benefit from this study if research and extension are better oriented towards their problems, needs and specific situation. Development agents will also benefit if the different actors involved in agricultural and rural development better understand their functional interdependency and the conditions shaping it, and what this means for their roles and development strategies.

1.4 Structure of the study

The study has seven chapters. In Chapter 2 the existing literature is reviewed in order to delineate the theories and concepts upon which the study is based. Section 2.2 deals with
concepts, models and functions of AKS as the main subject of this study. Section 2.3 focuses on local knowledge as a potentially new direction for research and extension, first by discussing the concept of local knowledge and its potential for development, and then reviewing the differences and similarities between local and formal knowledge systems. Section 2.4 provides an overview of the theoretical background of extension and the developments and challenges shaping extension.

Chapter 3 describes the methodological approach of the study. The study used narrative interviews and focus groups as the primary means of data gathering for analysing the overall performance of the AKS in the Tigray region.

Chapter 4 provides descriptive information on Tigray to acquaint readers with the socio-economic and bio-physical context within which the agricultural knowledge infrastructure operates. It briefly describes the policy environment which governs the operation of the AKS in Tigray. It also provides a historical overview of research and extension in Ethiopia, particularly in Tigray, as a basis for assessing the current situation of the extension service in the Tigray region.

Chapters 5 and 6 constitute the main parts of the study. Chapter 5 deals with the extension service, by exploring the changing nature of farmers’ situations (Section 5.2) as a basis for assessing its performance (Section 5.3) and the institutional and human capacity constraints surrounding it (Section 5.4). Section 5.5 analyses the recent policy frameworks and institutional developments, and how they could shape the development of the AKS. Section 5.6 deals with the inter-organisational field, assessing the institutional coordination and linkage situation in Tigray and highlighting the steps that are being taken towards developing an integrated AKS in the region, as well as in the country. From here, the section draws critical preconditions and success factors for improving the institutional collaboration and linkage situation in the Tigray region and throughout the country.

Chapter 6 deals with agricultural research, education and training in Tigray, focusing on the role of agricultural research and education in the AKS and the potential synergy that may arise from close collaboration between agricultural education, research and extension. The chapter examines the extension role of the Mekelle University and its Practical Attachment Program (PAP) which provides a critical link between its education, research and extension functions, as well as between the university and research and extension organisations. The chapter also deals with the organisation and performance of the Agricultural Technical and Vocational Education and Training (ATVET) program and the Farmer Training Centers (FTCs) in Tigray.

Chapter 7 summarises and synthesises the key findings and conclusions of the study. The chapter integrates the results of the empirical chapters and discusses the policy implications of the study. The chapter finally provides suggestions for future research.
There is nothing more practical than a good theory.
— Lewin 1951

2 Theory and Concepts

2.1 Introduction

The introductory chapter laid the foundation for the study. It introduced the background for the study, the research problem, the objective of the study and the research questions. This chapter presents the theoretical issues and concepts at the base of the study. The chapter is organized around three major topics: the AKS, local knowledge, and the theoretical background of extension.

2.2 Agricultural Knowledge System: concepts, models and functions

2.2.1 Concepts of a systems approach

The concept of a system is vital toward understanding the AKS. A system is generally defined as a set of components that act as a whole to achieve a common purpose or shared goal, and the characteristics of the whole arise from the relationships between the component parts. By considering something a system, one can observe the synergetic effect of the interaction of its parts (ROLING 1988,188).

All systems are composed fundamentally of networks of connected entities regardless of their size, function or level of complexity (HAVELOCK 1986a,77). As illustrated in Figure 2.1, organic systems require a specific differentiation of entities and connections into six elements or features: 1) boundary, 2) sub-entities or sub-systems, 3) sub-system connections, 4) an internal processing routine, 5) input, and 6) output (HAVELOCK 1986a,79).

Figure 2.1: Essential elements of an organic system

Source: HAVELOCK (1986a,79)
According to CHEMA et al. (2003, cited in RIVERA et al. 2005,12), systems analysis emphasizes four dimensions of a system: 1) system elements and structure, 2) system environment, 3) system linkages, and 4) system performance.

Another property of a system is the flow of inputs and outputs. The boundaries of systems are not completely closed, and allow for the survival of the systems through their permeability (HAYLOCK 1986a,85; CHIN 1966,206). The flow of messages (needs, problems, information and feedback) is vital for the systems to function smoothly. An interface is a device shared by systems or sub-systems to allow them to exchange inputs and outputs (ROLLING 1988,188). The connections between components may be strong or weak in many ways, for example, in the amount of messages they carry, the variety of messages they carry, the extent to which they influence the nature of either connected entity, their durability and their resistance to breaking influences (HAYLOCK 1986a,78).

Systems are arranged in hierarchies. As systems grow, the number of sub-systems within them also grows. Thus, the individual components of a system can be considered systems themselves, and the system can also be considered a component of a yet larger system (METTRICK 1993).

2.2.1.1 A systems approach to agricultural knowledge

Traditionally, agriculture has played a key role as a foundation for food security and industrial raw materials. The conception of agriculture has changed throughout time and continues to change, no longer seen as a sector in the narrower sense, but rather as a systems hierarchy, taking a constructivist perspective. Agriculture has multiple objectives, plays environmental, social and economic roles, and interacts with other sectors, requiring a cross-sectoral and holistic approach to the AKS. A new orientation is required for the AKS to respond to the ever-changing social and natural environment of agriculture. The innovation systems perspectives have become a popular approach to studying knowledge processes (SPIELMAN 2005; 2006a,b). A systems approach to agricultural knowledge is essential to understanding the complexity inherent in the agricultural knowledge process since it addresses the linkages between a multitude of actors, the performance of their relationships, and the social and institutional boundaries involved. In soft systems theory, reality is seen as a complex pattern of relationships among various actors, recognising a wider set of innovation sources and offering more inclusive ways of thinking about the actors and the institutional contexts in which the generation, dissemination and use of new knowledge takes place (SULAIMAN and HALL 2002).

Sectoral efforts in agricultural development usually single out a particular dimension of agricultural problems and fail to look at the full picture. In the TOT model, agricultural knowledge is treated as an input which has a definite beginning and end. This model assumes knowledge transfer is mechanical and neglects the transformation of knowledge at various levels. The systems approach is an effort towards shifting away from this conventional perspective, attempting to bridge the gap between the components of the AKS and acknowledging the multiplicity of actors in the knowledge process (BIGGS 1989a). Each actor plays one or more, often overlapping, tasks with functional interdependency (MCDERMOTT 1987). Therefore, in addition to farmers, researchers and extension, educa-
tion and training institutions, policy makers, private firms dealing with agricultural sup­port services, non-profit organisations, consumers, civil societies and others are now seen as important elements of the AKS (BACHMANN 2001). The various components of the AKS are no longer seen as isolated parts, but rather in interaction with one another. As NAGEL (1980,16) states, the process of information flow in agriculture is neither one-way nor does it have a definite beginning or end. Therefore, without adopting an attitude that everything is interconnected, the function of each element may not be fully understood without the other elements. Furthermore, the whole AKS is seen as interacting with its environment and with other knowledge systems, instead of an isolated entity.

The concept of AKS found its roots in the actor-oriented approach, stakeholder analysis, social network analysis, social learning theories and communications systems, and its underpinning ideas have been developed with crucial conceptual and practical developments. RÖLING (1988,34) described the historical roots and developments of AKS. LIONBERGER and CHANG (1970) used the systems approach in their analysis of the extension system in Taiwan. However, drawing upon the linkage model of HAVELOCK (1969), NA­GEL (1980) was the first to use the concept of AKS as an analytical tool in his analysis of the extension role of two agricultural universities in India. The International Program for Agricultural Knowledge Systems (INTERPAKS) at the University of Illinois at Urbana-Champaign and the Agricultural University of Wageningen in the Netherlands have played a leading role in developing the concepts and models of the AKS. More recently, FAO and the World Bank developed the concept further, going beyond the notion of merely linking public sector agricultural institutions, as a guiding framework for conceptualising and developing AKSs (FAO/WORLD BANK 2000).

One of the pioneers of the AKS perspective, Niels RÖLING, defines Agricultural Knowledge and Information System (AKIS) as ‘a set of agricultural organisations and persons, and the links and interactions between them, engaged in such processes as the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilisation of knowledge and information, with the purpose of working synergically to support decision making, problem solving and innovation in a given country’s agriculture or a domain thereof’ (RÖLING 1990,1). A key concept in this definition is synergy: the process of two or more forces acting together to produce a greater result than either could accomplish alone. This means that the diverse elements of the AKIS are articulated or linked, mutually adapted and engaged in complementary relationships and are working together for common goals. In the same direction, FAO/World Bank define the AKIS as ‘the links between people and institutions to promote mutual learning and generate, share and utilize agriculture-related technology, knowledge and information. The system integrates farmers, agricultural educators, researchers and extensionists to harness knowledge and information from various sources for better farming and improved livelihoods’ (FAO/WORLD BANK 2000).

There are a couple of key concepts in the definitions which should be noted: knowledge and information. The following section provides a brief discussion along these terms.
2.2.1.2 Knowledge and information

Knowledge and information are usually used interchangeably or stated in terms of other related concepts that are equally difficult to define. There is a bit of linguistic and conceptual confusion over the definitions of knowledge and information. One of the pioneers of knowledge systems perspective, HAVELOCK (1986b,13), shows this difficulty in defining knowledge and information. HAVELOCK understands knowledge as ‘the collective achievement of the human race, nothing less’. He goes on to say, ‘Knowledge is the one thing that accumulates among humans, that can be passed from one human to another almost intact ... and that can be stored from generation to generation ...’. According to HAVELOCK, knowledge is the possession of a culture rather than individuals and can, therefore, exist independently of its holder. On the contrary, RÖLING (1990,12; 1988,185) argues that knowledge is the property of the mind, something between the ears, and cannot be transmitted to others unless transformed or encoded into information. According to RÖLING, the difference between knowledge and information is that ‘the latter can be transmitted, while the former is an inherent function of the brain. Thus, one can generate knowledge and utilize knowledge, but not transfer it’ (RÖLING 1988,32). Nevertheless, RÖLING admits that ‘knowledge can be shared and accumulated in social groups’, referring to local knowledge as a ‘shared and accumulated knowledge vis-à-vis a collective experience in a shared environment’ (RÖLING 1988,186).

Two types of knowledge can be distinguished: implicit and explicit knowledge. Implicit knowledge is something in the brain that is known and applied (practical knowledge), but cannot be verbalized easily, or expressed discursively. On the contrary, explicit knowledge is something that can easily be transformed into information, which can be written down or recorded as text, audio, video or graphic. The former represents local knowledge, while the latter represents formal knowledge that exists as a physical or virtual entity. Local knowledge is usefully contrasted with formal knowledge in Section 2.3.2.

The other term that has to be understood from the knowledge perspective is information. HAVELOCK (1986b,14) contends that information, unlike knowledge, has no cultural status. Similarly, DISSANAYAKE (1986,262) understands knowledge as ‘an interrelated and ordered body of facts as opposed to information, which suggests a body of disconnected facts’. Information has the property of transferability. As RÖLING (1988,186) puts it, information can be transmitted to others and affects uncertainty and human decision-making, but it only informs if it reduces someone’s uncertainty beyond his or her existing knowledge. Some patterned data can be information to some, but not to others. Thus, something is information depending on the uncertainty of the audience and the power of the information to reduce this uncertainty. In this context, ‘the concept of information has targeting built into it’ and ‘cannot be seen in isolation from its audience’ (RÖLING 1988,186).

In summary, the main difference between knowledge and information is that information is the raw material from which knowledge is created (RÖLING 1988,48). Knowledge is built when information is selectively assembled to serve a purpose. Facts, observations and discoveries, as items, are but the nutrients that feed the tree of knowledge, only when they have been thoroughly absorbed and assimilated into new configurations do they truly
enlarge the body of knowledge (McCreary 1989). Information is thus the raw material from which human beings create knowledge suited to fulfilling their chosen objectives. Knowledge is derived from action, information from the actions of others, and information becomes knowledge when it is consciously used for action.

### 2.2.1.3 Positivism and constructivism

Whether a system actually exists or whether it is a conceptual construction in order to study a real life situation is controversial. It is not the purpose of this section to resolve or enter into this argument, but rather to highlight the controversies in systems thinking within the knowledge system perspective. As mentioned earlier, Havelock (1986a,77) defines knowledge systems as a ‘network of connected entities’ which assumes that systems exist objectively with clearly defined boundaries. This represents the hard systems thinking where systems are considered predictable once the parts are known. In contrast, Checkland and Scholes (1990) questioned the application of the hard systems thinking in social contexts and developed the soft systems thinking. The hard and soft systems thinking have their roots in two fundamentally different schools of thought: positivism and constructivism respectively.

Dissanayake (1986,266) terms the positivist and constructivist schools of thought as the individual-centered and society-centered approaches respectively. The positivist tradition assumes that reality exists objectively and that truth and meaning reside in their objects independently of any consciousness (Crotty 1998). Science seeks to discover the true nature of this reality by breaking down the components of a complex world into discrete parts, analysing them, and then making predictions about the world based on interpretations of these parts. The ultimate aim is to discover, predict and control natural phenomena (Roling 1996). This philosophical school perceives knowledge as the product of individual effort, and in this effort, there is very little intrusion between the individual, reality, and its representation. Therefore, the perception of reality is independent of the experience, interests and propensities of the individual.

On the contrary, the constructivist tradition views that ‘all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context’ (Crotty 1998,42). This school of thought emphasizes the socio-cultural basis of knowledge: ‘Knowledge is no longer seen as a projection of an immanent reality but a construction, the result of a collective learning process’ (Roling 1996,40). Dissanayake (1991) and Arce and Long (1987,5) maintain that knowledge is a social and cultural product, emerging from the socio-cultural environment and taking on a unique meaning because of the particular environment from which it emerges. This means that the representation and interpretation of knowledge are social acts that cannot be assumed to be neutral or objective. Along this line, White (1963, cited in Roling 1986a,247) states, ‘Reality is not passively received. It does not imprint itself on the mind. It is slowly constructed through active, varied and persistent exploration, and what is learned about it is how to deal with it: what actions produce what effects on what objects’. Roling (1996), Chambers (1993) and Scoones and Thompson (1994,19) also challenge the assumption of the positivist view of investigation that sees
knowledge as a tangible stock or store that can be tapped, and instead view knowledge as a social process, the process of knowing being engaged, value-bounded and context determined, with different realities and perspectives. Further, PROBST et al. (2005) argue that knowledge is not a static entity, but is socially constructed through relationships among human actors and their organizations, and their differential capacity to value, generate and act upon different kinds of information. Human beings create knowledge by involving themselves with their physical and social environment and by reflecting on the results of their behaviour. In all, ‘People develop their knowledge in close relationship to the environment which impinges upon their lives. They want to understand and control it and ... to reach their goals in the environment’ (RÖLING 1988,182).

Coming to the systems thinking controversy, the hard systems approach is used to determine how to make improvements to a better-defined problem and to make a system more efficient, focusing on individual pieces of what is being studied. On the contrary, the soft systems approach is developed as a way of understanding and improving complex situations, and as a learning process to determine what needs to be done in an ill-defined problem situation (SENGE and LANNON-KIM 1991). Soft systems are arbitrarily or subjectively defined as the interpretation of the situation by individual actors influences the constitution of the system. However, in practical terms, this contrast may unnecessarily polarize the hard and soft systems methodologies, which are not mutually exclusive, but merely play different roles and are thus appropriate for different purposes. Therefore, a combination of methodologies is necessary to fully understand complex problem situations and develop appropriate solutions.

2.2.2 Agricultural Knowledge System models

2.2.2.1 The diffusion of innovations model

In the 1960s, the dominant paradigm of development was the modernization paradigm, which implies that the transfer of innovations lies at the heart of the development process (MOORE 1963). The classical diffusion model fits this dominant paradigm of development (ROGERS 1995). The model is supply-driven, predominantly a one-way communication process in which messages travelled from top to bottom through a hierarchical structure. The intent of the message is to inform and persuade farmers to adopt technologies and practices which are developed by researchers (NAIR and WHITE 1994; SULAIMAN and HALL 2002). RÖLING (1988,56) calls it the ‘sock-it-to-them’ approach, where agricultural knowledge has a vectorial quality (BLUM 1991). Extension is seen as having only a transmitting (and to some extent a transforming or translating) function, and the primary goal of the model is to increase the rate and completeness of the adoption of agricultural innovations (LACY 1996,34). The researcher is assumed to have the right question and the right answer to the problem, and failure to adopt the innovation is best understood as a communication problem, or the farmer’s ignorance or deficiency, the individual-blame bias as ROGERS (1995,114) calls it. The diffusion model is systematically implemented in agricultural extension through the Training and Visit (T&V) extension system, which has been developed in commercial irrigation schemes in Turkey and subsequently promoted by the World Bank in many developing countries (BENOR and HARRISON 1977; MET-
Thus, the T&V system shares many of the deficiencies with the diffusion model. In practice, the T&V system has been a top-down approach since it has been grafted to the innovation-centered approach (Pickering 1987,69), leaving little possibility for participation and initiative both for farmers and village extension workers, and too little of an emphasis has been put on critical feedback based on self-evaluation (Nagel 1997; Hoffmann et al. 1998).

The modernization paradigm for development, along with the diffusion of innovations paradigm, came under careful scrutiny and criticism in the late 1960s with regard to ideology and its appropriateness for developing countries. Several authors have shown the shortcomings and criticisms of the diffusion of innovations model (Lacy 1996,35; Rogers 1986,50; Leeuwis 2004,134; Röling 1988,69; Melkote 1991,75; Vanclay and Lawrence 1994). The diffusion theory assumes that there is a single, objective and uniform world or a social system, based on the positivist science. It neglects the economic, socio-cultural and political diversity in the transfer and utilisation of innovations. Further, there is no meaningful feedback to direct research or to inform researchers that a particular technology is unsuitable or in need of modification. All too often new technologies are assumed to be optimal to all situations and thus useful for all users, the pro-innovation bias (Rogers 1995,100). The model has a dichotomous perspective, putting the researcher in a higher position and the farmer in a lower position. More importantly, the diffusion approach treats science as isolated from society; it tries to see knowledge as value-free and employs the standard practice of scientific research. Thus, the diffusion approach has been limited by a lack of understanding of the difference between scientific and everyday rationality, as well as by a failure to recognise its own underlying assumptions (Lacy 1996,35; Röling 1994,60).

The problem is that, Rogers (1995,115) concludes, ‘We know too much about innovation successes, and not enough about innovation failures. We know much more about the diffusion of rapidly spreading innovations than about the diffusion of slowly diffusing innovations, about adoption than rejection and adaptation, and about continued use than about discontinuance’. All these processes frequently occur during the diffusion of an innovation and that such behaviour may be rational and appropriate from the individual farmer’s point of view. An approach with more emphasis on system-blame might question whether the extension service was properly attuned to the actual needs of farmers, and whether the extension organisation was fully informed about the actual circumstances of farmers in recommending modern technology packages. In summary, the diffusion of innovations model had a significant impact on extension theory and practice, and is still the dominant ideology influencing the practice of extension planning and implementation in many developing countries since improved models have not yet become widely used.

2.2.2.2 The linkage model

Knowledge and information cannot be utilised unless communication takes place between the source and the potential user of that knowledge. Havelock (1986a,101) considers the linkage model a basic concept for understanding how an AKS works as a whole: ‘If we generalise the linkage model, we can interpret the entire knowledge system as a kind of macro-dialogue between knowledge builders on the one hand and knowledge users on the
other’. Similarly, RÖLING (1988,55) describes the linkage model as ‘the basic paradigm for all communication interventions’.

Figure 2.2 illustrates the basic features of the linkage model (HAVELOCK 1986a,98) which builds on two ideas: 1) the systems that are to be connected are separate problem-solving systems; and 2) a two-way communication between the systems is the essential prelude to any significant transfer of useable knowledge and information from one system to the other (HAVELOCK 1986a,99-100). Information flows about problems and feedback are as important as information flows about solutions or innovations. Each system is an extended network of sub-systems and individuals who similarly do their own problem-solving. HAVELOCK (1986c,211) used the link-chain metaphor to describe this extended connection between sub-systems.

**Figure 2.2: Elements of a linkage model of the Agricultural Knowledge System**

For needs and solutions to flow between the sub-systems, a considerable amount of prior communication that establishes channels, agendas, ground rules, appropriate media, and understandings of internal processes and contextual factors must exist. In the figure, these communicative elements are identified as meta-communication (communication about the communication process, the message, and the media) which is also a two-way communication. The figure also suggests that the resource and user systems have other options for bridging relationships besides each other. However, a major problem inherent in this model is the assumption of the existence of adequate incentives or driving forces for establishing an effective exchange relationship and synergy between the systems.

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3 Meta-communication is the relational aspect of communication: 'This is how I see myself; this is how I see you; this is how I see you seeing me' (GRIFFIN 2005).
2.2.2.3 A comprehensive AKIS/RD model

Coordination among the components of the AKS has long been a concern of donors, policymakers and planners. With the emergence of the Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD) as a guiding framework for conceptualising and developing AKSs (FAO/WORLD BANK 2000), AKS concepts and models have evolved substantially. Earlier models focused on forward linkages between the three basic institutional components of the system. Later, backward linkages or feedback mechanisms were built into the AKS model. More recently, other entities, such as the media, government, the private sector, support systems and civic society, are recognised as playing an important role in the system, making the system more complex and the need for coordination and integration greater ever. Figure 2.3 illustrates a more comprehensive AKS model that includes support systems (credit institutions, supplies, markets) and the contextual and environmental factors surrounding and influencing the system (government policy, institutional commitment, communication systems, physical and human resources) with a central focus on rural people as a whole, not just agricultural producers.

Figure 2.3: A comprehensive AKIS/RD model

The model has a range of institutional inclusiveness, embracing all those concerned with Agricultural Knowledge and Information Systems, and its central purpose is beyond earlier notions of system linkages, 'broadly concerned with fostering practical knowledge in an agriculturally organised rural learning society, with a view to developing a rural knowledge society' (RIVERA et al. 2005,12). Compared to earlier concepts of Agricultural Knowledge and Information Systems (RÖLING 1990), the model recognises the importance of the institutional and political context, and the behaviour of actors and their commitment in increasing system synergy and performance.
If education, research and extension are to serve society through the farmer, then they must be in close interaction with the farmer and the farm family. Based on this model, therefore, a well-functioning AKS can be described as a continuous process of institutional development and technical change with a continuous interaction among all stakeholders, and an effective provision of services based on demand. In other words, a successful AKS is characterised not only by strong intervention power and a good calibration of the research-practice continuum, but also by strong user control (RÖLING 1986b, 112).

2.2.3 Agricultural Knowledge System functions

In the literature, quite a number of different functions are attributed to the AKS (NAGEL 1980, 23; LIONBERGER 1986, 117; RÖLING and ENGEL 1991, 125; BLUM 1991, 324; EPO-NOU 1993, 18; RÖLING 1990, 16; HAVELOCK 1986b, 17; McDERMOTT 1987, 95). HAVELOCK (1986b, 17) describes at length six main categories of knowledge processes: generation, verification, transformation, transfer, reception, and utilisation. For the purpose of this study, the construct of NAGEL (1980, 23) is used together with ideas of other authors as an analytical framework. NAGEL identified six basic, inter-dependent and mutually reinforcing functional problems which the AKS must solve in order to ensure the initiation and perpetuation of the process of knowledge and information flow. These are: need identification, knowledge generation, operationalisation of knowledge, dissemination of knowledge, utilisation of knowledge, and evaluation of performance.

Need identification

Participants in an AKS should take the needs and problems of users into account at each point that information or technology is transformed or adapted (RÖLING 1990; MCCASLIN and TIBEZINDA 1997). Definition of problems determines what kind of knowledge will be generated, disseminated, and for whom. This happens on two levels: the farmers’ level and the institutional and policy level. At the farmers’ level, needs may differ among different categories of farmers and across time. Within a group of people, there may be different needs. For example, women may have different needs from men, wealthier households may have different needs from poorer households, and older people may have different needs from the young. If there is a strong resistance by a group towards a priority identified by another, then there is a need to explore further the relation between the groups and the resource at issue in order to understand the underlying reasons behind competing visions. It is also important to find out what the most important needs are so that key needs receive priority.

Which of the farmers’ problems are investigated depends on the personal preferences and prejudices of researchers and extensionists (NAGEL 1980, 24). Often researchers and extensionists assume that they know the problem and define it from their own perspectives, only to find out that farmers have different needs and priorities. Farmers may see other problems as more important, or see proposed solutions unfeasible. Thus, those who know the problems best are the farmers themselves, but at the same time, farmers may not adequately articulate their needs and problems. It is, therefore, the task of those promoting development to involve people in a process of innovation in which they can begin to de-
fine and solve their own problems (NEUGEBAUER 1995). On the whole, definition of problems and opportunities is an iterative and dynamic process that continues throughout the functions of the AKS (ALBRECHT et al. 1989). A good situation analysis and problem definition brings together research results and the goals of farmers and their families, information on their situation and their experiences (VAN DEN BAN 2001,25).

Knowledge generation

For a long period of time, knowledge generation has been considered a sole task of research institutions. More recently, it has been recognised that farmers also generate and adapt knowledge. In a broader sense, knowledge generation is ‘a normal aspect of coping with the environment and not a special function of researchers’ (ROLING 1988,181). Knowledge generation has a collective nature and thus requires the bringing together of various actors where a wide range of activities can take place. Knowledge generation includes the activity of screening existing knowledge and adapting it to local conditions. For a new knowledge to be utilized, it has to be appropriate and adapted to the specific socio-economic and agro-ecological conditions of users. However, in most AKSs, a minority of progressive farmers have influenced the knowledge system to meet their needs. Avoiding this default condition requires the deliberate targeting of technology development toward resource-poor farmers and developing their capabilities to adapt technologies to their own conditions (ROLING 1989,23). The problem is, however, ‘in diverse, small-scale farming systems that are not producing a large surplus, a dedicated and effective AKS cannot easily evolve’ (ROLING 1989,24).

Operationalisation of knowledge

The transformation of knowledge into usable forms is a crucial knowledge process. Knowledge generated in one part of the system has to be turned into information for use in another part of the system (ROLING 1990,15). The process involves a spectrum of activities by which not only research results are put into usable forms but also farmers’ problems, needs and feedback must be fed into the research process in a usable way (NA- GEL 1980,28). Knowledge transformation includes all forms of adaptive research and field trials together with the individual experimentation of farmers and extension workers. If research results are to be used by farmers, then they must fit the specific agro-climatic and socio-economic conditions of farmers.

Dissemination of knowledge

Knowledge dissemination is a process by which usable knowledge is communicated and exchanged. It involves both a vertical and horizontal exchange of knowledge. Dissemination takes place in light of socially defined and accepted goals which pre-structure emphasis and direction of promotional efforts (NAGEL 1980,29). The key issues in knowledge dissemination are ‘the effectiveness and appropriateness of different types of media, the social structures and networks through which knowledge flows and the speed of that flow given different receiving cultures and different knowledge types, and the use and effectiveness of various types of mediating roles and agencies’ (HAVELOCK 1986b,21). The social structure determines how information is disseminated and which individuals and groups have access to it (ALBRECHT et al. 1989,60).
Utilisation of knowledge

Knowledge utilisation is the integration of useful new knowledge into the system of agricultural production and its application at the farm level. This is a crucial test of whether the overall AKS is working adequately (NAGEL 1980,29). The proof that new knowledge is worthwhile resides in its actual effect on users. This means that knowledge dissemination cannot take place until the user has fully integrated the knowledge, adopted it, and incorporated it in thought and action (HAVELOCK 1986b,21). ‘Knowledge affects thinking and action in very complex ways yet it has traditionally been studied and measured in terms of specific behavioural responses (e.g., innovation adoptions) to specific sets of message stimuli (knowledge of the innovation)’ (HAVELOCK 1986b,23). The conceptual utilisation of knowledge may be far more important than the specific behaviours involved in adoption. It is not sufficient if farmers learn how to apply a new technology. They need to understand the principles behind it to be able to make desirable modifications. Only if they understand how it works, will they be able to adapt it to their conditions and improve their own practices (BACHMANN 2001,23).

Besides farmers, knowledge can be utilised by other users. Development agencies, training institutions, the mass media, policymakers and so forth are utilisers of knowledge. Knowledge utilisation is, therefore, ‘the consequence of linkage between the system having the problem and the system capable of assembling solutions or opportunities’ (ROLING 1986a,250). ‘Responding to a great many different small claims from below, coordinating different agencies each capable of dealing with part of a problem, creating responsiveness and accountability to overcome institutional imperatives, all these linkage problems seem to be key issues in knowledge utilisation’ (ROLING 1986a,251).

Evaluation of performance

NAGEL (1980,30) refers to evaluation in a broader sense as ‘the forming of judgements on the performance of informational inputs (knowledge) at the utilisation level (user subsystem)’. Taking the needs orientation of a knowledge system, evaluation takes place in the light of the fulfilment of the needs identification and knowledge utilisation functions. This means that the ultimate test of the adequate performance of the overall system is to be found in the satisfaction of the user system (NAGEL 1980). However, this should not be measured in adoption behaviour alone. As HAVELOCK (1986b,23) observes, the conceptual utilisation of knowledge is far more important than the specific behaviour involved in adoption. This means that the performance of an AKS should be seen from its contribution to developing farmers’ knowledge and adaptive capacities. The effect of an AKS on the user system can be the introduction of physical inputs, knowledge increments, or the enhancement of human capital. An effective AKS must develop farmers’ knowledge and capabilities to adapt new technologies and solve their own problems. Therefore, besides the identification of needs, a comprehensive situation analysis and documentation of local knowledge and practices is a prerequisite for evaluating the overall performance of an AKS in terms of developing and building on local knowledge and adaptive capacities.
2.3 Local knowledge: a potentially new direction for research and extension

The Transfer of Technology (TOT) model has proved ineffective in addressing the needs of farmers in diverse and complex farming systems. More recently, local knowledge has come to be a potentially new direction for research and extension in the developing countries (CRITCHLEY et al. 1999; REIJ and WATERS-BAYER 2001) as a basis for defining researchable problems and priorities. This section deals with local knowledge, emphasising the role played by farmers in knowledge generation and dissemination, and its complementarity with scientific knowledge.

2.3.1 Concepts and development potential of local knowledge

The definition of the term local knowledge is a debated topic among anthropologists and sociologists. The terminology in the debate on local knowledge is highly diverse and causes intellectual confusion with respect to its meaning and concept: indigenous knowledge, traditional knowledge, cultural knowledge, farmers' knowledge, rural people’s knowledge, and many other terms are used to specify different aspects of local knowledge and reflect the different attitudes about it. ANTWEILER (1998,471) provides an overview of the diversity of terms for local knowledge (and its branches) and their various connotations.

The terms local knowledge and indigenous knowledge have been used interchangeably although they are not perfectly synonymous. ANTWEILER (1998) and SINCLAIR and WALKER (1999) used the term local knowledge to denote a locally derived understanding based more on experience and real world observation (a dynamic process of acquisition and integration of contemporary information and experience) than indigenous knowledge, which reflects cultural beliefs and values to a greater extent. Local knowledge has become widely accepted as having validity and development potential and has been studied and integrated into development interventions (SCORBOROUGH et al. 1997; ANTWEILER 1998,472; MILLAR and CURTIS 1999).

In the literature, local knowledge is presented in three different ways (SAAD 2002,3; SCOONES and THOMPSON 1994,17). The first is in the thinking that farmers’ knowledge and practices are primitive, based on superstition, unscientific, and basically wrong in need of correction. This view implies replacing local knowledge with scientific knowledge and educating farmers in modernizing their production systems. In this model, development is seen as a linear process of transforming traditional practices, and farmers are perceived as passive users of external knowledge. In the early 1980s, however, scientists began advocating that farmers’ practices are rational and that their knowledge can be an enormous resource in agricultural research and development. This view sees development as a partnership between local people and outsiders and acknowledges the knowledge and capacities of local people. Outsiders are seen as facilitators of knowledge exchange between different actors. Advocates of this representation believe that local knowledge can be incorporated into the formal knowledge system. However, the attempt to remove local knowledge from its context and apply and replicate it in different contexts has faced se-
vere criticism. It assumes that local knowledge is ‘an easily-definable body or stock of knowledge ready for extraction and incorporation’, and thus fails to recognize that local knowledge is ‘manifold, discontinuous and dispersed’ (Scoones and Thompson 1994,19). The third representation is the idea that local knowledge is based on empirical evidence, embedded in both biophysical and social contexts from which it cannot easily be separated without losing its meaning. This view questions the validity of a unified and systematized view of local knowledge and demands that it has to be interpreted as being constructed through local people’s practices as situated agents. Scoones and Thompson (1994:19) warn that ‘to remove local knowledge from the web of meaning and influence in which it arose and attempt to fit it into the constructive framework of western scientific rationality is likely to lead to significant errors in interpretation, assimilation and application’. Thus, an attempt to scientize local knowledge without fully understanding its nature and the processes that generate it can reduce its value rather than adding value and stimulating its processes.

For decades, researchers used to believe that farmers were interested only in increasing production and consequently developed drought and pest resistant varieties. They failed to realize that farmers deal with complex production problems and need technologies which address different problems and fit their circumstances and available resources (Zewdie 2004). Recently, researchers have begun to realize that local knowledge provides a unique opportunity to understand farmers’ objectives and problems. They have started to move away from viewing farmers as passive individuals dependent on outside knowledge to viewing farmers as active seekers and processors of knowledge and developers of systems to tackle agro-ecological problems. This change in attitude is a basic requirement for developing a knowledge partnership between farmers and scientists.

2.3.2 Local and formal knowledge: rivalry or complementarity?

Several authors have tried to understand and classify local innovation processes in order to explain the relations with formal science procedures (Sinclair and Walker 1999; Saad 2002; Scoones and Thompson 1994; Agrawal 1995). In the literature, the similarity or difference between formal and local knowledge is mixed. Some authors argue that there are differences between formal and farmer innovation processes (Sikana 1994; Sinclair and Walker 1999). For example, Sinclair and Walker (1999,255) show practical differences between local and scientific knowledge, but the differences are rather compatible and suggest complementarity between local and formal knowledge systems. In general, the differences lie in the motivations, type of result sought, sources of new ideas, and in the methods used for inquiry (Saad 2002).

Farmer innovation is an integral part of farming and a continuous survival strategy aimed at addressing multiple and dynamic production constraints. Farmers are motivated to innovate by the necessity to solve their immediate problems, and their innovations are often driven by unintentional activities and by chance (Fetien et al. 2001a). They do not see that they are actively innovating; instead, they think that innovation is a normal part of everyday activity in the farm (Scoones and Thompson 1994,26). Unlike formal research, farmers innovate and experiment in diverse and complex farming systems. Their
experimentations are small-scale and low risk, mostly happening in home gardens or along farms in short lines to observe potential interactions and effects. In other words, farmers experiment with small quantities before moving to large-scale experiments and investments. Further, farmers experiment with several variables at a time in order to cope with complex interactions. They deal simultaneously with the whole farm, family, and natural and social environment (PROBST et al. 2005). On the contrary, formal scientists seek to control all variables and investigate one or two variables.

Another difference lies in the explanation of causality. While there is a wide consensus that scientific knowledge attempts to explain causality in universally applicable and predictive principles, there is not a similar understanding about local knowledge providing systematic explanation of causality (SINCLAIR and WALKER 1999). However, this is unnecessary, as NIAMIR (1990, cited in SINCLAIR and WALKER 1999,254) writes: ‘Local knowledge is entirely based on what people think it is necessary to know—they may see correlations but feel it is unnecessary to explain causality’. As discussed in Section 2.2.1.3, explaining causality in universally predictive and applicable principles is a characteristic of the hard systems science. On the contrary, local knowledge is analysed from the soft systems perspective.

Still another difference is the type of result sought. Formal science aims to generate new knowledge, but farmers innovate as a continuous farming activity and as a survival strategy. Further, scientists look for explicit generalisable statements and rules (STOLZENBACH 1994; PROBST et al. 2005), but farmers’ objective is agriculture as a performance (RICHARDS 1994). Along this line, NIAMIR (1990) writes, ‘Local knowledge does not devise general principles and absolutes but allows an understanding of the heterogeneity of local conditions, while formal science seeks general applicability ... and has difficulty in attempting to cope with the variability that is found in the real world’. Farmers deal with complex and unpredictable situations in which flexibility and adaptive rationality are important, and learning and decision-making occur simultaneously and continuously. Continuous observation and adjustment are necessary to adapt to changing conditions. Therefore, keen observation, comparison and deduction are critical skills for farmer experimentation (STOLZENBACH 1994,158).

Some argue that farmers are more knowledgeable with observable and physical innovations than with less observable factors. For example, BENTLEY (1989,30) asserts that farmers have information gaps in certain predictable domains of knowledge and that researchers and field workers should improve the quality of on-farm research by identifying and filling those gaps while using farmers’ knowledge to fill their own knowledge gaps. Though this assertion of local knowledge existing in observable domains can be challenged by the existence of sources on indigenous medicinal knowledge, it suggests complementarity between farmers’ and researchers’ knowledge. Along this line, MILLAR (1994), SCOOINES and THOMPSON (1994) and RICHARDS (1994) show similarities between local and formal knowledge. For example, RICHARDS (1994,166) shows that local knowledge is ‘in conformity with general scientific principles’. Similarly, MILLAR (1994) argues that, while farmers’ experimentation processes have resemblance to Western meth-
ods of inquiry, the steps can be implemented differently, and some may occur simultane­
ously and temporarily.

In summary, SINCLAIR and WALKER (1999, 260) argue that a ‘comparison of local knowl­
edge and scientific knowledge can be powerful and facilitates development of both the
farmers’ knowledge system and that of researchers, leading to more relevant research
and identification of opportunities for extension of existing knowledge’, but comparative
analysis of local and scientific knowledge systems ‘does not imply attempting to validate
one system against another but to seek common ground to facilitate communication
among farmers and researchers, and to identify areas of complementarity where knowl­
edge can be usefully exchanged and combined’. Thus, knowing that local knowledge has
an immense potential for development, the question is how to revitalise local knowledge
and come to an effective and equitable partnership between local and formal knowledge
systems through adaptive and people-centered agricultural research and extension that
promote innovation and experimentation by farmers.

2.3.3 Farmer innovation: a source of inspiration for research and
extension

2.3.3.1 Revisiting the concept of innovation and innovator

ROGERS (1995, 263) describes innovators as those individuals who are the quickest to
adopt new ideas, venturesome, resource-rich, educated and risk-taking, and who have a
great interest in new ideas and more cosmopolite social relationships. On the contrary, the
farmer innovation literature (CHAMBERS et al. 1989; CRITCHLEY et al. 1999; REIJ and
WATERS-BAYER 2001) characterizes innovators not as direct adopters of new ideas but as
developers of new production techniques and systems. Farmer innovators are not progres­
sive or model farmers who directly adopt extension recommendations but spontaneously
develop or try out new ideas and practices. They basically develop innovations that fit
their own specific situations and resources. They are representative of their peers and are
primarily driven by particular problems to innovate and find solutions to those problems.
In short, they use locally available resources more creatively and adapt new ideas to
improve their own practices rather than directly adopting introduced technologies recom­
mended by extension workers.

A key aspect of the concept of farmer innovation is the intuition and capability of farmers
to creatively use ideas from various sources to experiment with and adapt them to their
own specific situations. Farmer innovators often learn from technologies demonstrated by
extension workers without necessarily having direct interpersonal communication with
the extension workers. They observe what other farmers have done and interact with

4 Social learning theory explains the observational behaviour of farmers. According to ROGERS
(1995, 330), the central idea of social learning theory is that ‘an individual learns from another by
means of observational (or social) modelling, that is, one observes another person’s behaviour (and
its outcomes), and then does something similar. The observer’s behaviour is not exactly the same as
the model’s, ..., rather the observer extracts the essential elements from an observed behaviour pat­
tern in order to perform a similar behaviour’.
them to learn more about their practices. They take the essential elements from an observed behaviour and integrate them into their own practices, leading to even better practices than are promoted by extension workers. Thus, watching, thinking, trying and reflecting on action are basic learning processes for innovative farmers.

2.3.3.2 Distinguishing real innovation from adaptation

Defining what is actually an innovation and its sources of ideas is usually difficult. It is equally difficult to distinguish a real innovator or a true innovation from an adopter (a second-generation innovator) or an adaptation of an innovation. Generally, a farmer innovation is defined as something new that has been started within the life time of a farmer. It is not something that is inherited from parents or grand parents (YOHANNES 1999). LEEUWIS (2004,12) defines an innovation more pragmatically, in terms of its successful application as ‘a new way of doing things’ or even ‘doing new things’, but it can only be considered an innovation if it actually works in everyday practice. Along this line, YOHANNES (2001,176) observed that for something to be considered an innovation, it is not only its novelty that matters but also its compliance with value systems: ‘Any innovation that does not fit into community values is not easily accepted or integrated as a common practice, and the innovator also has acceptance problems’. This means that innovators and their innovations have to be an integral part of the whole social system. Thus, anything new which does not comply with community values may not be considered an innovation and consequently may not spread quickly and spontaneously throughout the community.

A challenging task in defining an innovation is figuring out its technical categories. Some innovations are easily categorized; others are not so easily categorized (CRITCHLEY et al. 1999) because they are closely integrated with each other. Moreover, the categories used by farmers usually differ from those used by scientists. Farmers’ criteria for classification are functional unlike the standardized categorization criteria of scientists (IDS WORKSHOP 1989; PRETTY 1995). Farmers have multiple objectives and deal with complex problems. They have chains of innovations, which are multipurpose and integrated. A cluster of interconnected innovations occurs together as a result of a farmer developing synergic linkages between different resources and problems. Thus, a single innovation may have different functions. For example, some innovations are designed to harvest water and others to drain excess water, perhaps both in the same field at different seasons of the year (YOHANNES 1999).

Another challenge is the dynamic nature of the innovation process itself. Time is an important factor in describing the process of farmer innovation and experimentation. Farmers constantly change and improve their practices over time depending on seasons, resources and observations. In other words, because conditions are constantly changing, innovations undergo continuous modifications and improvements. Often one innovation stimulates the other, with continuous observation of changes and opportunities over time (see SIMPSON 1998). Thus, it is difficult for local people, let alone outsiders, to observe when something new is done on a farm. It becomes even more complex when agronomic practices such as frequency of ploughing, seeding rate and crop mixtures, or management practices such as time of sowing are considered (YOHANNES 2001,173). On the whole,
farmers’ knowledge and practices have co-evolved over time as adaptations to particular environmental, social, economic and political circumstances and pressures (IDS WORKSHOP 1989,33).

2.3.3.3 Distribution of local knowledge

Local knowledge is unevenly spread between people and locations. SCOONES and THOMPSON (1994,25) observed that ‘knowledge is held, controlled and generated by different people in a society’, suggesting that there are a few who are considered real innovators. BOX (1986) and FRANZEN et al. (1996, cited in SAAD 2002) argue that, while there may be a widespread experimentation among farmers, only the few ‘expert cultivators’ are really innovating. BAYUSH (1991) also shows that whereas all farmers select seed, the level of sophistication in selection methods and criteria vary greatly from farmer to farmer in southern Ethiopia. SAAD (2002,8) concludes that ‘it may be that most farmers practice an adaptive type of experimentation trying out new seeds and imposing selective pressures on their populations, while those farmers who are recognized as being experts may be engaging in a type of experimentation that is more proactive in seeking new solutions to specific problems or constraints’.

This variability can be explained by technical and human factors. For example, agricultural areas with more sloping landforms tend to stimulate more innovation because water and soil move more on sloping lands. The presence of surface stones can also be an important factor; where plenty of lose stones is available, it tends to be used creatively for stone terraces (CRITCHLEY et al. 1999). YOHANNES (1999) observed that many of the innovators’ plots are located at critical sites such as on steep slopes, at run-on sites, in depressions, and close to big gullies in northern Ethiopia. Thus, the incentive to innovate is survival for the individual farmer. At such critical sites, even short-term survival would not be possible without some inputs into land management; otherwise, seeds would be easily washed away, and the farmer would have to use more seed per unit area.

2.3.3.4 Farmer innovation as a source of research ideas

MUTIMBA (1997), SANGHI (1989) and RHoades (1989) showed that researchers and extension workers have lost many opportunities to learn from farmers by not deliberately creating conditions for learning. For example, MUTIMBA (1997,4) described the case of an agronomist who tried to prove that row planting of beans would give a better result than broadcasting. The agronomist learned that farmers broadcast to achieve high plant density in order to control weeds. He then started experimenting with various plant densities and assessed their effectiveness in weed control. Further, MAURYA (1989,12) documented an innovative adaptation of scientists’ recommendations by resource-poor farmers in India, and how this adaptation provides a research idea for scientists. Weed scientists in Punjab recommended spraying with herbicide solutions. Some farmers who lacked a sprayer mixed the recommended herbicides with sand, or even urea, and broadcasted them. This practice worked well and disseminated widely among resource-poor farmers. The scientists also tested it in experiment stations and found it to be effective. Similarly, several authors documented that farmer innovators are a major source of inspiration for research and extension in Africa (CRITCHLEY et al. 1999; REIJ and WATERS-BAYER 2001).
2.3.3.5 Learning selection

Small farmers rarely adopt technology packages without making site-specific adaptations or modifications to select and promulgate beneficial elements (Pretty 1995, 52; Geta-Neh 2001, 43). Douthwaite (2002, 218) calls this process of selection and adaptation learning selection, and Rogers (2003, 180) re-invention. According to the learning selection model, the most successful technologies are those that are most modified and adapted by farmers themselves. Farmers also rarely reject technologies introduced by development agents altogether. They seek ideas and information that can be adapted to their specific conditions, and this information becomes knowledge through farmers’ active process of experimentation and self-validation. Farmers often pick ideas from introduced technologies and integrate them into their existing practices. Such farmer-adapted and developed practices often spread quickly and widely among farmers beyond the villages in which they are developed (Maurya 1989). Thus, lasting innovations are not merely adopted, but are embraced and internalised by farmers. However, this process is often invisible to outsiders who look for technologies that are adopted by farmers in the form they were introduced.

Several authors have documented that farmers made adaptations to introduced technologies and developed alternatives which could obtain almost the same results as that of the introduced technologies, whereas the cost was significantly less and locally available materials were used and no extra equipment or any special efforts were required (Sanghi 1989, 176; Maurya 1989, 12; Mutimba 1997, 4; Pretty 1995, 48). And with the introduction of new technologies, farmers do not stop using their own existing practices; instead, they integrate the introduced technologies with the existing ones (Rhoades 1989, 5).

2.4 Theoretical background of extension

2.4.1 Meaning and philosophy of extension

Several authors have shown the historical roots and evolving conceptions of extension (Jones and Garforth 1997; Leeuwis 2004; Blackburn and Flaherty 1994a; Swanson and Claar 1984). The use of the word extension derives from an educational development in England during the second half of the nineteenth century (Jones and Garforth 1997). Extension is very well known to almost everybody and accepted by many people, but also has very different meanings and concepts throughout the world; it is open to a wide variety of interpretations (Oakley and Garforth 1985; Van den Ban 1986; Röling 1988; Hoffmann 1990; Leeuwis 2004; Cho 2004). In the UK, Germany and the Scandinavian countries, the focus is on advisory work, solving specific problems (see Albrecht 1982), while in the American tradition the term extension education is used to emphasise an educational activity, which helps farmers make a decision in such a way.

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5 Re-invention is the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation (Rogers 2003, 180).
that they are able to make similar decisions in the future (see SIMPSON 1998). In Indonesia and the Netherlands, the terms penyuluhan and voorlichting are used in extension to mean keeping a light in front of the farmer to enable him or her to find their way. In France, the term vulgarisation is used to indicate that extension attempts to simplify information to make it understandable by the ordinary people or the ‘vulgus’, stressing the transfer of knowledge function. The French word animation and the Spanish word capitación mean enabling farmers to find their own way by helping them clarify their goals and the possibilities which they have, together with other farmers, to realise these goals. The Austrian word Förderung means furthering, stimulating desirable agricultural development. The German word for extension is Beratung, meaning giving advice or counselling.

Besides differences in terminology, political and other traditions have made a considerable contribution to the intellectual confusion with respect to the concept of extension. Extension is expected to achieve different purposes depending on the policy tradition within which it functions (ROLING 1988,37). In the conservative tradition, extension is regarded as an instrument to help people make well considered decisions in their own interests. In the developing world, extension involves transferring new technologies and practices to farmers and teaching them how to use the technologies to improve their agricultural production. In most familiar form, extension means providing farmers with information and skills to improve the output of farm enterprises (WJERATNE 1988).

Extension has different definitions, and each definition is a product of its time (Leeuwis 2004,23). Many definitions tend to prescribe what extension should be (normative definitions) and not what it is in practice (descriptive definitions). Hence, the actual practice does not correspond to the ideal practice explained in the definitions. Essentially, extension is an instrument for inducing a voluntary behaviour change, and it operates at the interface of goal achievement both for intervener and client. RÖLING (1988,39) identifies common elements in the various definitions of extension. Combining these elements, he defines extension as: ‘A professional communication intervention deployed by an institution to induce change in voluntary behaviours with a presumed public or collective utility’ (RÖLING 1988,49). The core concept in this definition is communication as leverage instrument for inducing a voluntary behaviour change.

### 2.4.2 Basic elements of an extension approach

As understandings of extension differ, so do extension approaches. There is no single blueprint for the best extension approach; each must be tailored to meet particular contexts and conditions under which it operates (PICKERING 1987,72). It is, therefore, difficult to talk about the best and most appropriate extension approach. HOFFMANN (1992,273) eloquently writes: ‘There is no better or even the best approach to extension as such’. Thus, situation specificity is the basic principle. An extension approach has to be assembled and developed depending on the specific situation of client groups and the goals, working program and organisational set up of an extension organisation. The extension approach must be guided by the needs and circumstances of clients. Figure 2.4 illustrates the basic elements of an extension approach.
Situation analysis of client groups

Sufficient knowledge about client groups is vital to improving their problem situation (ALBRECHT 1970,238; McCASLIN and TIBEZINDA 1997,39). This is particularly important in light of the shortcomings of the progressive farmer strategy which assumes homogeneity of the client population. In this strategy, possible differences in access to resources which might make an innovation marginally relevant or keep it out of reach altogether for certain categories of farmers are not taken into account (RÖLING 1988,71). This is a characteristic of most extension services which requires a major re-orientation. In order to improve the livelihood of client groups, their situation must be fully analysed and understood. The analysis of socio-economic conditions and description of problems is an important aspect of extension intervention: ‘A careful definition of problems already reveals the type of approach to adopt and is an indirect indication of the action that should be taken. ... In most cases more than half the solution is contained in the way the problem is defined’ (ALBRECHT et al. 1989,42). Learning about the situation thus becomes the primary outcome rather than the often fruitless search for optimal solutions to poorly formulated problems (ISON 1990,12).

However, situation analysis must be carried out in a holistic and comprehensive manner. In most cases, situation analysis is limited to sectoral problems, and the information collected does not correspond to the extension measures taken. Further, when planning extension, technical aspects are usually considered more important than communication, or methodological aspects. Overall, the definition of problems is the cardinal point, not the definition of targets, or the decision on the measures to be applied (ALBRECHT et al. 1989,42), and it must be carried out in a comprehensive manner. Extension programs...
have to be designed on the basis of the real needs and problems of farmers and on the local capacities and lessons from practical experiences.

**Extension contents and methods**

Extension contents must respond to the needs, the available resources, and the shortcomings of the respective client groups. For decades, unresponsiveness to the needs of farmers has been a significant shortcoming of public extension services because of a centralised and hierarchical organisation, which is incompatible with the ethos of client-oriented and participatory extension. The performance of an extension system depends, in large part, on the appropriateness of the message, and the appropriateness of content is situation driven (Campbell and Barker 1997, 67). The contents of extension programs may seem appropriate from the eyes of experts but often times these extension contents are rarely adopted by farmers. Even if they are adopted, it is not by the farmers to whom they are primarily targeted. Thus, extension contents must be adapted to local realities to meet farmers’ needs, to solve their problems, and to reduce their uncertainties and risks. The best way to adapt extension contents to local circumstances is to develop them together with farmers based on their knowledge and practices. It is widely accepted that extension programs are successful, and locally relevant technologies are provided, when the process of technology generation and dissemination involves farmers from the start. However, the actual practice in many developing countries is very disappointing and leaves much to be desired.

### 2.4.3 Major problems facing extension services in developing countries

**Linkage and appropriate technology**

Sigman and Swanson (1984) in their survey of the major problems facing agricultural extension in 59 developing countries (Africa, Latin America and the Caribbean, Asia and Oceania) reported that directors of national extension systems view the lack of mobility, extension training, and communication and teaching equipment, along with organizational problems, as the most serious problems, while technology and linkage problems are infrequently viewed as serious problems facing their organizations. However, in many of the sub-Saharan African countries, poor adoption of technologies is a major problem due to a lack of appropriate research results to extend to farmers (Wiggins 1986; Roberts 1987; Lipton 1988). This is again rooted in the lack of effective linkages between research and extension, and between research and users. Although this problem was largely addressed in the 1970s and the early 1980s through the Training and Visit (T&V) extension system (Pickering 1987, 69), there is still insufficient cooperation between research and extension, despite their common ultimate goals, because in most cases these services were established without a built-in complementarity (McDermott 1987; Swanson 1997). Various ISNAR and other studies on linkages have shown that solutions to achieving synergy among AKS actors and making relevant technologies available and accessible to farmers lie in improved interactions between the actors, through the development of linkage strategies that improve cooperation and communication (Kaimowitz 1990; Boyd et al.
Human resource and organisational problems

To be effective in the knowledge exchange process, extension services must have enough competent advisors who have a common language with both farmers and researchers, and are able to grasp both of their problems. Adequate numbers of well-trained and motivated extension personnel are the basic resource for a successful extension system (Swanson et al. 1989; Albrecht et al. 1989; Peterson 1997). Field-level extension personnel have to be qualified in several areas and need to have a positive attitude (Albrecht et al. 1989). However, in most developing countries, human resource and organizational problems limit the ability of national extension services to plan and execute effective extension programs. For example, SIGMAN and SWANSON (1984) reported that field-level extension personnel lack practical skills and training in improved agricultural technology and in extension methods and communication skills. They also lack the essential teaching and communication equipment, teaching aids, bulletins, and demonstration materials. Moreover, a worldwide analysis of the status of agricultural extension shows the very low level educational qualification and training of field-level extension personnel in most developing countries (Swanson et al. 1989). As a result, in many sub-Saharan Africa countries, farmers lack confidence in extension workers, because they transmit inappropriate extension messages, are involved in non-extension tasks, and have limited practical knowledge and competence (OPIO-ODONGO 2000; AXINN 1987), while farmers’ confidence in the advisors’ will and ability to help is paramount (BLUM 1987).

In most developing countries, agricultural extension is left with a limited number of scientists and a large number of practitioners, with low formal education. Even the few extension specialists are not placed in key impact points in public extension services; most of them are engaged in administrative works running a bureaucracy rather than developing the body of science to inform extension practice. Furthermore, extension personnel suffer from the low priority of their profession for further training opportunities. For a long period of time, agricultural extension has not been a traditional career in many developing counties; it is professionally less rewarding and stands below research in both funding and trained staff (Wijeratne 1988). For example, CHO (2004) reported that extension education received low priority for domestic and overseas training opportunities for agricultural professionals in Myanmar. Many developing countries have a well-developed research system in contrast to their weak extension set-up although it contributes little to agricultural development without an effective extension service (Wijeratne 1988; Belay and Degnet 2004).

It bears repeating that extension cannot function properly without adequately trained and motivated personnel. The effectiveness of agricultural extension work depends on the availability of extension personnel who are well qualified, motivated, committed and responsive to the ever-changing social, economic and political environment (Swanson et al. 1989; Belay and Degnet 2004).
The other problem facing extension services in developing countries is the organizational problem. Sigman and Swanson (1984) and Swanson et al. (1989) reported that extension personnel in nearly every country in the developing world are assigned many other tasks besides extension work. More specifically, extension workers worldwide are spending at least one-fourth of their time on non-educational duties (Swanson et al. 1989). Government extension personnel are engaged in many non-extension duties, such as local government servicing activities, responding to information requests, input distribution, and the collection of input loan repayments, and this creates role conflict and affects their credibility and reputation as extension advisors. For example, Belay (2003) reported that in Ethiopia, many people in rural areas consider extension agents government spokesmen rather than facilitators in the rural development endeavour. Thus, the fundamental principle of concentration of effort (BENOR 1987,138) in the T&V extension system has not survived. A further aspect of the organisational problem is the insufficient extension agent-farmers ratio in most developing countries in providing minimal levels of extension coverage for the vast majority of small, subsistence farmers (Swanson et al. 1989; Belay and DEGNET 2004). This problem is exacerbated by the absence of appropriate extension materials and effective incentive systems. In most developing countries, reward systems that will promote innovative initiatives and personal development of extension personnel are either lacking or poorly functioning. The bureaucratic structure of extension services is a basic hindrance to designing a better incentive and reward system (Vijayaragavan and Singh 1997,131).

In summary, Blum (1987,171) identified the main elements in the agricultural development of Israel which could be adapted to different eco-agricultural and socio-cultural conditions in developing countries. These features include:

- Identification of problems in the field. The best extension technique cannot make up for an inaccurate analysis of problems or for lack of knowledge.
- Empathy with farmers and understanding of their socio-cultural environment, when looking for practical solutions to problems. Farmers’ confidence in the advisors’ will and ability to help is paramount.
- Starting to work with farmers whose advice is sought and accepted by other farmers in the village.
- Close contacts with research institutions and participation in adaptive field trials.
- Demonstrations, under real farm conditions, on how to implement the advice. The advisor is the first ‘to get his hands dirty’.
- Concentration on extension only, while closely coordinating at the top level with planning and with credit, farm supply and marketing organisations – private, cooperative or state, whatever may be available.
- Constant upgrading of staff at all levels through training and encouragement of professional development.
• Creativity, which leads to improvised solutions until better founded ones can be applied.

Undeveloped supporting structure

The effectiveness of extension in the improvement of small-holder agriculture in developing countries depends on a reliable source of relevant technology, a dependable supply of agricultural inputs and access to credit, a favourable government pricing policies and markets, and a conducive working condition for extension staff. ROBERTS (1987,77-84) identified the factors that are most hostile for North-East African extension services:

• inadequate research structure, poor research-extension cooperation;
• deficient input supply and credit mechanisms;
• insufficient production incentives for farmers; and
• impediments to effective use of extension staff.

As discussed earlier, a major problem facing extension in sub-Saharan Africa is the lack of available research information in a form that can be disseminated to farmers. This is due to the weakness of the research institutions and the lack of proper cooperation between research and extension organisations. Moreover, extension operates in an environment in which credit, input supply and marketing systems are poorly developed, and production incentives for farmers are inefficient, affecting farmers’ willingness to invest in new technologies and production methods.

2.4.4 Understanding farmers’ rationality and livelihood systems

Agricultural extension in developing countries has been a top-down process, with little consideration to the socio-economic, political and cultural context of agriculture and to farmers’ knowledge, priorities, resources and livelihood strategies. Non-adoption of technology was explained by farmers’ attitudes and their lack of knowledge, motivation and capacity to adopt, based on the social-psychological model of diffusion of innovations (ROGERS 1995,114). Appropriateness of technology to farmers’ problems and specific situation, as well as its impact on their farm family, was not questioned.

For decades, research and extension focused on increasing farm production and productivity. Agricultural extension transferred unified messages without considering the wider context of the farm family and understanding their farming systems and livelihood strategies. Figure 2.5 illustrates research and extension gaps in addressing different objectives of the farm family. Farmers are not interested only in increasing their production and productivity, but also have multiple objectives under complex and changing conditions. Farmers strive, among others, for enhancement or maintenance of a social position within their community, as argued by SCOTT (1976,9 cited in DENGLER 2005,25): ‘In order to be a fully functioning member of the village society, a household needs a certain level of resources to discharge its necessary ceremonial and social obligations, as well as to feed itself adequately and continue to cultivate. To fall below this level is not only to risk starva-
tion, it is to suffer a profound loss in standing within the community and perhaps to fall into a permanent situation of dependence'. This means that farmers’ decision-making is not based only upon formal rationality, but non-economic values and goals (substantive rationality) also play a great role. Therefore, farmers’ concerns, opinions and social positions must be considered more carefully in research and extension.

Figure 2.5: Research and extension gaps in addressing the household economy

If research and extension are to help small farmers, then they must understand their rationality based on a rural livelihoods concept. Extension based on a livelihoods approach is more complex and requires systems thinking and whole farm planning. In this perspective, extension is viewed in the context of the farm family and their economy, and its role is to broaden their livelihood choices. This requires that extension advisors must possess knowledge of farm and household economy to be able to comprehend complex situations and advise farmers on diverse livelihood options, strategies and outcomes.

The livelihoods approach and its linkage with extension

A livelihood comprises the capabilities, assets and activities required for a means of living (DFID 1999). The Livelihoods Approach (LA) was developed in response to the dissatisfaction with the results of past development efforts. It evolved from the late 1980s and through the 1990s (and still evolving) mainly as a result of the work of Robert CHAMBERS and Gordon CONWAY on rural livelihoods and the World Bank on understanding the dynamics of poverty and characterization of the poor.

The LA is an integrating concept that encourages holistic thinking and practice across sectors, recognizing the complexity of people’s lives and the diversity of their livelihood strategies. Different organizations have adapted it to their specific priorities, concerns and
institutional cultures and to make it appropriate to local circumstances and priorities, but the basic principles remain the same.

**The forms of capital**

The categorisation of capital assets has not been uniform and no clear cut boundary could be established, reflecting different perceptions about forms of capital and exchange processes, but contents remain broadly the same. Capital as viewed by Pierre BOURDIEU goes far beyond the narrow concept of economics, where capital is expressed only in monetary terms, exchange takes place on the basis of defined prices, and where the actor’s sole interest consists of the accumulation of economic capital. BOURDIEU (1997, cited in DENGLER 2005,9) distinguished four forms of capital. These are: economic, cultural, social, and symbolic capital.

**Economic capital** is the most common form of capital whose value is expressed in monetary terms. Economic capital is transferable from one person or generation to another in the form of property rights.

**Cultural capital** can exist in three forms: in the embodied state, i.e., in the form of long-lasting dispositions of the mind and body; in the objectified state, in the form of cultural goods (pictures, books, dictionaries, instruments, machines, etc.), which are the trace or realization of theories or critiques of these theories, problematics, etc.; and in the institutionalized state, a form of objectification of the embodied state in formal educational qualifications and titles (BOURDIEU 1983).

**Social capital** is the sum of resources and power which an individual or a group can mobilise through social networks and connectedness, membership of formalised groups, and relationships of trust, reciprocity and exchanges. The basis of social capital is the production and reproduction of useful, effective social relationships through acts of recognition and exchange (DENGLER 2005,11).

**Symbolic capital** is ‘any property (any form of capital) when it is perceived by social agents endowed with categories of perception which cause them to know it and to recognise it, to give it value’ (BOURDIEU 1998,47 cited in DENGLER 2005,12). The value of the property is not directly related to its original function but to the way it is socially perceived in concepts such as personal importance, reputation, distinction, social status and prestige. Thus, symbolic capital is based on the ‘meaning’ attributed to goods or practices through acts of recognition and exchange.

6 The DFID’s Sustainable Livelihoods Framework identifies five forms of capital: financial, natural, physical, social and human capital, which are relevant to pursuing a livelihood. This division of the forms of capital differs from that of BOURDIEU. The distinction of the ‘economic capital’ into financial, natural and physical capital emphasises the different tangible qualities of the capital, whose basis is money. The concept of ‘cultural capital’ is different from ‘human capital’ in that the former offers a more objective view on the relation between the conditions of generation of capital and the distribution of social positions. The concept of human capital neglects the aspect of the generation of capital by way of inheritance and socialisation and assumes that an increase in human capital corresponds automatically to the access to enhanced social positions and well being (DENGLER 2005,22).
An operational livelihoods model

Having a holistic perspective, the livelihoods approach depicts a household’s resources, priorities, options, strategies, activities and outcomes within the context of vulnerability, structures and processes. Figure 2.6 presents a livelihoods model by Bettina DENGLER (2005) that integrates the theoretical concepts of Pierre BOURDIEU on social structure and forms of capital and the Sustainable Livelihoods Framework of the UK’s Department for International Development (DFID), which depicts the complex relations between the creation of livelihoods; capital endowment; livelihood strategies; policies, institutions and processes; and vulnerability context.

Figure 2.6: A livelihoods model integrating forms of capital, options and outcomes

The model provides a comprehensive perspective on exchange processes and social practices which are at the base of the reproduction of capital and the creation of livelihood. The capital assets are transformed through social practices and exchanges into livelihood outcomes, which then contribute to the resource base and the composition of the capital endowment, eventually leading to sustainability or vulnerability.

Household priorities and options are directly linked to the capital endowment and perception of the household. This means that the household, in order to put an option or possibility of action into practice, needs the required forms of capital and the categories of perception to identify the option as practicable, in form of considerations concerning what are appropriate, socially accepted and ‘rational’ options. This requires extension work to help farm households gain an insight into their problem situation and clarify the relations between means and ends.

7 For further information, see the DFID Sustainable Livelihoods Guidance Sheets at http://www.livelihoods.org/info/info_guidancesheets.html.
2.4.5 The Hohenheim School of Extension

Extension studies at Hohenheim have evolved under the strong influence of psychology and are based on a selection of fundamental concepts and models for advisory work (HRUSCHKA 1964; ALBRECHT 1986; 1970). Over time, basic concepts and models for extension practice have been developed based on the pillars of:

- Active participation of extension partners.
- Client group differentiation.
- Active listening and understanding of the situation of partners.
- Respecting partners and taking them seriously.
- Thinking from the perspective of partners.
- Generating options together with partners.
- Giving priority to the well-being of partners.
- Assisting and accompanying partners in the problem-solving process.
- Leaving partners with full responsibility to make decisions (EHRET 1997,15).

Based on these basic ingredients, extension studies at Hohenheim view advisory work as giving a client intellectual help in solving acute problems in the sense of counselling to reach a goal of the client.

Advisory work is seen as a process. Its function is to support through intellectual help, to encourage and enable the people concerned, so that they can take action in solving their own acute problems. The people concerned gain a better insight into the network of problems and recognise possible alternatives for solving them. They also get the motivation, as well as the direction, for problem-solving actions. The relationship between advisor and client should be based on partnership, where the advisor should be exclusively committed to the partner’s well-being. Freedom of decision making and self-responsibility belongs to the clients. It’s them who must bear the responsibility for the consequences of their actions. The advisor, however, is responsible for the quality of his or her work, that is, the content of extension must be correct, and the method used must be suitable (HOFFMANN 2001,70).

According to this definition, the focus of extension is on client-orientation (seeing through the eyes of a client) and on problem-solving (action-orientation). Thus, a key function of the advisor is facilitation and knowledge brokerage, helping clients gain insights into their problems and strengthening their self-confidence in solving those problems. In this process, clients are free to make decisions and are responsible for the consequences of their actions.

This basic understanding of extension differs considerably from other extension philosophies, where extension is seen as a transfer of knowledge, as a transfer of technology, or as a modernization strategy. In the interventionist view, extension is ‘undertaken and/or paid for by a party who wants to influence people in a particular manner, in line with cer-
tain policy objectives' (LEEUVIS 2004,25). In this context, there needs at least to be a partial overlap or link between the interests of clients and extension organisations (ROLING 1988,39); otherwise, people will not be willing to change unless they are forced to or persuaded by other means than just extension messages (LEEUVIS 2004,25). However, such compulsion or persuasion is not reconcilable with the basic understanding of extension at Hohenheim: 'If compulsion is applied, there can be no question of extension, because there is equally a lack of personal responsibility and freedom to make decisions, even if the recipients are being coerced for their own good' (ALBRECHT et al. 1989,35).

The field theory of behaviour at the individual level (LEWIN 1951) and the framework model of the change agent system and the client system at the social system level (CHIN 1966) provide a frame of orientation and shape the basic concepts of extension at Hohenheim. Essentially, the focus of extension is on problem-solving, and this requires a change in behaviour. Thus, extension workers must understand concepts about the nature of human behaviour and its modification. As illustrated in Figure 2.7, behaviour results from 'the psychological field of forces in which inhibiting and driving forces are present in a state of equilibrium or disequilibrium with varying degrees of tension between them' (ALBRECHT et al. 1989,63).

**Figure 2.7: Model of behaviour modification**

The analysis of driving and inhibiting forces can help extension workers understand the process of behaviour change and work on both forces to bring about change. If extension workers increase only the driving forces, then there is a danger that after a period of time, or after the influence of extension is gone, the modified behaviour may revert to the initial stage (EHRET 1997,20). ALBRECHT et al. (1989,65) call this danger of relapse 'post-decision conflict'. Thus, extension workers must work to overcome this conflict and stabilise the modified behaviour.
Having a framework model for extension is crucial to clarify issues, trends and relationships between extension staff and clientele, as well as between extension staff and the extension organisation. The framework model provides an initial overview of the extension situation and stresses the interaction of individuals, groups, social systems and cultural spheres. Figure 2.8 illustrates the basic features of the model.

**Figure 2.8: The framework model of organized extension**

![Diagram of the framework model of organized extension]

Source: ALBRECHT et al. (1989,58)

The behaviour of individuals, of both the extension worker and the extension partner, is embedded and rooted in the wider social setting. Thus, behaviour is embedded in:

- a **complex of personal relations**. In the case of the individual seeking advice, this includes, e.g., his family, his circle of friends, and the village community. The same is true of the extension worker, but he also has informal contacts with other members of the extension service.

- a **social structure** in the case of the client groups and additionally in an organisational structure in the case of the extension worker. In contrast to the personal relations of the extension worker within his organisation, the emphasis in the case of advisors to an organisation is on formal relations and arrangements.

- a **cultural milieu**. In the client groups the orientation is mostly traditional and rural; in the extension service it tends to be modern and urban.

- a **cultural and social system**. Normally this is the same for the extension service and the client groups. With development cooperation, however, there are quite often intercultural contacts within the development aid system, and between it and the client population (ALBRECHT et al. 1989,57-58).

The framework model is also called the inter-system model because it enables systematic analysis of systems individually, as well as interactions with each other. Inter-system linkages require the crossing of system boundaries and the existence of interfaces (HAVE-
LOCK 1986a,98; RÖLING 1988,188). Thus, for the promotion system to be successful, there needs to be an overlap with the client system (RÖLING 1988,39), and this depends on the advisory approach and the structure of the extension organisation (ALBRECHT et al. 1989,58).

Not everything that is carried out under the label of extension can be acknowledged as genuine extension work. Most extension services attempt to exert influence that is not in the interest of clients. State extension workers often try to transfer pre-packaged solutions to fulfil a state program which may be called an extension program, but which is in fact an agricultural policy program (ALBRECHT et al. 1989,35). With the Hohenheim concept of extension, facilitating the problem-solving process of clients is the key role for extension workers. They are not expected to have all the solutions at hand, but they must know how to go about motivating their clients to start solving their own problems (EHRET 1997,19; HOFFMANN and THOMAS 2003,72). Therefore, knowledge of basic concepts and methods is as important as the technical knowledge of extension workers.

2.4.6 Participatory Technology Development (PTD)

An approach to agriculture based on high external input diminishes the value of local knowledge and practices (REUNITIES et al. 1992; RÖLING and PRETTY 1997). Local knowledge was once perceived as inefficient and haphazard, but it is now realised that resource-poor agriculture (CHAMBERS et al. 1989) operates under a wide range of fluctuating and unpredictable socio-economic and environmental conditions, and thus requires a different approach. In recent years, there has been a growing dissatisfaction with the poor rates of adoption of agricultural technologies in resource-poor farming systems. In response to this dissatisfaction, more participatory approaches such as the Participatory Technology Development (PTD) model emerged to address the issues of marginal areas using technologies generated by farmers and to strengthen farmers’ capacities to develop and adapt technologies (WATERS-BAYER 1989; RÖLING 1994). In the PTD approach, agricultural technology is perceived not as a technical construct, but more as a social construct, or a socio-technical complex.

There are different types of participatory approaches, and still many others are evolving, but all have a common philosophy underlying their values and basic aims. The reason why PTD is considered here is to show that a model comparable to the problem-solving model of Hohenheim exists. The PTD process closely resembles the Hohenheim’s stages of systematic problem-solving model (ALBRECHT et al. 1989,70; HOFFMANN and THOMAS 2003,70). The process starts with problem diagnosis and ends with evaluation of results, focusing on farmers’ knowledge and adaptive capacities. In the process, not only do farmers identify the problems that concern them most, but they also describe what actions they would like to take to solve their problems. Thus, local knowledge provides a window into the problems that have the highest priority and shows researchers and extension workers what actions farmers want to take in solving their problems. Through the PTD process, the role of extension changes from transferring knowledge to facilitating farmer experimentation and farmer-to-farmer extension (see SCORBOROUGH et al. 1997; SELENER et al. 1997).
2.4.7 Developments and challenges shaping extension

The role and practice of extension has evolved through historical developments and adjustments to changing conditions and pressures. Significant changes and directions have characterised extension systems worldwide and have posed new challenges. Today agricultural extension finds itself in the midst of significant changes and the re-focusing of paradigms regarding its funding, delivery and focus. The main global developments include globalisation, market liberalisation, privatisation, pluralism, decentralisation, client participation, and emphasis on integrated, multi-disciplinary, holistic and sustainable development (Farrington 1994; 2002; Blackburn and Flaherty 1994b; Rivera 2001; Rivera and Alex 2004; Leeuwis 2004; Qamar 2005). The changing nature of agricultural knowledge, as well as the mode of its delivery, and the new world ideology are shaping the development of extension (Rivera 2001). The global ideology is changing significantly, with a shift in power from the public to the private sector and the encouragement of new forms of public-private sector partnerships in funding and delivery arrangements. This causes public sector agricultural extension services to adopt various decentralisation, cost-recovery, and privatisation strategies (Collion and Rondot 1998; Neuchatel Group 1999; 2002; Ojha and Morin 2001; Swanson and Samy 2002; Alex et al. 2004).

In light of these changes and trends, agricultural extension systems throughout the world need to rethink their initiatives and purposes in order to ensure that their educational programs fit the diverse and rapidly changing needs of society. There is now a greatly reduced emphasis on uniform messages, and agricultural extension is being pushed off from its traditional role of technology transfer to that of promoting sustainable livelihoods (Rivera and Cary 1997; Chapman and Tripp 2003; Alex et al. 2004). In many countries, agricultural extension is being reoriented to provide more demand-based services, taking into account the diversity, perception, knowledge and resources of users (Ehret 1997). Farmers need advisory services in a diverse range of areas. To meet this need for information and advice, extension needs to engage in a wide range of issues related to agriculture, livelihoods, health and environmental protection and broaden its clientele and methodological approaches. This means that new concepts and approaches to agricultural extension are needed to accommodate the evolving developments and trends.

Taking this view further, Leeuwis (2004) argues that extension will have to be reinvented as a professional practice, accompanied by significant conceptual and practical changes. He proposes a shift away from ‘extension’ to ‘communication for innovation’ and defines extension as ‘a series of professional communicative interventions amid related interactions that is meant, among others, to develop and/or induce novel patterns of coordination and adjustment between people, technical devices and natural phenomena, in a direction that supposedly helps to resolve problematic situations, which may be defined by different actors involved’ (Leeuwis 2004,27). Central to this definition is the need for building coherent linkages and networks between technological arrangements, people and social-organisational arrangements. This concept of extension requires major changes in relationships with clientele and skills for moderation or facilitation. Partnership, mutual learning, and responsiveness must characterise the relationship between extension workers and...
clientele. Table 2.1 provides an overview of the changes in perception and thinking over the last decades regarding research and extension.

Table 2.1: Research and extension: beliefs and socio-economic research frontiers 1950-2000

<table>
<thead>
<tr>
<th>Period</th>
<th>Explanation of farmers' non-adoption</th>
<th>Prescription</th>
<th>Key extension activity</th>
<th>Socio-economic research frontiers</th>
<th>Dominant research methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950s-1960s</td>
<td>Ignorance</td>
<td>Extension</td>
<td>Teaching</td>
<td>Understanding the diffusion and adoption of technology</td>
<td>Questionnaire surveys</td>
</tr>
<tr>
<td>1970s-1980s</td>
<td>Farm-level constraints</td>
<td>Remove constraints</td>
<td>Supplying inputs</td>
<td>Understanding farming systems</td>
<td>Constraints analysis; Farming systems research</td>
</tr>
<tr>
<td>1990s</td>
<td>Technology does not fit</td>
<td>Change the process</td>
<td>Facilitating farmer participation</td>
<td>Enhancing farmers' competence Understanding and changing professional behaviour</td>
<td>Participatory research by and with farmers</td>
</tr>
</tbody>
</table>

Source: CHAMBERS (1993,67)

2.5 Concluding remarks

Usable knowledge is the primary input into and output of the AKS, and how inputs are processed into outputs determines its functions. A good situation analysis brings together research results and the goals of farmers. In this process, local knowledge is of vital importance. For farmers to understand and use new knowledge, it has to be translated into familiar terms and concepts and adapted to their socio-economic and agro-ecological conditions. Thus, the ultimate test of the performance of the AKS is the utilisation of knowledge, and especially the development of farmers’ knowledge and adaptive capacities. This entails basic conceptual and practical changes in extension theory and practice in developing countries.
3 Research Process and Methodology

3.1 Introduction

The preceding chapter presented the theoretical framework for the study. This chapter describes the research process and methodology used to collect the data to answer the research questions. The chapter is organized into two major topics: the study areas and data collection techniques. Broad coverage is given to how narrative interviews and focus group discussions were used, how the data were recorded and analysed, and what their results mean.

3.2 Selection of the study areas

Series of consultations were made with extension personnel of the BoARD to select areas for the study. The Eastern and Central zones were selected based on agro-ecological diversity and institutional and practical aspects. The zones have the greatest population and are priority areas for external intervention both by the Government and NGOs. They are generally characterized by erratic rainfall, high population density, severe land degradation, and low agricultural productivity. Exploratory visits were made to the zones to learn about the general situation and existing institutions.

Since the zones are fairly large to cover and also show similar conditions, two woredas (districts) were selected for the study. Further, one study area was selected from each woreda: Begasheka tabia located in Kola Temben woreda of Central zone and Debre Birhan tabia located in Hawzen woreda of Eastern zone. The study areas provide contrasting situations in agro-ecological diversity, while providing similarity in the low use of improved agricultural inputs. Introductory visits were made to meet members of communities, local leaders and development agents in the study areas. Discussions were made with local leaders to learn about the local governance systems. Contacts were also made with woreda offices of Agriculture and Rural Development and NGOs to gain a wider insight into the general picture of the agricultural systems and development interventions in the study areas. These visits were also essential to establish rapport, explain the purpose of the study, and gain the trust and cooperation of local leaders, farmers and development agents in the course of the study.

The Operational Research and Capacity Building for Food Security and Sustainable Livelihoods Project operates in the study areas. The project is undertaken in collaboration between Mekelle University, the Tigray Agricultural Research Institute, the Relief Society of Tigray, the Bureau of Agriculture and Rural Development, and the Tigray Food Security Coordination Office. Mekelle University assumes the overall coordination role, while technical teams drawn from collaborating institutions follow up on the day-to-day operation of the project. The study utilised this project to assess the institutional cooperation and linkage situation in Tigray. It was also hoped that findings from the project could be compared to those of this study.
3.3 Description of the study areas

Begasheka tabia

Begasheka tabia is located 13 km from Abiy Adi which is the administrative center for Kola Temben woreda, where the representative offices of the various bureaus are based. The tabia is divided into three kushets (villages) and is a slightly hilly area, with an average altitude of 1670 m above sea level, characterised as a middle highland. Begasheka has a total land area of 1429 ha and a population of 5507 in 2003. Of the total land area, 80% is under cultivation, 9% is grazing area, 6% is forest land, and 5% is settlement and unused land (deep gorges, gullies, steep slopes and rock outcrops). The average land holding is 0.8 ha which is a little more than the woreda average. Grazing areas are particularly scarce. Most farmers feed their livestock through systems such as free grazing, restricted grazing, straw giving, and cut and carry from enclosures and grazing lands (MENGISTU and DESTA 2005). Further, moisture stress is a critical production constraint in the tabia, receiving a mean annual rainfall of about 600 mm, which is highly erratic and unreliable. Achieving optimum moisture condition for cultivation is difficult under the present management practices and farming technology. Irrigation practice in the area is limited. According to MENGISTU and DESTA (2005), more than 85% of the households did not practice vegetable production.

Maize, finger millet and tef are the major crops grown in Begasheka. Tef is mainly grown as a cash crop. Farm households are subsistence oriented, and food production in the tabia is very low. None of the households manages to cover all of its annual food needs through its own production. The majority of food and cash derives from the sale of livestock, as well as labour in the form of agricultural workers in some months and piecemeal town labourers and local hires in others. The months of December-January, March-May and August-September are the times of labour migration to Humera, Shire, Raya and Abergelle. In the tabia, most households have low economic opportunities outside of agriculture. They have extended their farming fields to very steep slopes, reared livestock on overgrazed fields, and cultivated on severely degraded soils without fallowing. They use scant trees and shrubs, crop residues, and dry animal droppings for household energy. This has caused severe land degradation, which makes farming more difficult and risky with the existing farming technology. In response to this environmental situation, enormous efforts in soil and water conservation, reforestation and area enclosures have been made both by the Government and NGOs in the recent past. These efforts have shown promising results in reducing land degradation. According to MENGISTU and DESTA (2005), about 93% of the households in the tabia believed that land degradation problems were on the decline.

Debre Birhan tabia

Debre Birhan tabia is located about 12 km from Hawzen, the administrative center for Hawzen woreda. The tabia consists of four kushets (villages) with a population of 6036, out of which 33% are women-headed households, and a total land area of 2447 ha. The tabia is located at an altitude of 2160 m above sea level, characterized as highland. Land is very scarce; the average landholding is about 0.5 ha. In contrast to Begasheka, Debre
Birhan has a good market access to Hawzen, Kilteawulaelo, Saesie Tsaedaemba, Dugum and Wukro. Pack animals are used as transportation both for people and goods.

A limited number of NGOs operate in the *tabia*. The Relief Society Tigray (REST), a local NGO, works in environmental rehabilitation and livestock development. The *tabia* has perennial streams and great ground water potential, and traditional irrigation found its way long ago. The Irish Development Aid has been working to develop this potential and has made significant contributions in watershed management, construction of deep wells, and provisions for motor pumps for vegetable production, forage development, bee keeping and dairy development. There are significant water resource development activities in the *tabia* for domestic use, irrigation, and livestock drinking. These activities include household ponds, hand dug shallow wells, spring development, and livestock watering points. Many farmers grow cabbage, green pepper, tomato and onion both for consumption and sale. Maize is also grown on irrigated land. The people in Debre Birhan have more positive attitude about household ponds and improved inputs than the people in Begasheka. Farmers use various sources of vegetable seeds, and wheat is the commonly used improved seed in the *tabia*. Most households in the *tabia* derive their income from the sale of livestock and vegetables.

Figure 3.1: Map of Tigray and location of the study areas

3.4 Data collection techniques

The study used empirical data collected using narrative interviews and focus group discussions between May 2004 and June 2005 in two districts in the Tigray region. The narrative interviews and focus groups were supplemented by personal experience and with a review of the documentation surrounding the evolution of agricultural extension services and the current extension program in Ethiopia.
A general field guide was prepared during the preparatory phase of the study based on preliminary ideas, concepts from a literature review, and personal experience, first by preparing questions, and then converting them into a set of topics. The field guide was enriched in the process of the fieldwork and helped the researcher create a natural progression across topics with some overlap between the topics. The researcher was free to probe more deeply when necessary, skip over areas that have already been covered, and follow new topics that arose during the focus group discussions.

In the early stage of the study, there was not a systematic selection of informants, but rather informal interviews were made with a wide range of extension personnel to get a general picture of the circumstances in which they operate and the kind of relationship they develop with the farming community. This helped the researcher get an insight into the overall situation of the AKS and orient the specific focus of the study. This was made possible during the months of July and August in 2004 when the staff of the BoARD were attending a continuing education program at Mekelle University.

A case study methodology was used because the AKS is a complex subject. Case studies formed the empirical basis for the study, providing the local context for assessing the performance of the AKS, as this cannot be fully understood only from institutional analysis, or a study at a given point in time.

3.4.1 Qualitative, informant-oriented approach

The study of an AKS requires a comprehensive approach with a systematic combination of methods. A flexible, continuous, and iterative process is needed for such an exploratory study. Qualitative research methods have great potential to explore complex situations involving people's constructions of meanings, and are appropriate for incremental improvements in understanding (progressive learning and reflection). Qualitative research is an empirical, socially located phenomenon involving sustained and engaged interaction of people (KIRK and MILLER 1986,12). There are different types of methods and tools available, and each method is suited for different situations and goals. Thus, a key aspect of the methodological approach of this study is to make the best combination of complementary methods in order to achieve methodological and data source triangulation. The study used narrative interviews and focus groups as the primary means of data gathering. Focus groups are a necessary complement to individual interviews and allow for verification and generalisation.

Narrative interviews

Life history interviews are a form of individual interviewing. They have been used by sociologists and anthropologists for a long time. Narratives are also used in development project settings to explain how actors align themselves by learning their stories about conflicts and negotiations within the local processes of project negotiation (VAN DER DOES and ARCE 1998; ROE 1991). The life history methodology focuses on the ways in which individuals account for, and theorize about their actions in the social world over time (MUSSON 1998,10). This interview form aims to obtain a personal account of a respondent's life situation retrospectively reconstructed through continuous input on the part of
the respondent. In the interview process, there is very little conversation, and the interview situation is dominated by the story-telling respondent. The researcher uses a story-generating question and may ask additional questions after the story is completed. During the story-telling, the respondent offers a complete reconstruction of a certain topic as it occurred in the past, in the context of conditions and factors as they unfolded at that time, and as recalled and experienced by the respondent (Sarantakos 1993,185).

The subjective interpretation of the situation in which people find themselves is the cornerstone of the methodology (Musson 1998,10). This enables the researcher to gain an insight into a segment of a respondent’s life, as experienced, understood, explained and justified by the respondent, and get an idea of why people are doing things a certain way. Individual explanations and interpretations of life situations are used as social windows (see Engel and Salomon 1997) through which change processes and social interactions are re-constructed, understood, and their implications discussed. This method provides a tool for accessing the sense of reality that people have about their own world, and attempts to give voice to that reality. Put another way, it provides a fundamental source of knowledge about how people experience and make sense of themselves and their environment, thus allowing the actors to speak for themselves (Musson 1998,11). For this reason, narrative interviews were used to depict interfaces between local and formal knowledge systems, and provide a historical context for assessing the development and effectiveness of the AKS in Tigray.

Focus group discussions

The focus group technique is a tool for studying topics in group context. Focus groups can be used either as a self-contained method or as a complement to other methods, especially for triangulation and validity checking (Morgan 1988,24). Focus groups have long been used by marketing research to gain potential customers’ reactions to new products and services (Morgan 1988,10). They are used to generate information that cannot be generated using other methods such as observation, individual interviewing or questionnaire surveys. Compared to these methods, focus groups elicit a multiplicity of views and emotional processes within a group context. The hallmark of focus groups is the ‘explicit use of the group interaction to produce data and insights that would be less accessible without the interaction found in a group’ (Morgan 1988,12). Participants discuss ideas, issues, insights and experiences among themselves, and each member is free to comment, criticize and elaborate on the views expressed by others. Inhibitions of participants are often reduced in the course of the group discussion because the participants stimulate each other to express their views. The participants’ interaction among themselves replaces their interaction with the researcher, thus leading to a greater emphasis on participants’ points of view (Morgan 1988,18). Thus, the opinion eventually expressed by the group does not really reveal individual opinions because opinion formation is determined by group dynamics.

The key to focus groups is the ability of the researcher to control the assembly, conduct the focus group sessions, and observe the process of opinion formation (or group behaviour). As a moderator, the role of the researcher becomes critical. The researcher has to provide clear explanations for the purpose of the discussion, help participants feel at ease,
and facilitate interaction between group members. During the discussion, the researcher introduces the subject, keeps the discussion going through subtle probing techniques, and ensures that everyone participates and gets a chance to speak. Observing how participants respond to each other provides a useful insight into people’s differences, and how participants challenge each other and respond to these challenges. As a technique, focus groups emphasize maintaining discussion on a topic until the participants’ points of agreement and disagreement become apparent (Morgan 1988,29). In this process, the researcher must refrain from showing too much approval and giving personal opinion so as not to influence participants’ position or opinion.

The composition of a focus group is usually based on the similarity of the group members. Participants need to feel comfortable with each other, but should also have something to say about the topic to carry on a productive discussion. Meeting with others who possess similar characteristics or levels of understanding about a given topic is more appealing to participants than meeting with those who are perceived to be different (Morgan 1988,46). Several sessions can be held with different participants on a specific topic. Small groups are more productive when the researcher desires a clear sense of each participant’s reaction to a topic. As a rule of thumb, moderate sized groups of between 6 and 10 participants are recommended, with typical length of sessions between one and two hours.

3.4.2 Data collection and analysis

A field guide was used to create a natural progression of the fieldwork, and field notes to record information, interactions, and observations. Recording dates of interviews and topical headings of questions that were asked contributed to the chronology and meaningfulness of the field notes. According to Spradley (1979, cited in Kirk and Miller 1986,55), four kinds of field notes can be distinguished: 1) the condensed (verbatim) account; 2) an expanded account recorded as soon as possible after each field session; 3) a field work journal that contains experiences, ideas, fears, mistakes, confusions, and problems that arise during fieldwork; and 4) a provisional running record of analysis and interpretation. Field note entries must clearly differentiate between various kinds of entry (e.g., what people literally say, the context of social interactions, and the reaction of the researcher to the situation), and must record native-language utterances as nearly verbatim as possible (Kirk and Miller 1986,56). It is important to be clear when a fact or a reaction is recorded.

Two basic approaches exist for analysing qualitative data: content and biographic analysis. The principal difference between the two is that the former involves coding response options, while the latter uses the actual words and behaviours of participants. However, these are not conflicting means of analysis, and there is generally added advantage by combining the two (Morgan 1988,64).

This study used ‘story’ as fundamental data. Transcripts of participants’ experiences and perspectives were used to answer the research questions. Participants’ perceptions or subjective interpretations of their situations were transcribed and analysed qualitatively, using
direct quotations from field notes that illustrate the points the participants were making. Farmers’ accounts of their life situation were interpreted reflecting their own interpretations, without introducing biases, distortions and erroneous interpretations by the researcher. A cross-case analysis was carried out, in which similar or contrasting findings were considered and discussed.

Narrative interviews

Narrative interviews with elderly farmers were used to explore the changing situation of farmers in two communities in the Tigray region. The interviews with elderly farmers began with the past situation and converged on the contemporary development problems and interventions. This enabled the researcher to gain a more comprehensive understanding of the past situation and a better understanding of the current situation and its future direction. Elderly farmers are rich sources of information about local situations and change processes. By understanding their life histories, a closer understanding of local situations and changes was gained in a historical context. Reconstructing the biographies of elderly farmers helped the researcher explain the links between local and formal knowledge systems. The story-generating question that the elderly farmers were asked was: ‘What did the situation look like when you were young, and how has it changed over time in your life time?’ This question made the informants try to remember the changes in their life time and enabled the researcher to reconstruct the stories of changes, innovations and sources of information in the study areas. The inquiry produced a wealth of information leading to useful insights into the changes in the local farming systems, thus learning about the discontinuities and experiments done to adapt to changing circumstances.

The elderly farmers were selected with the help of development agents and local leaders. This was verified by asking other community members to identify elderly knowledgeable farmers in their community. The question addressed to them was: ‘If you have agricultural problems, who is the farmer you will contact for advice or information?’ They were also asked to explain the reasons why they identified certain farmers as their sources of information or as knowledgeable farmers in their community. This way, the elderly farmers who were recommended by development agents and verified by other farmers were contacted for in-depth interviews. On average, ten elderly farmers were recommended as participants for the narrative interviews, and six are actually involved in the study. They were selected based on their knowledge of the community, length of stay in the area, farming knowledge, and ability to express themselves.

The elderly knowledgeable farmers were asked about their farming life and the farming system followed by other farmers in their community. Individuals reflected on their life experience through a given period of time, providing an understanding that extends to the wider community. Unstructured interviews were held around a few story-generating questions. The researcher followed-up any interesting information that emerged during the narrative interviews. After each interview session, the researcher went over the information and identified issues that needed further discussion in subsequent interviews. Often people gathered while individual interviews were conducted, and this helped the researcher introduce general topics to show the purpose of the study to the community.
Focus group discussions

Different focus groups were used in order to obtain differing views. With the help of a research assistant, focus groups were held with participating farmers, non-participating farmers, and model farmers in the extension package program in order to understand its current situation, and how the participants felt it has benefited or harmed them, or a particular social group in their community. Focus groups were also held with local leaders and development agents, based around a discussion on the process of involving farmers in the extension program, the diffuse role that development agents held, and the consequences on their work and relationships with farmers. On average, eight focus groups were conducted in both study areas, providing the most meaningful information and allowing cross-validation of data. Preliminary findings from preceding focus group discussions were used as the basis for the creation of a more structured interview guide that was pursued in more groups. The groups discussed a range of topics and also introduced new issues to the researcher.

The participants were selected on the basis of their participation in the extension package program: graduate farmers, dropout farmers, and non-participating farmers. Development agents and local leaders helped the researcher select participants and make appointments with them for the public meeting places. Holidays were appropriate to have appointments with participants and to meet other farmers and local leaders in the village meeting places. Efforts were made to identify neutral locations to avoid negative or positive associations with a particular site and to build rapport with participants through informal and general discussions. In Begasheka, the study benefited from the existence of a local drink house where the focus group discussions were conducted in a friendly and informal way. A few rounds of Siwa, the local beer, initiated discussions smoothly and gradually generated heated discussions. Farmers in Tigray had a long tradition of discussion and were expressive and critical during the focus group discussions.


4 Natural and Socio-Economic Environment of Tigray

4.1 Introduction

The previous chapters presented the conceptual and methodological framework for the study in order to answer the research questions. This chapter is intended to provide the context of agriculture in Tigray for the readers who are not familiar with the agricultural situation in Ethiopia. The chapter is organized into two major topics, first presenting the socio-economic and natural environment of Tigray within which the agricultural knowledge infrastructure operates, and then providing an overview of the evolution of extension services in Ethiopia, particularly in Tigray, to provide a historical background for the analysis of the organisation and performance of the current extension service in the Tigray region.

4.2 Natural environment of Tigray

The Tigray region is located in the northern part of the country situated between latitudes 12°15'N and 14°57'N and longitudes 36°27'E and 39°59'E (BoANR 1996). It borders Eritrea in the North, the Afar region to the East, Sudan to the West and the Amhara region to the South. The area of the region is estimated to be 80,000 km² with a population of about 3.5 million. About 85% of the population lives in rural areas where agriculture is the main means for living, and about 58% are estimated to be below the poverty line. Agricultural production and productivity is very low, and the growth in agricultural output has barely kept pace with the growth in population.

The topography of the region is characterised by varied landscapes and different altitudes, ranging from 500 in the northeast to almost 4000 m.a.s.l. in the southwest (TASSEW 2000). Due to this variation in topography and altitude, there are different agro-ecological niches or micro-climates within short distances (AMARE 1996). Farming in Tigray depends on rainfall, which is highly variable and erratically distributed over a single rainy season from mid-June to early-September. The coefficient of variation in the annual rainfall for Tigray is about 28% compared to the national average of 8% (AMARE 1996; TASSEW 2000). Average rainfall varies from about 200 mm in the northeast lowlands to over 1000 mm in the southwest highlands (FITSUM et al. 1999; MITIKU and ABEBE 1999). The mean annual rainfall and the length of the growing period increase considerably when one moves from lower to higher altitude and from East to West. The length of the growing period varies from more than 120 days in the West to 90 days along the eastern escarpment and eastern lowlands (BoANR 1996). The distribution of rainfall in the main rainy season creates a mono-modal cropping pattern; the meher season produces the bulk of the annual harvest.

The performance of the agricultural sector over the past few decades has been very poor due to soil erosion and moisture stress. The average productivity of land for most crops has long been below one ton per hectare (BoANR 2002a). Soil erosion, nutrient depletion and moisture stress are the major problems and threats to the successful continuation of
agriculture in Tigray. Due to the long history of settlement and agriculture, the vegetation cover has been cleared. Thus, the land which once supported a productive agriculture with a luxurious vegetation of diverse flora and fauna currently has a vegetation cover of 1% at most (MITIKU and ABEBE 1999).

4.3 Farming systems and farming technology

Agriculture in Tigray consists of both mixed farming and pastoral systems. The mixed farming system is dominant in the highlands, while pastoral systems are more common in the lowlands. Cereal crops are the major source of livelihood. The major crops grown in the region are maize, sorghum, barely, wheat and tef (*Eragrostis tef*). Livestock also constitute an important part of the rural economy. There is a high level of interaction between crop production and livestock husbandry. Livestock are kept mainly for capital and breeding stocks to provide draught power for agricultural operations. They are also an important source of risk mitigation in the case of crop failure. Donkeys are the principal pack animals complemented by camels, mules and horses (FESEHA 1999). They are also used for ploughing purposes, especially during the planting season, by farm households who lack oxen (FETIEN et al. 2001a). Oxen are the most commonly held livestock. Households with no oxen acquire oxen for their ploughing operations through various arrangements. The dominant arrangement is the exchange of labour for oxen power. Other arrangements include the exchange of oxen for straw or pasture and through sharecropping and land renting.

The average farmland holding in Tigray is 0.97 hectares (TASSEW 2000) which is below the recommended average hectare of 1.53 that, according to the MoA, is sufficient for producing the household food requirement (BoANR 2002a). Seventy percent of the farm households own less than one hectare (TASSEW 2000). The land scarcity leaves no room for increasing the area of land under cultivation. Thus, increasing agricultural production is possible only through agricultural intensification using improved inputs and practices.

Farming is a typical economic activity organised at the household level. The production process is family based with little hired labour (TASSEW 2000). The largest proportion of the labour force for the farming household is derived from family members, and female family members account for about 48% of the total family labour force. Non-family labour is used during the peak periods to overcome labour shortage through hiring and labour exchange systems. In Ethiopia, while a certain division of labour is evident in agriculture, it is often blurred; both men and women participate in agricultural activities (MAMUSHA 1996; GEBREMICHAEL 2004). Rural women are virtually involved in almost all agricultural activities. In the northern part of the country, ploughing is operated by men because it is a taboo for women to plough. However, in response to changing situations, women become increasingly responsible for tending their farms. Driven by the lack of male labour, female-headed households are ploughing for themselves in Tigray, challenging cultural norms and championing cultural innovations (MAMUSHA et al. 2000; FETIEN et al. 2001a).
The small-holder farming system is characterised by small-scale farming operations and traditional technology based on animal traction. It involves the use of the oxen-drawn plough, locally called *maresha*, a wooden plough fitted with a metal chisel to penetrate the soil. The *maresha* is used for ploughing and creating drainage ditches. This technology has existed for a long period of time without any significant changes (McCANN 1995). However, in order for agricultural development to occur, farmers’ knowledge and skills must increase and the technologies they use should also advance (MOSHER 1966). Local blacksmiths are the experts who produce and modify the ploughshare (PANKHURST 2000).

Farmers plough their land two to four times depending on the type of soil and crop before planting. The ploughing intensity is higher for cereals than for pulses and oil crops. The land is ploughed up to four times, especially for tef and wheat to suppress the growth of weeds, and thus reduce the labour required for weeding. Grain harvesting is done manually, and the harvested crop is transported from fields using human power and donkeys. Some farmers thresh the harvested crop in the field and transport the grain and straw to their house by using donkeys. Cattle and horses are used for threshing harvested crops. Storage structures are traditional with substantial post-harvest losses. A survey report made by the BoANR showed that an average of 12% grain loss occurs yearly due to storage pests in Tigray (MEKELLE PLANT HEALTH CLINIC 2003).

### 4.4 Social services and infrastructure

The Tigray region has few social services and little infrastructure development. The region was forgotten in the *Derg* regime due to the civil war, which engaged most parts of Tigray. Although, after the fall of the *Derg* in 1991, there has been a considerable improvement in infrastructure development, the quality of the service is very low. There are still not enough roads, and even the quality of available roads has deteriorated. The regional average road density is below the national average (TASSEW 2000). This poor infrastructure development constrains the transportation of agricultural inputs and outputs and the use of new production methods, making it difficult and expensive to get agricultural inputs to farmers. Farmers transport agricultural products to local markets and inputs to farms in head loads and on pack animals. They market only a few things, in small quantities and buy little, thus depending on their own production for most of their subsistence.

The region has undeveloped electricity and telephone services. Many rural towns do not have electricity and telephone centers. Some efforts in rural electrification using solar energy are limited only to health clinics and schools. Although the potential coverage of health and veterinary services has shown an improvement, the quality of the services is still poor because health and veterinary centers are poorly equipped with material and human resources.
4.5 Structure and function of local governance

The *woreda* is the administrative structure that handles the local administrative and development matters. Each *woreda* is divided into *tabias* (sub-districts). On average, a *tabia* consists of 1500 households. Each *tabia* is again sub-divided into *kushets* (villages or hamlets) which are the lowest level of formal government. *Kushets* are further subdivided into neighbourhoods locally called *got*. About 20 to 30 people live in each *got* and are led by the *Abo Selasa*, the leader of 30 people.

The *baito* (people’s council) is an important institution that runs the administrative, socio-economic and political affairs of local people within its jurisdiction. Local councils are vital to accomplish political and development goals. Six executive persons constitute the *baito* administration at the *tabia* levels. These are the chairperson, propaganda, rural development, *wudabe*, capacity building and security. They have different responsibilities in the administration and operate through various committees. The chairperson is charged with the overall administration and is paid for offering this service. The propaganda, who is also the vice-chairperson, is responsible for culture and information. The rural development person is entrusted with the responsibility of coordinating and following up of the execution of planned development programs and works closely with local development agents. The *wudabe* is responsible for the mobilisation and organization of mass associations. The capacity building person coordinates health and education efforts. The health person follows up the activities of *Fana Tena* (women’s health), *Tena Cadre* (environmental sanitation, child vaccination, surveillance and reporting of diseases) and *Merahi Hakim* (local health agents). The education person is responsible for the educational affairs of the community. The security person maintains peace and order in the community and regulates violent behaviours, such as cutting down trees, selling fuel wood, discharging flood, ploughing unauthorised land, and letting animals graze in protected areas.

Local governments are empowered to bring about closer interaction with people and facilitate local development. People’s participation is promoted through the *baito* whose decision-making process theoretically involves a widespread discussion, encouraging the presentation of different viewpoints and problem-solving scenarios. Regular evaluation locally called *gumgam* is a characteristic feature of the *baito*, a practice which has now been widely adopted by the civil service in the country.

4.6 Evolution of agricultural extension in Ethiopia and its linkage with research

4.6.1 During the Imperial period

Agricultural extension in Ethiopia has a brief history. Its beginning dates back to the 1930s (TESFAYE 2003). The establishment of the Ambo Agricultural School in 1947 marked the beginning of agricultural education (BELAY 2003). Forma...
sion started in the early 1950s with the establishment of the Jimma Agricultural Technical School in 1952 and the Alemaya Imperial College of Agriculture and Mechanical Arts\(^8\) (now Alemaya University) in 1953, both modelled after the Land-Grant Colleges in the United States. The college was given a mandate to develop and deliver a national agricultural extension service, but when the administration of the college was transferred to the Haile Selassie I University (now Addis Ababa University), the extension mandate of the college was taken over by the MoA in 1963.

In the 1960s, agricultural policies were oriented to expand large-scale commercial farms (BELAY 2003; ATAKILTE 2003). In the First and Second Five-Year plans of the Imperial Government, small-holder agriculture received little attention. The First Five-Year Plan (1957/58-1961/62) was set out to integrate agriculture with an industrial economy. The Second Five-Year Plan (1963/64-1967/68) tended to acknowledge the marginalization of the small-holder agriculture and focused on social and agricultural extension services, but large-scale farming dominated the period. It was in the Third Five-Year Plan (1968/69-1973/74), when food scarcity provided the motivation, that the government started to pay attention to the peasant sector and launched strategic approaches (area-specific extension programs) to agricultural development through Comprehensive Package Projects (CPPs) in the high-potential areas of the country, with financial support from donors. The projects involved an integrated application of different strategies such as improving of existing infrastructure, provisions for better social services, marketing and credit services, animal husbandry, training of development agents and farmers, preliminary field experimentation, and popularisation of improved agricultural technologies (BELAY 2003; TESFAYE 1999; GETANEH 2001; EYASU 2002).

The most popular agricultural development project that targeted small-holder farmers emerged toward the end of the Imperial regime in 1967. This project was known as the Chilalo Agricultural Development Unit (CADU), which was undertaken in the Chilalo district of Arsi province. The project was undertaken with the assistance of the Swedish International Development Agency (SIDA) employing demonstration plots and the model farmer strategy to demonstrate technology packages to other farmers. Extension activities

\(^8\) In the early 1960s, there was a large-scale attempt to export the land-grant agricultural extension service complex to the developing nations of Latin America, Africa and Asia. With funding from the U.S. Agency for International Development (USAID) and private foundations, U.S. land-grant universities created overseas campuses where American faculty members taught, conducted agricultural research and advised extension services (ROGERS 1995,56; NAGEL 1980,119). The Alemaya College of Agriculture and Mechanical Arts was one of the overseas campuses established with the agreement signed between the United States Technical Cooperation Administration and the Oklahoma Agriculture and Mechanical College (now Oklahoma State University) under the Point Four Program to give assistance to the Imperial Government of Ethiopia in furthering economic development and in establishing and operating a college of agriculture. Accordingly, the Imperial Ethiopian College of Agriculture and Mechanical Arts (now Alemaya University) was established in 1953 to carry out agricultural education, research and extension on a national basis. In 1961, the college became part of Haile Selassie I University (now Addis Ababa University) under the Ministry of Education. Following this shift of administration, the national extension mandate of the college was transferred to the Ministry of Agriculture (MoA) in 1963 and the research wing to the Institute of Agricultural Research (IAR) in 1966, marking the structural separation of education, research and extension in the country, which remains a major problem facing the Agricultural Knowledge System in Ethiopia.
were focused on a few selected farmers who would then demonstrate to neighbouring farmers the advantages of improved agricultural techniques and products (ALEMNEH 1989). Thus, despite significant changes in the project areas, the project did not benefit the majority of small-holder farmers; instead, landlords and model farmers benefited (BELAY 2003; ATAKILTE 2003; GETANEH 2001; EYASU 2002). Further, the project was capital intensive and more suited for large-scale farms which were accessible by main roads. As a result, the project did not extend to other areas.

Cognisant of this limitation, the Extension Project Implementation Department (EPID) of the MoA launched the Minimum Package Project I (MPP-I) to cover wider areas adjacent to main roads with minimal costs. The MPP-I involved road construction and the provision of extension services, fertilizer, marketing and credit services using a model farmer strategy to demonstrate improved agricultural inputs to other farmers. The objective of the project was to extend the achievements of the CPPs to small-holder farmers using the approaches developed by the projects. However, the MPP-I was not without problems. It falsely assumed that farmers' problems were due to lack of improved technologies and practices and focused on the introduction of new inputs (fertilizers, improved seeds and pesticides). There was no systematic effort to understand the real circumstances of small-holder farmers and to orient project activities around their needs and problems. On the whole, the neglect of local farming systems and the heavy reliance on external inputs were the major shortcomings of the package projects. Moreover, the package projects failed to have significant impacts on agricultural development because the necessary land policy reforms were not in place.

4.6.2 During the Derg period

Following the 1974 revolution, the military Government took radical land reform measures by abolishing the private ownership of rural lands and establishing Peasant Associations (PAs) as the basic instrument for implementing land reform. After political stability and major structural changes in rural areas, the MPP-II was started in 1981 with the same objectives as the MPP-I. The project used PAs as a local link to distribute packages and cooperative farms for demonstration purposes. PAs selected farmers that would receive technical training and serve as links between PAs and development agents. The shift from a model farmer strategy to cooperative farms was due to the political orientation of the extension service, which promoted agricultural collectivisation. The socialist Government discriminated against small-holder agriculture in favour of large-scale state farms and producer cooperatives, which received high priority for the provision of agricultural inputs and services.

The performance of the MPP-II in technological change was poor due to the heavy involvement of PAs and development agents in mass organization and limited human resources with inadequate logistical support (GETANEH 2001; BELAY 2003). Since the woreda was the basic organizational unit to carry out the package project, the concentration of extension staff at the woreda level created gaps between development agents and farmers due to lack of adequate transportation. Development agents were also unpopular among many farmers (PAUSEWANG 2002) because they were heavily involved in collect-
ing taxes, promoting producers’ cooperatives, and collecting loan repayments (ALEMNEH 1989). In all, the lack of mobility and organizational problems were the major problems limiting the performance of the extension service during the Derg period.

With the termination of the MPP-II due to donor dissatisfaction with government agricultural pricing and marketing policy, a new program called Peasant Agricultural Development and Extension Project (PADEP) was launched in 1989 by the MoA. The program was financed by the World Bank, the International Fund for Agricultural Development (IFAD), the European Economic Commission (EEC) and the African Development Bank (ADB) and worked in geographically delineated agricultural development zones to intensify input distribution, promote cooperatives, and create linkages between research and extension using a modified T&V extension system until 1993, when the Sasakawa-Global 2000 agricultural program started in Ethiopia.

4.6.3 During the EPRDF period

Despite the pitfalls of the TOT model, efforts similar to it still continue in Africa. The SG 2000 agricultural program has been working since 1986 in Africa based on modernist perspectives on future strategies for agricultural development (PRETTY 1995,5). The SG 2000 is an international NGO established in 1986 to assist African governments in reducing poverty, enhancing food security, and protecting the natural resource base through introducing improved technologies to small-scale farmers. The origin of the SG 2000 program in Africa started in the early 1980s: ‘When drought devastated the Sahel in the early 1980s, the late Ryoichi Sasakawa, Chairman of the Japan Shipbuilding Industry Foundation (now the Nippon Foundation) and father of Yohei Sasakawa, responded by underwriting shipments of emergency food aid to the drought stricken countries. He believed, however, that the famine was a symptom of underlying stagnation in food production. He contacted Norman Borlaug to find out whether the green revolution principles could be applied in Africa’ (SG 2000/ETHIOPIA 2000). The SG 2000 program is, therefore, an attempt to transfer to Africa the benefits that the Green Revolution brought to Asia and Latin America in the 1960s.

The SG 2000 agricultural program believes that agricultural development in Africa ‘cannot be achieved unless farmers have greater access to the productivity of science-based agriculture, namely improved varieties, chemical fertilizers and crop protection products, and improved crop management practices’ (DOWSWELL and RUSSELL 1991, cited in PRETTY 1995,50). The program assumes that technology is available in the program countries, but its dissemination and use by farmers is constrained by poor extension services and their linkage with research systems. Therefore, it believes, with a proper application of improved techniques by farmers with guidance by competent and motivated development agents, agricultural production could be increased tremendously in Africa. To make this possible, the program applies the following sequence of activities: 1) identifying and assembling improved technologies into extension packages; 2) training development agents and participating farmers in new extension packages; 3) conducting demonstrations on a half hectare in farmers’ fields; and 4) supporting the sharing of experiences among farmers. Participating farmers graduate after three years staying in the program,
after that they are expected to work independently, acquiring inputs on their own. Demonstration plots are a key instrument in convincing farmers and government officials about the potential effect of the package program on agricultural production and productivity.

The SG 2000 extension project was initiated in Ethiopia in 1993 by the Sasakawa Africa Association and the Global 2000 of the Carter Center. The project employs Extension Management and Training Plots (EMTPs) as key method of demonstrating improved technology packages to farmers. The EMTPs are a half-hectare of on-farm demonstration plots established and managed by participating farmers with the help of development agents. The project started establishing demonstration plots with 160 model farmers in the two high potential regions (Oromia and Southern regions) with two crops (maize and wheat). In 1995, the demonstration plots grew to 3500, and two other crop packages (tef and sorghum) were included. Farmers received loans to pay for inputs such as fertilizers, improved seeds and agro-chemicals, which were also subsidized to attract farmers.

With close technical support of development agents and researchers, the SG 2000 Ethiopia project achieved a great success, as yields on demonstration plots were greater than on other plots (SG 2000/Ethiopia 2000). This promising result convinced policymakers that the package approach is the best and only way to achieve food self-sufficiency in Ethiopia. Therefore, the Government of Ethiopia initiated a new extension system known as the Participatory Demonstration and Training Extension System (PADETES) in 1994/95 by blending the features of the T&V system and the SG 2000 program. The PADETES assumes that a large body of technology already exists that can be used to improve agricultural production and productivity. Thus, it starts with technology identification and packaging and looks for potential farmers who can utilise the technology packages. The major components of the extension package include crop packages (fertilizer, improved seeds and pesticides), livestock packages, and natural resources management packages. The primary tasks of development agents are organizing demonstration plots, assisting participating farmers in obtaining input loans, and directing farmers’ problems to agricultural offices (Belay and Degnet 2004).

The extension system is decentralised where each regional state maintains its own authority. At the national level, the MoARD coordinates and oversees inter-regional extension work, providing policy advice on nationwide agricultural extension issues, advising regional Bureaus of Agriculture and Rural Development in the areas of extension management and administration, developing extension training materials and organising training programs in agricultural extension for regional extension personnel, and evaluating the implementation of the nationwide extension program. The recruitment and training of frontline development agents, the development of technology packages, the coordination and supervision of input and credit services and the planning, execution, monitoring and evaluation of extension programs fall in the mandates of regional Bureaus of Agriculture and Rural Development.
4.6.4 Formative experiences in research-extension linkage

The Institute of Agricultural Research (IAR) was established in 1966 with the mandate to formulate and implement agricultural research policy and coordinate research programs nationwide. By then the task of technology transfer was not explicitly considered part of the mandate of the research system. The tendency was to treat technology transfer as only a peripheral responsibility to the given mandates of technology development and research coordination (EARO 1999). Researchers maintain that the task of identifying and communicating farmers’ problems to the research system and integrating research results to find practical solutions to farmers’ problems is the responsibility of the extension system (ROBERTS 1987; 79). As a result, the research system avoids the most important task that links it with extension and farmers, and this creates ‘a fatal gap’ between research and extension (MCDERMOTT 1987,90).

It is widely recognised that effective linkage between research and extension is important to ensure that research and extension programs are relevant to farmers’ needs and problems (PICKERING 1987; MCDERMOTT 1987; EPONOU 1993; SWANSON 1997; AGBAMU 2000; BOYD et al. 1999; CERNEA et al. 1985). In Ethiopia, both research and extension have experienced several structural changes a number of times with the aim of achieving a coordinated technology development and transfer system. Despite efforts at reorganizing the technology system, there has been a weak linkage between extension and agricultural research (ZEWDIE 2004). The first attempt to create a formal linkage between research and extension was the establishment of joint adaptive trials of the IAR and the EPID of the MoA in 1974 (EARO 1999). The joint adaptive trials were initiated for package testing and formulation of extension recommendations for different agro-ecological zones. However, the linkage was discontinued from the start due to budgetary problems because it was not seen as an important aspect of the technology system.

In 1980 the program was reinitiated between the IAR and the Agricultural Development Department (ADD) of the MoA, but with the same problems. On-farm trials were not implemented systematically to warrant meaningful results. Researchers could not travel regularly to handle trials due to the lack of transportation and budgetary constraints. When the management of trials was added to the regular duties of development agents, they did not have the time, capacity or the motivation to handle the trials properly. Even when the trials were managed adequately, the outputs were poorly analysed and the results were rarely communicated to development agents due to the lack of efficient coordination and communication between research and extension. As a result, research results were not sufficiently communicated, and appropriate extension messages were not prepared for specific areas (EARO 1999).

In 1985 the IAR established a Research and Extension Division (RED) with the initiation and financial support of the World Bank. Since its establishment, the RED played an important role in disseminating research findings to subject matter specialists (SMSs) and development agents, and conducting pre-extension demonstration and popularisation activities. As compared to its predecessors, the RED was effective in playing its linkage role. However, it also had some problems. It faced the problems of inter-group relations and resource constraints. Researchers working in the RED were left out of the mainstream
technology process, being introduced to new technologies at the same time with SMSs. Moreover, the financial resources required for enhancing linkage activities were lacking because the activities were not planned and budgeted. The RED was also not staffed with adequate and qualified personnel because it was seen as a simple task.

In 1986 Research-Extension Liaison Committees (RELCs) were formed along PADEP zones with a modified T&V extension system. The committees were mandated to review and approve research proposals and extension recommendations. Despite efforts to bring different stakeholders through meetings to ensure effective linkages, RELCs were not successful because meetings were irregular. Further, RELCs were affected by frequent changes in the organizational structure of the MoA, causing reshuffling of committee members and discontinuity of linkage arrangements. As a result, recommendations made during preceding meetings were either lost, or not carefully handled by incoming committee members since they were new in the position, or even to the work place. Moreover, the participation of farmers was passive; they did not even attend a single meeting. The absence of decision making power due to the lack of legal authority to ascertain the duties and responsibilities of RELCs affected their activities. Committee membership was seen as add-on work because there was no enforceable responsibility and incentive system that provided motivation for effectiveness (EARO 1999).

Presently, with a critical review of previous linkage experiences in the country, new institutional arrangements known as the Research Extension Advisory Councils (REACs) have been launched nationally to promote collaboration between research, extension, farmers and support systems and to make research and extension more responsive to the needs and problems of farmers. The national REAC is the highest responsible body for the overall policy guidelines with regard to both federal and regional research and extension program coordination and linkage arrangements. However, given the ups and downs of the research-extension linkages in the country, many have raised concerns as to how the current research and extension advisory councils could improve the coordination and linkage situation (TESFAYE 2003).

4.7 The CADLI strategy and agricultural extension in Tigray

4.7.1 Overview of development policies and strategies

After the fall of the Derg regime in 1991, the planned economy was replaced with a market-oriented economic system. Within the framework of the ADLI strategy, the development of the agricultural sector is the engine for the overall development of the economy, and the government dedicates tremendous effort to achieving greater progress in this sector. The priority areas of the ADLI strategy are: 1) acceleration of growth through the supply of fertilisers, improved seeds and other inputs; 2) expansion of small-scale industries to interact with agriculture; and 3) expansion of exports to pay for capital goods import (TASSEW 2000). This strategy is divided into two Five-Year periods: the First Five-Year Plan (1995/96-1999/2000) and the Second Five-Year Plan (2000/01-2004/05). The Second Five-Year Plan sets out to address household food security and poverty reduction,
giving emphasis to input delivery, agro-processing, cooperative development, private sector development, capacity building, and institutional development to bring about accelerated and sustained development to end poverty.

The agricultural development policy aims to ensure food security by increasing agricultural production through the use of improved agricultural inputs, expanding the coverage of rural financial institutions, training development agents and farmers, improving the functioning of markets, and strengthening farmer cooperatives. In order to achieve the policy objectives of the agricultural sector, the following major directions have been laid down: 1) to ensure labour intensive activities, appropriate land use, agro-ecology based and integrated development, voluntary resettlement, market-oriented agriculture; and 2) to develop the productive capacity of farmers through training and the provision of improved technologies and credit services (FDRE 2001, own translation).

The land policy in Ethiopia has remained a highly debatable issue. Many civil society organizations, opposition political parties and donor agencies have held various public discussions on land policy. Despite this, the Government of Ethiopia has maintained a firm stand on the public ownership and administration of land. However, given the present focus on market-oriented agricultural development, the state ownership of land may not be the most feasible model for achieving food self-sufficiency. Some people argue that the state ownership of land is a means of controlling the rural mass. Others expect that, with the development of the private sector and the market-oriented economy, the government will ultimately privatise land.

The development strategy of the Tigray region closely resembles the national development strategy with a regional orientation in order to adapt to the specific socio-economic and political conditions of the region. Under the framework of the ADLI strategy, the Government of the Tigray Regional State gave priority to environmental rehabilitation, food security and poverty reduction through the expansion of basic socio-economic services, strengthening community participation in development programs, enhancement of the democratic system, and by creating a conducive environment for the private sector. The development strategy of the Tigray region takes into account the agricultural potential and constraints of the region and its environmental degradation. In the Tigray region, a Conservation-based Agricultural Development-Led Industrialisation (CADLI) strategy is pursued to ensure food security and to reduce vulnerability. The food security strategy of the region is in accordance with the country’s food security strategy framework and addresses specific problems and priorities, taking into account the severe environmental degradation, structural food deficit, and the high level of vulnerability of the region to frequent drought (GEBREMICHAEL 2004).

The land policy of the Tigray region stipulates that there will only be land re-distribution in irrigated areas. To make this possible, the regional government has made tremendous efforts to ensure land tenure security through engaging new claimants in non-farming activities. Farmers are issued land certificates to ensure tenure security and encourage investment in land management. The rights and obligations of land users are laid down. Land users are obliged to protect existing trees on their farmland and to carry out soil and water conservation practices. Trees found on farmland belong to the landholder. But cut-
ting down indigenous trees and planting eucalyptus and figs on farmland are prohibited (COUNCIL OF TIGRAY NATIONAL REGIONAL STATE 1997).

4.7.2 Evolution of agricultural extension in Tigray

Section 4.6 provided an insight into the broader historical, political and institutional context of agricultural research and extension in Ethiopia. This section reviews the development of extension services in Tigray to provide a background for analysing the current state of affairs in extension in the region, by looking at two different traditions of extension, one coming from the extension activities of the Tigray People’s Liberation Front (TPLF) and the other from the centralised system of technology transfer practised by the national government.

Agricultural extension during the TPLF

The early history of extension in Tigray dates back to the period between the late 1960s and the early 1970s. Tach-Adyabo and Hadegti Agricultural Development Unit (TAHADU) was the first comprehensive package project attempted in Tigray in the late 1960s. However, the project did not last long due to the expensive nature of the package approach and the civil unrest in the region. The anti-government movement in Tigray did not provide much opportunity for government intervention in the region. Thus, unlike the central and southern parts of the country, the effect of the comprehensive package project on the extension service in Tigray has been negligible due to a limited coverage and the short period of the project.

The development activity of the TPLF during the years between 1980 and 1991 was a landmark in agricultural extension in Tigray. During this period, the TPLF leaders felt that there was sufficient local capacity to intervene in the agricultural sector and selected members with basic formal training in agriculture to form a Department of Agriculture (DoA) in 1979. The work of the DoA had two major objectives: 1) to motivate farmers to continue farming and to rehabilitate the land; and 2) to help farmers make the most out of the available resources (BERHANE and MITIKU 2001,311). The members formed the core group for agricultural development in the liberated areas to define a direction for the DoA10. They had to take into account the war situation, the conditions under which the people were living, the available capacities, and the extremely limited access to external resources (BERHANE and MITIKU 2001,311). Community participation and decision-making were the key principles in the agricultural development of the TPLF. The task of the various TPLF departments was to facilitate the implementation of activities decided by the people themselves. Local knowledge and practices formed the basis for the DoA’s

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9 For a detailed account of agricultural extension during the struggle for liberation in Tigray, see BERHANE and MITIKU (2001).

10 The main objectives of the TPLF extension program were to: 1) reduce the displacement of people due to war and drought by mobilising the community to assist one another through sharing inputs (seeds, hand tools and labour); 2) create awareness of the natural resource degradation problem and mobilise communities to undertake massive soil and water conservation works; and 3) facilitate the adoption of improved agricultural practices (GEBREMICHAEL 2004).
activities. The department focused on documenting and disseminating the best local farming practices through recognizing and encouraging innovative farmers to share their knowledge and practices and to serve as local production cadres.

The DoA team made assessments of the best local practices of crop and animal husbandry. For each local practice, the team studied what the majority of farmers and the best farmers did differently and made farmers discuss what they thought were the differences (Berhane and Mitiku 2001,312). The team then agreed on the selected best local practices and experimented with them together with farmers. During this experimentation, farmers and the team compared the performance of different local practices and discussed differences. This way, the DoA promoted the best local practices that made the greatest difference in yield. In the process of documenting and assessing the best local practices, the team learned that moisture stress and environmental rehabilitation were the most important concerns of farmers. Thus, the agricultural development strategy focused on crop production, looking particularly at moisture conservation, soil and water conservation, and soil fertility management.

Another key activity area of the DoA was training the development agents and production cadres. The assessment of the best farming practices served as the basis for the preparation of training manuals. The minimal requirement for selecting development agents was a rural background and farming experience. The first batch of DAs were selected from the fighters and deployed to the different liberated parts of Tigray. Production cadres were also selected for training from local communities by the local councils and the DoA. These cadres were the best farmers who were accepted by their communities as good farmers and were willing to share their knowledge and assist other farmers (Berhane and Mitiku 2001,314). The training approach was based on farmers' experience, encouraging farmers to learn from each other.

Over time, improved technologies found their way to the extension service. In the mid-1980s, the TPLF leadership recognised the difficulty of addressing drought and poverty through promoting only best local practices. Thus, as large parts of Tigray became liberated and more agricultural professionals were available, the demands and opportunities for introducing new technologies were recognized, but the search for external technologies focused on low-input technologies that could easily be replicated and made locally available. Development agents established demonstration plots to help farmers observe and discuss the performance of introduced technologies and the possibility of adapting the technologies to their own specific situations.

Agricultural extension after liberation

After the fall of the Derg, the former DoA of the TPLF became the Tigray Bureau of Agriculture and Natural Resources (BoANR), and the agricultural extension service has been strengthened in terms of resources and program coverage (BoANR 2002a). Chapter 5 shows that there is a significant difference between extension interventions in Tigray before and after liberation. The extension intervention after liberation focuses on the transfer of improved technology packages, whereas before liberation, it focused on promoting best local practices and adapting introduced technologies to local conditions.
The major extension packages include crop, livestock and natural resource management. The crop extension package is dominant followed by the soil and moisture conservation package. Tef, wheat, barley, maize and finger millet are the major crop packages. More than 70% of farmers still depend on local seeds (MoA 1995). The use of improved seeds is low due to limited supply, high prices, limited knowledge of farmers, and inadequate operation of demonstration plots (BoANR 2002a). Thus, traditional seed systems, where farmers produce and exchange seeds, are crucial and need to be promoted by the extension service.

Until recently, the livestock package has not received significant attention. The package constitutes poultry, dairy, beekeeping, fattening and fodder development. Within the livestock package, the majority of farm families are involved in poultry, beekeeping and fodder development packages (BoANR 2002a). There is great potential for small ruminants in the lowland agro-ecological zones. The breeding and disposability of sheep and goats makes small ruminant packages particularly relevant to women-headed households. The introduction of milk goats rather than crossbred dairy cows, which require high quality feed, could be attractive for poor households that face increasing feed shortage problems and have trouble with the demanding management practices of dairy cows. Donkeys are also useful animals for poor households. There is already an experience in donkey traction in Tigray, which could be strengthened by the extension service. Donkeys have many advantages (FESEHA 1999); they relieve the shortage of oxen during the planting season and reduce feed shortage problems.

4.8 Concluding remarks

Many different systems of agricultural research and extension have been presented and practiced in Ethiopia. However, the history of agricultural research and extension is littered with examples of projects that have failed to consider the farming system and agro-climatic diversity prevailing in the country. The historical review of agricultural research and extension showed that the development strategies of Governments in Ethiopia have focused on agricultural transformation through technology package-centered approaches as the driving force for achieving overall development. While it gives emphasis to the small-holder agriculture, the rationale and the technical packages of the ADLI strategy are not significantly different from its predecessors. Thus, it can be said that the nature of the current extension service has not changed much since its establishment in the 1950s.

The need to increase agricultural output in Tigray is clear and urgent. The CADLI strategy focuses on the development of the small-holder agriculture through the conservation of natural resources and the introduction of improved agricultural inputs and services. Too often modernist perspectives on agricultural development emphasise technological options based on production potential, but small-holder farmers do not have the ideal situation to intensify their farming. They have a totally different livelihood strategy dominated by avoiding risk by diversification and developing all their assets. This means that agricultural development in Tigray is complex and calls for a large number of bio-physical, socio-economic, and institutional factors that need to be synchronised as essential ingredients to solutions of problems in the agricultural sector.
5 Changing Nature of Farmers’ Situation, Performance of the Extension Service, and Institutional Development in Tigray

5.1 Introduction

The preceding chapters laid the foundation for the study. Chapters 5 and 6 present the research results. This chapter is organized around three main topics. It starts with the analysis of the past situation, revealing the forces and their influence on the current situation, and the implications for further development. To fully understand the current situation of the extension service, it is necessary to look at changes over time since the past situation determines the present situation which, in turn, provides useful insight into future development. From here, the chapter looks at the organisation and performance of the extension service, its institutional and human capacity constraints, and recent policy frameworks and institutional developments shaping the extension program. Finally, the chapter analyses the institutional coordination and linkage situation in Tigray and puts forward critical preconditions and success factors for improvement.

5.2 Changing nature of farmers’ situation

5.2.1 Farmers’ assessment of the past situation

Socio-economic situation

The biographical interviews with elderly farmers illustrated that the feudal system during the Imperial period had influenced their lives. The farmers had two different stories depending on their status as land owners or tenants. The farmers who had been tenants described the past situation as ‘a system of inequality, exploitation and poverty’. Most farmers had at most one ox if any at all. Food grain did not last all year round. Many poor farmers had to borrow food from the rich which they repaid in the form of agricultural labour. Others traded in food grain by borrowing money from local moneylenders at high interest rates and purchasing grain from cheaper markets to sell at higher prices. The poor borrowed pack animals from the rich as a means of transportation. They had to give half of the money they earned to the owners of the animals; otherwise, they had to pay in agricultural labour. In reaction to this situation, poor farmers joined efforts with their limited resources to buy pack animals and use them communally for trading in food grains and other commodities. This enabled them to free themselves from exploitative relationships with local moneylenders. Other farmers diversified their trading activities, and this helped them increase their profits, as explained by an elderly farmer in Begasheka: ‘I was engaged in donkey trading. I bought a donkey with the profit and named it Mola’, which means ‘life is full’. This shows his relief from exploitation by local moneylenders.

Education appears to influence farmers’ knowledge of farming. In the past, formal education was limited; only the children of nobility had access to education. Moreover, the
peoples' attitude toward education was negative, particularly in the Christian societies. Religious leaders were influential in convincing people against formal education. Therefore, the only access to education was church education. As a result, the majority of farmers who are considered the best farmers are religious leaders, and their life philosophy is influenced by religious teachings. They referred to the Bible to stress that they have to live by working hard and viewed laziness and dependency as sin. Thus, they are a source of pride and inspiration in their community.

Health condition

The most common diseases affecting livestock health in the past were mendef (lymphangitis) and megerem (anthrax) which attack pack animals; gulhay (rinder pest), halafen (blackleg) and wekie (blackleg) which attack cattle; and tegta (anthrax), infrir (sheep pox), bieta (pastorolosis) and abek (skin disease) which attack goats. MENGISTU and DESTA (2005) reported that 75% of the households in Begasheka tabia have lost their livestock due to disease and drought in the last five years. They also showed that 32% of the households use traditional treatments, 21% use veterinary services, and 47% use both traditional treatments and veterinary services. Farmers use local knowledge to treat sick animals, such as smoking with leaves, bloodletting, and heating the sick part of the animal with hot metal. Another practice is separating sick animals from healthy ones to prevent the spread of diseases.

In the study areas, local medicinal knowledge is disappearing due to the loss of biodiversity. In the past, there was plenty of grasses, various types of plants, and dense forests with wild animals. Farmers attributed the disappearance of the vegetation to the social activity of the people: ‘The month of January is a wedding period during which massive cutting of forests has occurred for firewood and construction of shades to house invited guests. There was a great competition between people since it was prestigious to construct a large wedding shade in order to house many guests’. Moreover, the practice of tsebra, a local in-situ manuring system, requiring wood for enclosures, contributed to the disappearance of forests: ‘We constructed enclosures to keep livestock far away from home at night to fertilise fields’. More importantly, the rapid growth of the population has led to severe shortage of land, which encouraged the encroachment of forestlands for settlement and subsistence farming. In all, what appeared clearly from the narration of elderly farmers is that local medicinal knowledge exists with the availability of biodiversity, and with its loss, it has disappeared considerably.

Regarding human health, a major problem has been malaria, which is very serious and claims the lives of people. Another disease locally referred to as fera is a contagious disease, causing madness. An elderly farmer in Begasheka described the situation in the following: ‘When a household is hit by fera, no body enters the house for fear of getting the disease. When neighbours want to give food and drink for the sick, they throw stones at the roof to signify that someone is coming. When they see someone coming out of the house, they leave the food and run away to avoid the risk of transmission of the disease’.
Agricultural systems

In the past, while there was plenty of land and water, people had a fatalistic attitude and a limited farming knowledge. Thus, a good agricultural performance was not seen as a result of a hard work, but as a result of a predestined luck, as illustrated in the saying, ‘Lemin yalew stilichawun chan yalew korichawun ayatam’ (Amharic), which means that ‘One who is predestined to be poor shall not lack his begging bag, and who is destined to be rich shall not lack his saddle’.

In the past, different crops were grown since there was plenty of land, which allowed fallowing. Over time, the population has grown and farmers have faced severe land shortage. For example, barely and chickpeas were grown in large quantities, but most farmers have abandoned these crops due to a shortage of land, moisture stress and poor soil fertility. Their cropping system requires fallowing. After fallowing, chickpeas are planted followed by tef or finger millet, and then the land is fallowed again. At present, the shortage of land and its low productivity prohibit the growing of barely and chickpeas in sufficient quantities. Another reason is the condition of the rainfall. In the past, the rain started in May in which maize was planted, and harvested in August. The land was then immediately ploughed, and chickpeas were planted in September. At present, the rain starts late in June, and maize is harvested in October, pushing the planting of chickpeas in November where there is inadequate moisture. Further, in the past, farmers used furrows to drain excess water from their farm lands, but now furrows are used to harvest rainwater as the rain stops early before crops reach maturity.

In livestock management, a local practice known as meanda had been used as a collective livestock keeping system, where a group of livestock owners hire a common herder to keep their livestock. As a payment for his service, the herder milked the cows for himself every Wednesday. As mentioned earlier, this livestock keeping practice has resulted in a local soil fertility practice known as tsebra, an in-situ manuring system where livestock are kept in temporary enclosures during the night to fertilise farmlands. When one part of the farmland is fertilised, the enclosures are moved to another. Presently, this is rarely practiced because the livestock population has declined due to a shortage of fodder and grazing land. Another livestock keeping practice was locally known as ribi, a livestock share-keeping practice, offering relief to households with inadequate labour and grazing land to keep their livestock while providing poor households the opportunity to own assets. In this practice, a farmer who owns sheep or goats makes arrangement with another farmer who has labour and grazing land to keep the animals. The arrangement involves many duties and rights for both parties. The keeper has the moral obligation to keep the livestock well and inform the owner when they reproduce.

5.2.2 Farmers’ assessment of the present situation

Environmental rehabilitation

In the study areas, the most notable change farmers observed was the natural resource condition. The elderly farmers perceived significant environmental degradation such as soil erosion, deforestation, expansion of waste lands, and a decrease of water sources.
They also believed that the extent of poverty has increased. There is shortage of land, resulting in reduced livestock ownership. Agricultural lands have become unproductive because of continuous subsistence farming and a low level of technology use. The rainfall situation is unreliable to grow most crops grown in the past. As a result, the dependency of people on forests has increased, leading to massive destruction of forests for charcoal and firewood both for sale and household consumption.

Environmental rehabilitation has become crucial in Tigray. During the struggle for liberation, the people of Tigray contributed three months of free labour for soil and water conservation, which is currently reduced to 20 days during the slack periods. This has influenced the culture and working habit of the people. Farmers in Begashka identified the agricultural activities of the TPLF as an eye opener to learn soil and water conservation practices. The TPLF has significantly changed the attitude of the people towards self-help and collective action through mass mobilization. Self-help through people’s participation was the main ethos that governed the development activities of the TPLF. In the study areas, enormous efforts have been made in soil and water conservation, area enclosure and reforestation activities through mass mobilization and food-for-work programs.

Social services

Despite the expansion of rural health services, the elderly farmers believed that the human health condition has not improved considerably. This is because rural clinics have poorly organized material and human resources. The price of medication has also become beyond the financial reach of most farmers. An important aspect of human health is linked to local beliefs and practices. During the liberation movement, a lot was done to mobilise the people against harmful practices and beliefs. An example of harmful practices has been female genital mutilation. This is greatly reduced as a result of a widespread awareness campaign coupled with the activities of health workers, religious leaders and local officials. Farmers explained that there is a tendency of revival of harmful cultural practices and beliefs. This is particularly common with women who are presumed to have superstitious spirits which would be appeased with the buying of white clothes or the slaughter of coloured animals. The local councils expressed concerns about the revival of this belief since it causes a misdirected investment of meagre resources and creates a huge economic burden on the poor.

With regard to livestock health, the situation has not improved significantly. Farmers explained that the majority of past animal diseases still occur to a larger extent. The problem is particularly common with pack animals, small ruminants and poultry. Farmers received vaccination services for their livestock, but the treatments were ineffective. Despite this poor service, farmers preferred to use veterinary services to traditional treatments. For example, MENGISTU and DESTA (2005) showed that 94% of the households in Begashka were willing to use veterinary services.

Another aspect of social services is access to education. Farmers in Begashka described the change in education contrastingly. In the past, access to education was limited, but farmers believed that the quality of education was good and employment was even possible with a lower qualification. At present, in contrast to this situation, the coverage of
primary school has increased, but students perform poorly, as illustrated by one farmer in Begasheka: ‘Students are not competent for employment or further education. They hate farming and hard work, and this created conflict between parents and their children’. This may suggest that there is limited awareness about the new Education and Training Policy (TGE 1994). According to this policy, primary education aims ‘to create an educated farming generation who can better understand its environment, make use of modern technologies, and view agriculture as a business and earn a better living from it’ (FDRE 2001, own translation). However, the image of agriculture is very bad in the country, as illustrated in the saying: ‘For an educated person to be a farmer is like making a clean hand dirty’. Thus, primary education should play a crucial role in changing this image of agriculture through providing practice-oriented and quality education.

Agricultural technologies

The concept of improved seed is not new to farmers. In the study areas, farmers have developed an age-old seed selection, production and exchange system. They have practiced on-farm seed management to maintain the quality of seeds through selection, cleaning and separate storage. Farmers depend on local seed exchange systems as the main source of quality seed. During the planting season, farmers exchange seeds according to the terms of exchange which are usually decided by the owner of the seed. Farmers who want to get quality seeds have to pay more or exchange with their high value crops. There is also a sense of gratitude to the owner of the quality seed. Farmers who obtain quality seed from the best farmers want to maintain their relationship by reciprocating the resource flow in agricultural labour or other means to the best farmers.

From the analysis of the biographical interviews, it appeared that Begasheka farmers were left with few options of seed varieties. As mentioned earlier, farmers grew different types of local seeds in the past. Presently, because of soil erosion, moisture stress and low soil fertility, farmers are growing limited local seed varieties. For example, there were three varieties of teff locally known as dalga beray, tef may and sergey. Dalga beray means dewlap of an ox, metaphorically named because of its long spike. Currently, due to unreliable rainfall and moisture stress, these varieties are rarely grown. There were also two types of late maturing maize varieties: anju and berihu. Anju is a high yielding variety sown in fertile land between March and May and harvested in September. Berihu is an average maturing and yielding crop planted to medium fertile soil between May and June and harvested in September. Sometimes farmers practise responsive farming where they predict the rainfall condition and decide which variety to plant.

Due to the change in the rainfall situation, farmers have introduced early maturing maize varieties into their farming system. For example, arkbi, which means early maturing, is an average yielding maize variety. It is planted in June and harvested in September. Farmers have also introduced two other early maturing varieties: a finger millet variety locally called terekbe, which means acquired variety and teff varieties locally called gofguaf and wefey. Seasonal agricultural labour migration has been a major means of introducing new crop varieties. Farmers are keen observers of varieties and curious experimenters with new plant materials in order to adapt them to their own circumstances. Farmers named their varieties after the place from where they were brought, or after the person who in-
introduced them. Farmers also used metaphorical concepts to name new varieties in relation to specific qualities or references.

Another change in the local farming system is the use of intercropping as a means of efficient use of land and spreading the risk of crop failure. Farmers in Begasheka *tabia* intercrop sorghum with finger millet. This practice is locally called *wuhrar*, which means invasion because of variation in the composition of intercropped crops. Farmers intercrop more finger millet with less sorghum, hence the name of the practice comes from the observation that sorghum spreads over and invades finger millet. The comparative advantage of the crops is that sorghum emerges quickly and grows tall, while finger millet emerges late and is a short-heighted crop.

Farmers in Begasheka have specific crop preference for fertiliser application. They give priority to maize followed by tef, finger millet, and sorghum. Maize is the major crop grown, while sorghum is less dominant because of its susceptibility to bird attack. Further, farmers prefer to use fertiliser with local seed rather than with improved seed, because improved seed is not readily available and is also poorly adapted to local conditions. They tried using fertiliser with improved maize and tef seeds and evaluated them as having poor adaptability to their local conditions: *'The tef variety is early maturing and yields good, but the seed drops easily when it rains. We did not also get adequate straw for our livestock'*.  

Another issue which surfaced during the focus group discussions in Begasheka was livestock. Farmers explained that crossbred diary cows have been introduced to their community. When asked who in the group has received a dairy cow, the group members laughed pointing to one farmer. Then the researcher directed his conversation to the farmer and asked him to describe his experience: *'Yes, I did, but I will see it. I have received a dairy cow on credit, ranging from 700 to 1120 Birr. I am told, if the cow dies not because of my own failure, I will not repay the loan'*. From his conversation, the farmer is not really keen on his cow; he continued to say, *'I have not seen the cow in heat'*. The farmers identified shortage of feed as a major problem: *'The cows are not adapted enough to roam with the herd and need sufficient and high quality feed'*. They described the cows’ introduction as a ‘sin’ and the cows as ‘cursed’. The special feeding requirement seems to make dairy cows unsuited for local conditions. However, when asked if they consider the intervention a complete failure, they expressed the need to improve their livestock management, indicating that they saw the intervention as somewhat useful. They also suggested that adequate preparation has to be made such as training, feed preparation, and planting of fodder grasses and trees before the introduction of dairy cows.

**5.2.3 Implication for extension**

The analysis of the biographical interviews with elderly farmers revealed that there is little interface between local and formal knowledge systems in the study areas. There is little evidence of the influence of introduced technologies on the local farming systems. Farmers depend on their own knowledge and practices to adapt to varied and rapidly changing conditions. This implies that a careful combination of local and formal knowl-
edge systems is critical. Development agents should not ignore local knowledge, which farmers use to give meaning to innovations. The extension program needs to be founded on a realistic assessment of farmers’ situation and with due regard to their knowledge, experience and rationality in order to improve the productivity and stability of existing systems. It is when extension assesses these conditions realistically that it can help farmers adjust to rapidly changing environmental, production and marketing conditions.

5.3 Organization and performance of the extension package program in Tigray

5.3.1 Participation of farmers in the extension program

Farmers’ participation is needed for both ethical and practical reasons. As primary clients, farmers must be involved in the planning, implementation and evaluation of extension programs because they will ultimately influence their living conditions. Extension becomes more effective when it happens through farmers, with farmers and supported by themselves. Thus, trying to execute extension programs without the participation of farmers would be more harmful than beneficial to farmers. In Tigray, the participation of farmers in the planning, implementation and evaluation of the extension program has been far less than expected. The following discussion is based on the analysis of focus group discussions with development agents and participating and non-participating farmers in the extension program.

Farmers have various reasons to participate in extension programs. A Report of Impact Assessment of Extension Intervention in Tigray (BoANR 2002a) showed that farmers participated in the extension program because they were convinced by the advice of development agents and the demonstration effects of participating farmers. However, focus group discussions with farmers revealed that coercion in various forms was a major force for involving farmers in the extension program, particularly during its earlier periods. Farmers explained that ‘the fear of being excluded from food-for-work programs and other benefits of the Government’ was their main motivation to join the extension program. Moral punishment where development agents described non-participating farmers in meetings with farmers as ‘backward, weak and unable to distinguish good from bad’ was also a considerable pressure for farmers to join the extension program. Furthermore, farmers were forced to join the extension program because they were labelled as rich if they did not participate in the program, meaning that they would not be eligible to ‘receive food aid or participate in food-for-work programs’, unless they joined the extension program. In some cases, unwilling farmers were prohibited ‘supporting letters from local leaders to have access to free health services’.

The extension package program was implemented based on a quota system and competition with a poor feedback system. Every development agent had a quota of farmers participating in extension that they had to meet. As a result, development agents faced difficulty in convincing farmers when they openly told them that the extension package would
not work under their conditions. Development agents demonstrated superior results on demonstration plots, but farmers convinced themselves based on their experience that it would not work that way on their land. Despite this resistance, development agents persuaded farmers to join the extension program, because they were evaluated based on the number of farmers joining rather than the quality of results. For example, BELAY and DEGNET (2004) reported that in south-western Ethiopia, development agents had more influence than local leaders in persuading farmers to join the extension program, because the number of farmers adopting the technology packages was used to evaluate their performance.

The criticism of officials, as explained by development agents in Begasheka, was another driving force in persuading farmers: ‘if few farmers join the extension program, we are criticised by officials as being unwilling to support the agricultural program’. Moreover, incentives for the development agents on a competitive basis made them coerce farmers and focus on demonstrable successes rather than on helping the farmers to solve their problems. Since quotas are imposed on development agents, they use whatever means available to persuade farmers to adopt the packages and meet their quotas (BELAY 2003). Focus group participants recalled that farmers had been detained at community centers because they refused to take improved inputs, as illustrated by the ex-chairperson of Begasheka: ‘Many farmers were not confident to take improved inputs for fear of risk. As a result, they were kept in the local administration offices until they expressed willingness to take fertilisers and improved seeds’.

The experience in Tigray is matched by similar stories from other parts of the country. For example, PAUSEWANG (2002,90) reported the complaints of farmers in Southern and Oromia regions that local leaders ‘had forced them to take fertilisers on credit, on the advice of development agents, to be applied even on land that they considered not suitable for cultivation and fertiliser application’. Similarly, HABTEMARIAM (1997,17) reported farmers’ experiences in the Southern region of Ethiopia: ‘When the DA came to our village to nominate 10 EMTP farmers, we did not want to disappoint him by rejecting his invitation. There was no volunteer farmer, and thus we chose ten victims. We promised them to compensate what they may lose in trying the packages’. In all, the development

11 CARLSSON et al. (2005) observed that farmers in the highlands of Ethiopia seem to ‘vote with their feet’ by showing great hesitation in adopting modern agricultural inputs that are made available, or more aggressively promoted by extension agents with credit.

12 The direction for giving incentives for development agents and supervisors was according to their performance level of activities required to establish a half hectare demonstration plots in farmers’ fields. The activities included: selecting farmers (convincing and registration); selecting and measuring demonstration plots; collecting down payments; land preparation; planting cereal crops and application and harrowing of urea; timely weeding; assessment and prevention of pests and diseases; harvesting, threshing and recording of yield data; and collecting repayments. It is estimated that these activities would take ten months to accomplish and for this period, development agents and supervisors would be rewarded with 75 and 100 Birr per month respectively. The supervisor checks the timely accomplishment of the activities and gives order for the payment of incentives for development agents under his/her supervision. In Tigray, changes have been made in this direction. Scores are given based on indicators to measure the performance level of development agents and supervisors, based on this 150 and 100 Birr is given for first and second ranking development agents or supervisors in five instalments (MoA 1995, own translation).
agents failed to use communication as a leverage instrument for extension; instead, they forced farmers to join the extension program. One might think that they did this for the good of the farmers, often called ‘positive influence’, but this view is not compatible with doing good advisory work (helping farmers gain knowledge and insight to solve their own problems). More importantly, when development agents persuade farmers, their recommendations would not be taken seriously, or would not be considered effective enough.

Demonstration plots in farmers’ fields are a key method of the extension program to convince farmers about the effectiveness of improved packages. In the Tigray region, the type and the location of plots farmers allotted to the extension program varied over time (BoANR 2002a). In the beginning, farmers resisted the request of development agents to allocate land for the extension program. Despite the advice of development agents to allot good land for demonstration plots, farmers in Begasheka explained that they ‘deliberately allotted poor land’, expecting that the development agents would not accept the land as a demonstration plot. By doing so, they believed to ‘have fulfilled their obligation’ and left the decision to accept the allotted land to the development agents.

With regard to the location of plots farmers allotted to extension, the backyard plots were the dominant plot types. This was due to the proximity, ease of management, and suitability of backyard plots for crop packages. Other farmers allotted field plots for the extension program, because they preferred the application of manure to mineral fertiliser at backyards. However, most farmers have shifted periodically in the allotment of land to the package program between backyard and field plots (BoANR 2002a) for the purpose of crop rotation and risk minimisation based on their anticipation of the rainfall situation.

To establish the trends of farmer participation and yield increases, the researcher drew heavily on the data obtained from the office of Agriculture and Rural Development of Kola Temben woreda. However, the data may have some limitations and do not always have complete and uniform coverage. It was, therefore, necessary to aggregate data from similar but not the same years (bad and good years) when forming the relevant data. Nonetheless, the researcher believed that the broad trends presented below are a representative account of the participation of farmers and yield increases with extension in the woreda. Moreover, the assessment of the yield data for major crops indicated a trend comparable to farmers’ estimates. Farmers believed that the increase in crop yields was due to the application of fertilisers. Table 5.1 shows the trend of farmer participation in extension in Kola Temben woreda.

As shown in the table, the number of participating farmers and the average size of land allotted to extension increased initially. In terms of the size of land allotted to extension, the average size of land has been 1.53 tsimdi (a little more than one fourth of a hectare) in 1995/96 production year. This increased to 1.61 tsimdi in 1996/97 when the momentum for involving farmers was higher due to the promising result during the previous year, attributed mainly to good rainfall condition, better technical follow up, and reasonable input prices. However, the number of participating farmers and the size of land allotted to extension decreased in the next three years due to the high price of fertiliser, poor technical follow up, unavailability of improved seed, crop failure due to drought, increased indebtedness, and problems of the group-based credit system (BoANR 2002a).
Table 5.1: Trends of farmers’ participation in extension in Kola Temben woreda

<table>
<thead>
<tr>
<th>Production Year</th>
<th>Number of demonstration plots</th>
<th>Number of participating households</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994/95</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>1995/96</td>
<td>455</td>
<td>1754</td>
</tr>
<tr>
<td>1996/97</td>
<td>1792</td>
<td>7444</td>
</tr>
<tr>
<td>1997/98</td>
<td>2942</td>
<td>11180</td>
</tr>
<tr>
<td>1998/99</td>
<td>5322</td>
<td>13996</td>
</tr>
<tr>
<td>1999/00</td>
<td>2743</td>
<td>9497</td>
</tr>
<tr>
<td>2000/01</td>
<td>2105</td>
<td>7076</td>
</tr>
<tr>
<td>2001/02</td>
<td>2105</td>
<td>7420</td>
</tr>
<tr>
<td>2002/03</td>
<td>1019</td>
<td>3407</td>
</tr>
<tr>
<td>2003/04</td>
<td>1726</td>
<td>1961</td>
</tr>
</tbody>
</table>

Source: Compiled from various annual reports of Kola Temben woreda office of Agriculture and Rural Development

*The average demonstration plot in the woreda is a quarter of a hectare.

The effect of the extension program is measured by its potential to increase agricultural yields. The trend of yield increases under extension has not been so dramatic as compared to yield increases under farmers’ management (see Table 5.2). In Begasheka, development agents attributed this to farmers’ failure to properly apply extension recommendations: ‘They used fertilisers below the recommended rate. They did not plough their land properly and weed their crops timely and frequently’. On the contrary, focus group discussions with farmers in Begasheka revealed that the extension package was not profitable because of high input prices and declining output prices: ‘In the early period of the extension program, the benefits were good. We were even repaying input loans by selling the straw. At present, the price of fertilisers and improved seeds has increased, and output prices are declining during harvesting times. As a result, we face difficulty repaying input loans’. This will be discussed in more detail in Section 5.4.

Table 5.2: Yield increases under extension and farmers’ management for major crops in Kola Temben woreda, qt/ha*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>18.5</td>
<td>25.15</td>
<td>9.72</td>
</tr>
<tr>
<td>Sorghum</td>
<td>16.0</td>
<td>24.61</td>
<td>6.0</td>
</tr>
<tr>
<td>Finger millet</td>
<td>9.75</td>
<td>15.74</td>
<td>4.66</td>
</tr>
<tr>
<td>Tef</td>
<td>9.0</td>
<td>12.5</td>
<td>5.74</td>
</tr>
<tr>
<td>Barley</td>
<td>6.0</td>
<td>13.54</td>
<td>5.45</td>
</tr>
</tbody>
</table>

Source: Compiled from various annual reports of Kola Temben woreda office of Agriculture and Rural Development

*Quintal (qt) is 100 kg.
Although the participation of farmers and the benefits gained were not consistent, farmers were generally positive about the use of improved inputs, as illustrated by farmers in Begasheka during the focus groups discussions: 'In the past, we were not aware of the benefits of improved inputs. We resisted the requests of development agents to allot good land for the extension program. If it were today, all of us would be using fertilisers and improved seeds'. The BoANR has provided on-going encouragement through village field days and competitions. Particularly, farmer field days, locally called 'beal harstot', have played an important role in persuading farmers to take extension packages (FETIEN et al. 2001b; BERHANE and MITIKU 2001). The field days focused on promoting and celebrating the merits of improved technologies (fertilisers and improved seeds) to farmers. They are ceremonial in nature, involving officials from the BoANR, community leaders and farmers. On the field day, model farmers are praised by agricultural experts and officials and asked to demonstrate what they have done and benefited from it. Usually the field days are filmed and featured by the mass media, which play an important role in popularising the extension package program. On completion of demonstrating his or her practices, the model farmer receives appreciation from the BoANR officials and participating farmers through applauding, followed by questions and comments from participating farmers, but critical comments are made less important by the remarks of experts and local production cadres. After such demonstration and discussion, model farmers are given awards such as farm tools and a bag of fertilizer to honour them for their successful adoption of improved technologies and to stimulate other farmers to take credit and adopt improved technologies (BERHANE and MITIKU 2001).

5.3.2 Implementation of the extension program

Despite its success in the high potential regions (BELAY 1999), the performance of the SG 2000-based extension package program was generally not satisfactory in complex, diverse and risk prone farming systems (TESFAYE 1999; DEJENE et al. 2000; GETANEH 2001). Development agents disseminated blanket recommendations under all kinds of socio-economic conditions and across all agro-ecological zones, with little situation specificity or flexibility (EYASU 2002; BELAY 2003). The technologies they promote were developed outside the users' system and were extended to farmers without prior adaptability trials. This lack of adaptive trials made development agents and farmers lose confidence in the effectiveness of new technologies under local conditions. Development agents must master new technologies in theory and practice and must be convinced of their appropriateness and practical benefits. As MOSHER (1966,92) succinctly states, technological effectiveness is the most important factor on which farmers must be satisfied. Unless they are convinced of its effectiveness, farmers will not be willing to use a new technology for fear

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12 In Tigray, the extension program made efforts to run adaptability trials, but they were not effectively managed due to lack of capacity and coordination with research. For example, there were two demonstration plots in Begasheka tabia where development agents rented land from two farmers, who received food grains in compensation for their land and labour. The farmers explained that the demonstration plots were designed and managed by development agents. Moreover, there was not adequate publicity about the use of the trial plots in the tabia. Farmers in Begasheka thought that the plots were used for research purposes.
of failure and indebtedness. Technological effectiveness can be achieved through analysing the farming systems and identifying and adapting new technologies to local conditions. However, in practice, there is a lack of sensitivity to different environments, and ready-made technology packages are transferred to farmers without adequate local adaptive trials. Technology transfer must be agro-ecology specific, recognising that extension packages effective in one place may not be successful, or even possible in another.

Contrary to the rhetoric about the interdependent pillars of the PADETES (participation, demonstration and training), the extension system acknowledges participation only in theory. For example, Belay (2002) showed that farmers had a very marginal contribution in designing and formulating extension activities. Neither the farmers nor the frontline development agents were consulted in the course of policy formulation and program design and implementation. Further, Dejene et al. (2000, 22) showed that farmers' participation in the extension package program was very limited. Farmers lacked practical skills and confidence to use improved inputs. This is because they received inadequate technical support from development agents, who were overstretched serving a large number of farmers and engaging in non-extension activities, such as processing credit applications, dealing with input distributors, mobilizing farmers for public works, and collecting loan repayments (MoA 1998). This took a great deal of their time and affected their work and relationship with farmers, as commented by development agents in Begashuka: 'Farmers hide from us for fear of being asked for loan repayments'. This suggests that the primary role of development agents should be to disseminate new knowledge and help farmers use it more effectively.

The extension program was implemented in a rush, providing no room for timely adjustments, to look more widely at problems that need attention, and to look where research may be needed, or other crops that may fit into the system, neglecting the self-carrying capacity of the system. Extension goals were unrealistic, and feedback was deliberately misinformed, corrupting the system. Feedback to higher level personnel concerning problems faced in the implementation of the extension program was limited to obvious and common problems such as 'erratic rainfall, diseases and pests, rural institutions and infrastructure, and the backwardness of the existing agricultural technology and know-how' (Belay 1999), whose solution implies the transfer of improved technologies and teaching farmers to use them effectively. Real problems concerning the diversity of farming conditions and the top-down approach of the extension program were rarely communicated to higher level officials. Focus group discussions with development agents revealed that such attempts by field-level development agents were seen as 'unwillingness to face the challenges of convincing farmers' and were considered 'signs of weakness to implement the extension program'. Thus, rather than implementing the extension program with a top-down campaign, it was necessary to set realistic goals and establish a strong feedback system to assess experiences and lessons learned and to build capacity at all levels to provide a basis for expanding program coverage. It is only through the transmission of reliable information upwards could managers and policymakers be made fully aware of what is happening in the field, on which basis alone could they make appropriate and timely management decisions.
The major factors affecting the performance of the extension program were the shortage and the low educational level of development agents. The shortage of development agents was demonstrated by the extension agent-farmers ratio (density of advisors) which measures the intensity of the extension coverage. As shown in Table 5.3, development agent-farmers ratios have gotten worse from 1:692 in 1995/96 to 1:864 in 2000/01, showing that the growth in development agents failed to keep pace with the growth of farm households.

Table 5.3: Trends of average development agent-farmers ratios in Kola Temben woreda

<table>
<thead>
<tr>
<th>Production Year</th>
<th>Number of</th>
<th>DA-farmers ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DAs</td>
<td>Total households</td>
</tr>
<tr>
<td>1995/96</td>
<td>30</td>
<td>20,762</td>
</tr>
<tr>
<td>1996/97</td>
<td>30</td>
<td>21,405</td>
</tr>
<tr>
<td>1997/98</td>
<td>30</td>
<td>22,067</td>
</tr>
<tr>
<td>1998/99</td>
<td>28</td>
<td>22,750</td>
</tr>
<tr>
<td>1999/00</td>
<td>28</td>
<td>23,454</td>
</tr>
<tr>
<td>2000/01</td>
<td>28</td>
<td>24,180</td>
</tr>
<tr>
<td>2001/02</td>
<td>38</td>
<td>24,928</td>
</tr>
<tr>
<td>2002/03</td>
<td>44</td>
<td>25,699</td>
</tr>
<tr>
<td>2003/04</td>
<td>63</td>
<td>26,494</td>
</tr>
</tbody>
</table>

Source: Compiled from annual reports of Kola Temben woreda office of Agriculture and Rural Development

Under conditions of limited capacity and resources, a rise in development agent-farmers ratios merely signals a deteriorating access of farmers to development agents, with a consequent decline in the quality of the extension service. The decrease in development agent-farmers ratios after 2000/01 was due to the decline of farmers’ participation and the employment of contract workers. At face value, it seems that the quality of the extension service has improved, but in reality, it has worsened since the contract development agents were poorly trained and motivated to adequately work with farmers. Instead, they tended to work with model farmers and potential farmers who could adopt technology packages, as illustrated by one innovative farmer in Atsbi Womberta woreda: ‘The development agent heard that I was doing something differently and visited my place. He appreciated what I have done and asked me to join the extension program, but when he learned that I was not willing, he told me that I would not get improved inputs from the extension program’. As indicated earlier, many farmers were not willing to participate in the extension program due to resource constraints and fear of indebtedness, and some even believed that their own practices were more effective than what was on the offer by the development agents.

The other factor affecting the effectiveness of the extension program was the low educational level and motivation of development agents. Most development agents did not have experience in working with farmers, researchers and support systems. They received inadequate support from supervisors, whose relationship is determined by control purposes.
During the focus group discussions, development agents in Debre Birhan tabia explained that supervisors were not very useful in providing adequate technical assistance, as illustrated in the following: ‘Their objective is to follow up the execution of plans and report progresses. If we identify knowledge gaps in our performance and ask for assistance, we will be evaluated by that and will not be promoted’. This makes it clear that development agents do not dare to identify gaps in their work and that for the supervisors, the important aspect is to get the job done and to report accomplishments. As a result, development agents worked primarily to meet the expectations of their supervisors in order to ensure their promotion and job security, though this reduced their motivation and productivity.

To improve this situation, supervisors must strive to motivate development agents by having a cooperative approach to work, praising special efforts, helping them with difficult jobs, and targeting further training (ALBRECHT et al. 1989, 212). They must create a working culture in which making mistakes or asking for assistance is not interpreted as weakness or incompetence, but as an opportunity to learn and communicate. This can encourage development agents to acknowledge their weaknesses and concentrate on areas in which they are competent. Thus, they can become more motivated and have a better basis for communication with farmers. This, however, occurs in flexible and decentralized systems where supervisors and development agents are accountable to local governments and communities.

When asked to identify the major challenges facing the extension service, development agents mentioned the following: ‘Weak capacity, unreliable input supply, undeveloped credit and market system, poor access to information, and poor feedback system’. It is interesting that development agents identified their own limited capacity as a critical constraint in the extension service. Development agents in Debre Birhan tabia eloquently explained: ‘You cannot teach farmers how to use new inputs having knowledge no better than theirs; they will challenge you’. They attributed this to the lack of adequate practical training: ‘We are simply given orders to implement programs without having adequate theoretical and practical knowledge’ and explained their inability to assist farmers: ‘Farmers come to us with their problems, but we cannot help them solve their problems’. Particularly, they identified a critical knowledge gap in beekeeping: ‘We do not transfer the queen ourselves from farmers’ traditional beehives to the modern beehives, because we fear that if the bee dies, the farmers will not have trust in our capacity’. This clearly demonstrates the difficult situation of development agents, suggesting that capacity building through practical training is urgent. This will be discussed in more detail in Chapter 6.

Development agents believed that feedback is usually unrealistic and impacts are exaggerated. This is because, as mentioned earlier, complaints by development agents about the inappropriateness of the extension package to farmers’ circumstances were considered ‘unwillingness and weakness to implement the program’, and this made development agents comply with, and satisfy the wishes of their supervisors. Since problems may backfire on the development agent reporting or complaining, considerable problems facing the extension service were not reported to higher level officials. This is a widely reported phenomenon in the extension program (BELAY 2003; EYASU 2002; BELAY and DEGNET 2004). On the whole, development agents must ensure that the technologies they transfer
to farmers are realistic and successful. Farmers should not experience failures by using improved technology packages. Development agents must cultivate a high degree of quality among participating farmers, rather than meeting extensive contact quotas (SIMPSON 1998). And this requires a greater dynamism and flexibility in the extension program to make changes as necessary on the basis of newly recognized, or newly occurring problems and new targets.

5.3.3 Farmers’ perception of the role of development agents

Farmers are in the best position to judge the dedication and effectiveness of development agents. It is crucial that development agents gain the acceptance and confidence of farmers in their objectivity and that farmers do not perceive development agents as having conflicting interests from their own. The process of becoming accepted depends on the personality and attitude of the development agents and the extension system in which they work. It is with a personal relationship with farmers, an openness to their ideas, and a readiness to help them that development agents will be able to do successful extension work. Farmers’ perception of development agents is reflected in the amount of pressure officials put on development agents in order to persuade farmers to accept the extension program. As this section shows, farmers distrust their development agents despite needing their services.

In describing what constitutes good development agents, farmers during the focus group discussions said: ‘Commitment is a basic test of the knowledge and capacity of development agents’. Farmers believed that development agents have adequate knowledge, but their services generally turned out not to be in their best interests. Development agents made little effort to try to understand farmers’ problems and to help them solve these problems practically. Farmers expressed concerns about the poor practical nature of the extension program: ‘Talk is not enough! General information at occasional meetings is inadequate if development agents are to help us solve our problems’. This suggests that the capacity to innovate may be desirable but not necessary for development agents. Therefore, the basic requirement for development agents is a commitment to serve farmers in their capacity. Development agents should clearly show themselves to be involved with the problems which the farmers feel are important (ALBRECHT 1982).

In this regard, farmers in Begashaka expressed concerns that they were unable to hold development agents accountable: ‘We need extension advice on weekends, but development agents are not always available and willing to advise us’. Despite this, farmers generally considered their services useful, and this is understandable since development agents are their only source of external information. Development agents were considered important change agents to mobilise the people and teach new methods of farming and improved technologies: ‘If there are no development agents, we will go back to our traditional practices as there are not many wise farmers in our community’. In describing desired qualities for development agents, the farmers expressed that respectful attitudes and willingness to listen are of high priority: ‘Development agents should be able to live with us and respect our knowledge. They should also be ready to be criticized and corrected by us’. Thus, the willingness and the ability of development agents to accept ideas and criticisms
from farmers and respect farmers’ knowledge and practices are vital for successful extension work. This requires that development agents are primarily accountable to farmers and that the farmers have a means for rewarding good development agents.

Concerning the major sources of influence in their adoption of improved technologies, farmers explained that development agents have stronger influence in the adoption of fertiliser and improved seeds, while local leaders have influence in the vaccination of animals, water and soil conservation activities, and striga (*Striga hermonthica*) control campaign. Furthermore, local administration is active in the selection and mobilisation of farmers, signing of farmers’ contractual agreements for input loans, and nomination of model farmers. This distinction between the primary roles of development agents and local leaders is desirable. It would be even more desirable if local leaders take the responsibility of ensuring input loan repayments, so that development agents are engaged in assisting farmers in obtaining and using input loans efficiently and can maintain a healthy relationship with farmers.

When asked to describe their primary roles, development agents in the study areas explained that they were actually involved in everything and that there was no role exclusively defined for them. The primary duties of development agents included the distribution of inputs, collection of loan repayments, and technical support through training, demonstrations, field days and farmers’ conferences. This diffuse and conflicting responsibility constrained development agents from concentrating their efforts on advising farmers and made them actually less effective in the advisory work. Asked about their opinions on farmers’ perceptions of their roles, development agents explained: ‘There was no close and regular supervision and technical follow up. Farmers did not appreciate our involvement in distribution of inputs and collection of loan repayments’. This was consistent with the findings of Siegfried PAUSEWANG (2002,90) who showed that farmers in Southern and Oromia regions greatly resented the involvement of development agents in ‘enforcing the repayment of debts to newly privatised distribution companies’.

**5.3.4 Farmers’ perception of the use of model farmers**

Despite the pitfalls of the progressive farmer strategy, efforts are still continuing implicitly or explicitly along its line. The extension service cannot reach all farmers, and not all farmers accept messages from development agents. Thus, faced with a situation where a small number of development agents have to work with many farmers, the extension service employed a model farmer strategy to increase extension coverage and serve more farmers. The model farmers were selected by development agents and endorsed by local leaders and community members. They should be: 1) good farmers who have applied new inputs and are well accepted by the community; 2) willing to take advice from development agents and able to implement it and advise others; and 3) opinion leaders and have literacy skills. Opinion leadership potential is an important aspect of model farmers.

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14 ALBRECHT et al. (1990,275) distinguish between contact and model farmers. A contact farmer denotes to personal contacts, while a model farmer applies to farm situation.
Development agents worked with 6 to 8 model farmers who are expected to assist 8 to 12 follower farmers in their village. The role of the model farmers was to mobilise and provide technical support to follower farmers. They served as focal points for development agents to transfer knowledge to and obtain feedback from follower farmers. They assisted development agents in mobilising, convincing, and selecting farmers for new extension packages and credit programs. Development agents meet model farmers in meetings, evaluation sessions (locally called *gumgam*), field visits, and field days.

Unlike the previous extension services in the country (see Section 4.6), the model farmers were generally representative of the farming community. There was no significant difference in the education, wealth and access to resources of model farmers from the majority of farmers. Thus, it was believed that model farmers could be an effective means of improving the extension coverage, but the reality was far from this expectation due to personal and technical problems. Social relations determined how model farmers were selected and how they served other farmers. In principle, model farmers are selected by development agents and endorsed by local leaders and community members, but in practice, local leaders suggested their relatives or political supporters, because of expected incentives and other kinds of benefits from the government. Development agents expressed this as a major problem limiting the performance of model farmers. This was also shared by community members in Debre Birhan *tabia* who commented during the focus group discussions: *‘The model farmers were selected based on favouritism; were not really better farmers or useful sources of information; did not put in practice what they advised other farmers; and gave advice and technical support to farmers for their own advantage’*. Similarly, farmers in Begasheka *tabia* explained that model farmers were useful in the early periods of the extension program, but this importance cooled off gradually: *‘If not for the lack of money and labour, we now know the benefits of the extension program’*. Moreover, the model farmers were involved in political mobilisation, and this caused follower farmers to suspect their motives and hesitate to take their advice freely.

With supervision and support from development agents, model farmers can be more motivated and do a better job for their community. However, the model farmers explained that development agents did not give them adequate training and made regular follow up on their activities. They also complained that development agents demanded their time and labour: *‘We were considered formal extension workers’*. Development agents used training opportunity as an incentive for model farmers to convince other farmers: *‘If you want to be sent for training, you must convince more farmers to join the extension program’*. This causes model farmers to put political pressure on unwilling farmers since unwillingness was seen as opposing Government policy. As a consequence, model farmers explained that farmers did not listen to them and persuading and forcing farmers affected their social relationships; they tended to be rejected by their neighbours.

Some even admitted that they were not really model farmers themselves: *‘We did not adopt the extension package ourselves let alone assisting other farmers’*. If model farmers are to be recognised by their peers as competent and trustworthy experts on new technologies, they must adopt the new technologies before their followers. In this regard, farmers in Debre Birhan *tabia* explained: *‘If model farmers do not use new technologies...’*
and share with us their experiences, we do not consider them knowledgeable or useful sources of information'. This confirms the complaints of development agents, as well as community members, about the selection of model farmers by local leaders based on relationship and political patronage rather than on their knowledge and skills in farming, willingness to assist other farmers, and ability to adopt new technologies.

In describing the usefulness of model farmers, development agents in the study areas explained that 'model farmers were useful in selecting and convincing farmers but not in providing technical support to follower farmers'. Model farmers had limited time and a low capacity to assist other farmers due to poor follow up and support from development agents. This was consistent with farmers’ comments that model farmers were less useful: ‘They transmitted information in general, usual practices such as animal shades, soil and water conservation, manure application, and timely weeding and ploughing’. Furthermore, community members explained that some model farmers were not willing to assist other farmers: ‘When we approached them for advice, they said, ‘Who has taught us to do so? You have to do it yourself’.

In summary, the model farmer strategy did not perform as expected. Thus, the selection criteria and procedures for model farmers should be revisited and developed together with development agents and the farming community. Model farmers should be selected by the assembly of farmers based on their farming knowledge, skill and willingness to assist other farmers. Farmer-to-farmer extension programs offer valuable experiences in selecting model farmers. SCARBOROUGH et al. (1997,77) and SELENER et al. (1997,23) summarised the various arguments concerning selection mechanisms for farmer-extensionists. The ideal qualities of farmer-promoters include: motivation to experiment, learn and teach others; good technical knowledge; deep love for the land; ability and willingness to teach others; should practise what they preach; enthusiasm; conviction; and prestige. It is also important to use desirable incentives for model farmers based on real achievements. Appreciation by farmers must be an important criterion to reward good model farmers.

5.3.5 Farmers’ adaptation of extension packages

Adaptation is the modification of knowledge to fit a particular context other than the one in which it was generated. This process is key to the utilization of new knowledge that has been transferred (Havelock 1986b,20). In the study areas, farmers made various site-specific adaptations of extension packages. Hybrid maize was introduced as a package of technology which included the use of fertiliser, timing and frequency of weeding, and plant spacing. Farmers explained that the spacing recommendation for maize and sorghum in Begashca tabia was 50 by 80 cm between plants and rows respectively. Motivated by the shortage of land, farmers modified the spacing recommendation to 50 by 50 cm.

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15 The prescribed spacing recommendation for maize and sorghum in dryland areas is 20 and 75 cm between plants and lines respectively. The figures reported by farmers did not correspond with this recommendation. It might be because of information gaps of development agents. In most cases, development agents do not have production handbooks for most crops in the extension program. It might also be that information is distorted as it moves from subject matter specialists to development agents, and then to follower farmers through model farmers.
cm and observed no significant differences in grain size between the development agents’ spacing recommendations and their own modifications. They described the effect of line planting in the following: ‘The quality of the grain is good, but the yield is small. We obtained more yield and straw from broadcasting than line planting’. They experimented with line planting and observed that it was not really better than their own planting methods. In Begasheka, farmers explained that the practice required labour: ‘While ploughing, we need other persons to drop seeds and fertiliser in lines’. To address this problem, farmers said that the primary schools were closed to allow children to assist their parents during the planting season.

Fertiliser rates vary based upon crop and soil types. Farmers modified fertiliser recommendations according to their local conditions. They experimented with different fertiliser rates through experience and identified appropriate rates to meet their own specific situations. For example, farmers in Begasheka tabia used the recommended rate for maize, sorghum, finger millet and barley, but applied a reduced rate for tef. They explained that when they used the recommended rate for tef, it grew vigorously and died before maturing. They thought that it could be because they applied much fertiliser, so by reducing the fertiliser rate, they obtained better results. Farmers applied less fertiliser in poorly fertile lands because of their experience of crop failure due to poor soil moisture conditions. They explained that crops germinate vigorously and die as they grow with too much fertiliser in less fertile lands. They attributed this to the poor soil condition of the land. Therefore, they apply less urea in poor lands to reduce the risk of crop failure. But they believed that there is no land that hates fertiliser: ‘The land learned to be bribed to give a good yield’. Facing high fertiliser prices, farmers apply fertiliser thinly to accommodate all their lands because, they explained that, ‘Even if the fertiliser amount is small, it is much better with fertiliser than without’. Other farmers mixed fertiliser with manure and compost and found out that compost with fertiliser performs better.

Some farmers used tied-ridger for moisture conservation. This technology has not been widely adopted because it is a heavy load for the oxen to draw, and farmers’ knowledge and skill is limited due to inadequate training. Furthermore, farmers explained that it is difficult to work with a tied-ridger since both hands are occupied, and it floats and makes noise in stony soils, frightening the oxen. It also does not fit well with the traditional plough, the maresha. Therefore, as discussed in Section 2.3.3.5, farmers adapted the basic principle of how a tied-ridger works and used a wide diger (wooden pulverizer) to make furrows for moisture conservation.

In the same way, farmers modified the design of modern beehives with three supers vertically. They arranged the supers sideways to reduce the loss of nectar and energy of bees when travelling upwards through the supers. Other farmers removed the third supper (which is often less productive) and constructed another beehive.

In the study areas, farmers were given six exotic chickens (five female and one male) for egg and meat production. Through experience farmers came to learn that they need only the male exotic cock to crossbreed with the local hens. Farmers explained that, despite their high productivity, the exotic breeds were susceptible to diseases and predators, and also needed high quality feed. The white leghorn poultry are susceptible to predators due
to their visible colour and inability to respond to distress calls from other poultry. The crossbred poultry recognise distress calls from their mother through imprinting\textsuperscript{16}. Moreover, farmers preferred crossbreds to local breeds because they free range and yield better eggs and meat. They also have good prices in the market because the eggs are preferred by consumers.

Each of these examples shows that different farmers have different strategies, and when supported properly, the strategies can yield good results. However, this kind of diversity is not valued by development agents who only seek farmers to adopt their recommendations. BELAY and DEGNET (2004,154) reported that in south-western Ethiopia, about 51% of the development agents had the firm belief that they have the right solutions to farmers' problems and that they should play a key role in solving farmers’ problems. Thus, development agents tended to see farmers' adaptations as failure to use recommendations properly and viewed non-adoption as farmer deficiency, because adoption was considered the only rational behaviour. As a result, farmers who modified extension recommendations were considered 'off-types' and 'troublemakers' and were denied 'access to credit and improved inputs’. Unfortunately, this pro-innovation bias (ROGERS 1995,100)\textsuperscript{17} limited the development agents' opportunity to learn from farmers' adaptation processes and to teach other farmers what they could have learned.

5.3.6 Farmers' perception of the use of household ponds

Water is crucial for agricultural production and food security, and thus water development has a high political priority in Ethiopia (FDRE 2001). The Government is promoting household ponds as a means of ensuring household food security and reducing rural poverty. However, household ponds were unpopular among many farmers due to technical and implementation problems.

Technical characteristics of household ponds

Generally speaking, the pond intervention has not been systematically planned and technically directed. Field verification of recommended design and actual implementation of ponds showed that ponds were wrongly designed and implemented (TAYE 2004). The vast majority of household ponds were constructed in a hurry and poorly managed. As a consequence, household ponds had different slope-side ratios, which affected the volume of water. Steeply ponds are difficult to fetch water and have unstable structure, because the stones and plastic cover move down to the bottom of the ponds, while ponds with a high slope-side ratio have a large surface area, which causes high evaporation and seepage loss, leading to low volume of water. Formans usually decreased the height of ponds and increased the sides to accommodate the recommended volume of water, and this led to

\textsuperscript{16}Imprinting is a process in which a newly born animal learns to make a strong association with another organism or an object, and is characterised by a short sensitive phase, which in all cases occurs early in the animal's life (critical period) (ZEMEDE and ABEBE 2001,177).

\textsuperscript{17}The pro-innovation bias is the belief that 'an innovation should be diffused and adopted by all members of a social system, that it should be diffused more rapidly, and that the innovation should be neither re-invented nor rejected' (ROGERS 1995,100).

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high evaporation and seepage loss. As a result, by the end of the rainy season, the amount of water left in ponds was by far lower than the capacity of the ponds and was not adequate to irrigate the recommended hectare of land (Taye 2004). The researcher observed many ponds with no water during the rainy season due to inappropriate site selection and high seepage loss. Some ponds did not have silt traps, and this led to high sedimentation. In other cases, silt traps were improperly designed, not frequently cleaned up by farmers, did not have the necessary depth and distance from the ponds, or the inflow and the silt trap were in opposite direction, forcing households to dig small depressions which were not lined with stones.

**Figure 5.1: Cost and technical effectiveness of different household ponds**

![Diagram showing cost and technical effectiveness of different household ponds]

Farmers doubted the storage effectiveness of household ponds without lining materials such as plastic or cement which can reduce seepage loss to a higher degree. As shown in Figure 5.1, compacted soil ponds have low structural stability because the walls are easily eroded during the rainy season. In the case of stone lined ponds, farmers reported that the stones slipped down to the bottom of the ponds and reduced the pond volume. The size of stones also affected pond volume. In plastic lined ponds, farmers placed stones on the plastic which also slipped down to the bottom of ponds and caused the plastic to roll down. The plastic cover could also be torn by rodents and the sharp edge of stones. Therefore, a combination of lining materials would be appropriate to tackle these problems. Plastic lining with clay soil compaction proved to be more effective in holding water (Taye 2004). Cement lined ponds can be more effective in reducing seepage loss and are also more stable and durable, but the cost of construction is very high, which is beyond the financial reach of most farmers.

**Community participation**

Most household ponds failed, despite good designs and techniques, because the social, economic and management factors were inadequately integrated into the pond development system. As Box 5.1 shows, a crucial condition for a pond intervention to be success-
ful is its acceptance by farmers. The chances for success are higher when farmers are involved in the site selection and the design of ponds, and when communication is used as a leverage instrument for mobilisation. Community meetings are important to explain the use of ponds and get initial feedback and must involve a cross-section of the community, including women-headed households. As discussed in Section 2.3.1, there is a great advantage in involving local people in site selection and determining water availability, because local people are in the best position to help outside technicians by providing local knowledge about the size of catchments, amount of run-off, and problems of sedimentation.

Box 5.1: Farmers’ perception of household ponds in Begashke tabia

- Ponds encourage sorghum birds
- Ponds reduce cultivable lands
- Difficulty of withdrawing water, no entrance to ponds for withdrawing water
- Fencing is required (risky for children and animals)
- Little rainfall to produce a high volume of run-off
- Lack of credit for pond construction
- Lack of motor pumps and watering cans
- Labour demanding to water crops
- Lack of material for pond maintenance
- Stone cover harbours rodents, tearing the plastic cover
- High seepage loss, due to soil permeability, tearing of plastic cover by the sharp edge of stones
- Small catchment area to produce the desired amount of run-off water
- Poor structural stability of ponds
- Inappropriate site selection, leading to low volume of run-off
- High sedimentation

The selection of participating households is the other crucial condition for success. It should be realised that participants are selected based on willingness and ability, because it may not be feasible to build ponds everywhere. Development agents must ensure that household ponds are realistic and successful and that farmers do not experience failure using ponds. This is particularly advantageous in the long-run when participating farmers gain knowledge and experience and become self-reliant that they serve as local resources for other farmers interested in constructing household ponds and sharing practical experiences.

Incentives for pond construction

Household ponds were constructed through mass campaign fuelled by food-for-work programs. Understandably, there was a high initial enthusiasm for ponds, but this enthusiasm cooled off gradually when the food aid was discontinued. Farmers in Begashke tabia were promised to receive plastic for free, but when they were asked to take it on credit instead, they abandoned their ponds. A further problem was the lack of farmers’ decision in site selection, thus leading to disagreements between experts and farmers. In most cases, experts recommended farmland for constructing ponds, while farmers believed that ponds
waste farmland\textsuperscript{18}. Thus, the foregone benefit of farmland was a major limiting factor for the adoption of household ponds because of the small landholding size. On the whole, due to the permeability of the soil, the water did not last long for supplementary irrigation or growing vegetables without plastering the ponds, thus farmers did not see ponds as a feasible investment.

Despite such an inauspicious beginning and lack of popularity of household ponds, there were encouraging initiatives by farmers in using household ponds more effectively. Essentially, household ponds were intended for supplementary irrigation, but farmers began growing vegetables and spices. Thus, a more feasible approach for the extension program is to look for what farmers are doing and to help them improve their practices and promote group actions. Development agents should assist farmers in gaining a basic understanding of the important elements of site selection, water control, pond construction, and eventually the dynamics of pond management (SIMPSON 1998,103). Thus, a key role for development agents is to facilitate horizontal sharing of experiences and to advise farmers on the choice of vegetable crops by taking into account the water holding capacity of ponds, the rate of water loss, the crop water requirement, and the method of irrigation. Further, they should offer training for farmers on efficient water usage and pond management (cleaning up of silt traps, planting grasses around ponds, diverting run-off water into ponds, protecting run-off from entering the ponds from every direction, which causes the erosion of the walls of the ponds, and pond maintenance).

5.3.7 Implication for extension

Farmers learn from technologies demonstrated by development agents without having direct interpersonal communication. They pick ideas from introduced technology packages and integrate them into their own practices, leading to even better practices than are promoted by development agents. This conceptual utilisation of new knowledge (how farmers understand the principles behind a new technology and adapt it to their own conditions) is ultimately far more important than its adoption (HAVELOCK 1986b,24). Actual extension work is more than the delivery of technology packages. The utilisation of new knowledge is both a mental and a technical adaptation problem (NAGEL 1980). The integration of an innovation into the decision making, as well as the actual production process, has to be achieved by farmers themselves with the help of development agents. Therefore, the ultimate test of the extension program is to be found not in what it has offered to farmers over a specified period of time or its potential to increase agricultural yields, but rather in the extent to which it has built farmers’ knowledge and adaptive capacities. Farmers must understand the principles behind a new technology to be able to adapt it to their own circumstances and livelihood strategies. Field extension advisors must also understand the principles of doing good extension in order to help farmers integrate innovations into their production systems. And this requires that training and appropriate incentive system are in place.

\textsuperscript{18}TAYE (2004) showed that 80\% of the ponds are constructed on farmlands, 10\% on wastelands, and another 10\% on grazing lands in Atsbi Wombera woreda, eastern Tigray.
5.4 Institutional and human capacity constraints surrounding the extension service

Agricultural extension is a key policy instrument for agricultural development, but without the support of other policy instruments, its contribution can be limited. Appropriate technology, attractive markets, available inputs, and access to credit are crucial ingredients for extension, which cannot also become effective without an effective extension service. Research without extension is seldom used; good markets without dependable production are useless; and input providers cannot achieve farmers' responses without extension services and good markets. In reality, however, extension is put into practice without this necessary intervention mix, because it requires 'different agencies involved in research, extension, credit, seed multiplication, market development and price setting, as well as the need for farmers or their representatives, to work closely together to create accessible packages and provide the conditions for their use' (ROLING 1988,14). This remains a major challenge for extension services in developing countries (ROBERTS 1987) and calls for the need to develop pluralistic, decentralised and coordinated agricultural service systems, along the production-value chains. Extension must be nested within a wider service context including credit, input supply, processing and marketing if farmers are to transform production increases into better livelihoods.

MOSHER (1966) outlines essentials and accelerators for agricultural development. His contribution is an important one in order to understand the mix of elements necessary for agricultural development. Essentials are preconditions, including price, market, inputs and technology. Accelerators include extension, production credit and group action by farmers. MOSHER argues that there can and will be some growth in agricultural productivity wherever all of the essentials are present, but without all of them, there will be none. His proposition suggests that extension is not indispensable for agricultural development as long as the essentials exist.

On the contrary, the study argues that extension is indispensable, but cannot be an effective means of agricultural development without the necessary mix of conditions, which is not usually fulfilled in most developing countries. As a result, extension is blamed for what it is not primarily responsible. Therefore, it is necessary to look at extension as an element of a system of development mix in which it interacts with, and is influenced by other elements. Put another way, a lack of any one of the necessary conditions can affect otherwise effective extension work. For example, if prices are too low to provide a good incentive for farmers, then extension is a useless instrument. If credit is not available according to the needs and capacities of farmers, extension cannot be an effective means for agricultural development. And if agricultural inputs are not made available locally, adequately and timely, extension is also blamed.

5.4.1 Supply and use of agricultural inputs

The use of inputs is not only a function of information but also of accessibility, effectiveness and profitability. Poor quality and inadequate supply are the critical problems facing the seed sector. The Ethiopian Seed Enterprise (ESE) has a poor seed multiplication and
distribution system. There are no private seed dealers that could make improved seeds available in convenient packages, at desired locations, and with reasonable prices. The operation of the ESE is constrained by several factors, including poor quality seeds, lack of adequate production sites, limited prior contract arrangement with producers of breeder and pre-basic seeds, weak distribution channels, lack of reliable demand estimates, low purchasing power by farmers, and absence of demonstration fields to promote the use of improved seeds (HOWARD et al. 1995; TECHANE and MULAT 2000; SEBOKA and DERESSA 2000). There are inadequate seed farms for different agro-ecologies. Presently, the ESE has four basic seed farms in Awassa, Gojam and Arsi representing mid-altitude and highland agro-ecologies. Moreover, due to a lack of adequate adaptive trials, agricultural bureaus lacked knowledge and confidence in improved seeds, leading to a low use of improved seeds and a large stock of unsold seeds (MoA 1995). This problem could be addressed by encouraging innovative farmers, farmer cooperatives and community seed banks to multiply and distribute secondary seeds, thereby reducing administrative problems and providing quality seeds to farmers at reasonable prices.

Farmers' use of improved inputs depends on certain factors. MOSHER (1966,92) identified technical effectiveness, dependable quality, reasonable price, local availability, and the size of the container as the most important factors. Farmers must be convinced that new inputs can work in their conditions and are really better than what they already have. This confidence in the performance of new inputs is an important one as illustrated by the views of farmers in Begasheka during the focus group discussions: 'When new inputs were introduced to our village for the first time, we resisted because we were not sure if they would work in our condition. Now we are convinced that fertilizer is important, and we cannot even produce without it'. However, this awareness and willingness to use improved inputs was constrained by the availability (unreliable supply and high price) of inputs. In taking production loans, farmers consider the prices of inputs and the prices they can get from their products (CROPENSTEDT and MULAT 1996). Farmers took fertilizer and improved seeds on short-term credit which has to be repaid after harvest during which output prices are lower. Similarly, the timely and adequate availability of inputs influences farmers’ continued use of improved inputs. As MOSHER (1966,95) puts, the need for each input is seasonal. Seeds must be available shortly before planting time, and fertilisers must be applied at specific times. This means that input suppliers must be intimately acquainted with the seasonal need for each input and have enough foresight to have adequate supplies of each input ahead of time, so that farmers can get them quickly. This is, however, constrained by limited availability of private fertiliser wholesalers and retailers due to the deregulation of fertiliser prices and a lack of working capital (TECHANE and MULAT 2000; RAYMAKERS 2002).

Besides a reliable input supply, reasonable input prices and profitable output markets are necessary conditions for farmers’ continued use of improved inputs. Following the liberalisation of fertiliser procurement and distribution and the removal of subsidy on fertiliser in the 1996/97 production year, the price of fertiliser at the village level has increased considerably. Many farmers found fertilisers too expensive in the local markets because retail traders sell fertilisers at prices higher than the government (EYASU 2002; BELAY and DEGNET 2004). Moreover, the decline of output prices after harvest has affected
farmers’ gain and ability to repay input loans. Farmers in Begasheka explained: ‘During the planting season, we took one kilogram of improved seed for 3 Birr on credit which has to be repaid after harvest during which output prices decline to 1 Birr, resulting in a loss of 2 Birr’. This plausibly illustrates that access to markets is a critical problem (Schuh 1987; Roberts 1987; Canz 2005) forcing farmers to withdraw from the extension program due to their inability to repay input loans, which also reduces their future access to input credit. For example, in the 2000/01 production year, production increments were not accompanied by the necessary mechanisms to ensure market price stabilisation, and this caused asset depletion and impoverishment of participating farmers, as the farmers were compelled to repay the loans contracted for the purchase of input packages (Raymakers 2002).

In summary, many farmers seem to be willing to join the extension program if they could repay input loans in kind. The provision of inputs on credit to be repaid with farm produce may be a better option, relieving farmers of uncertainty about the prices that they can get for their harvest in order to repay loans in cash. Farmers may purchase seeds or fertiliser knowing how much grain or other produce they must give in payment for it after harvest time (Moser 1966).

5.4.2 Access to credit and its impact on technology adoption

Farmers need credit to buy inputs, oxen, agricultural implements, and meet urgent family needs. The use of credit depends on the availability, effectiveness and profitability of inputs and new production methods. If farmers feel that the technology being promoted may not be effective or will not be profitable, they may not be willing to borrow production credit, unless they are forced to or persuaded by other means. Farmers have to estimate the probable yield and the market price of their crop at harvest time. They also consider variations in the weather. Under unreliable rainfall and poor soil conditions, farmers are less likely to risk the investment of borrowed funds (Moser 1966). Thus, if farmers experience considerable price fluctuations in the local market, they are less willing to incur cash obligations to repay input loans. In the Tigray region, price instability for agricultural inputs and outputs tends to be very high due to poorly developed infrastructure and market systems.

The Commercial Bank of Ethiopia (CBE) has been the major financer of input credit to small-holder farmers, initially through service cooperatives and later, due to long overdue input credit repayments, through loan contracts with regional governments, providing guarantees for full loan refunds due to farmers’ lack of collateral. However, the involvement of regional governments in the administration of credit using their annual budgets to

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19 Access to market affects the ability of farmers to repay production loans, because farmers’ adoption decisions are affected by the perceived profitability of input use.

20 Carlsson et al. (2005), using the choice experiment method, reported that the majority of farmers in the highlands of Ethiopia prefer a local public good (health care or protected spring) to agricultural extension packages. However, when the extension package is combined with insurance in terms of no payback of the credit in case of crop loss, then they found a significant increase in the choice of the extension package.
provide security for the CBE caused financial and administrative problems. It created a huge administrative burden for development agents and local leaders and affected their objectivity since they were both advisors, lenders, enforcers and collectors of loan repayments. It also created confusion and role conflict for the development agents and affected their relationship with farmers (DEJENE 2000; EDILEGNAW 2000; RAYMAKERS 2002).

In attempting to strengthen the rural financial sector, the National Bank of Ethiopia (NBE) issued a regulatory framework (Proclamation No. 40/1996) that includes a loan ceiling of 5000 Birr, loan duration of one year, and delivery of financial services based on group collateral. Following this proclamation, different NGOs have shifted themselves into (and established new) micro-finance institutions (GUUSH 2004). The credit institution operating in Tigray is the Dedebit Credit and Savings Institution (DECSI), which has five shareholders—the Relief Society of Tigray, the regional state of Tigray, the Women’s Association of Tigray, the Farmers’ Association of Tigray, and the Youth Association of Tigray (SOS FAIM 2000). The DECSI uses groups to provide solidarity security for agricultural input loans. In many developing countries, the joint-liability mechanism has been a major methodological breakthrough for lending to the very poor (MKNELLY and KEVANE 2002; HERMES et al. 2005). Before joining a particular group, farmers study carefully the ability of group members to repay loans. Thus, credit groups usually admit farmers who have assets for collateral as members, but this can cause exclusion of the poorest from credit services (SOS FAIM 2003).

More farmers in debt: a problem for extension

In Tigray, like elsewhere in the country, the group lending approach seems to be unpopular among many farmers, because borrowers do not like to share risks with others in the case of their failure to repay input loans (GUUSH 2004; GETANEH 2004). There was persistent peer pressure to repay loans and forced asset disposals of failed members, thus weakening the social relationships and networks which are very important to get immediate assistance in times of crisis. Farmers believed that they have been impoverished by the credit program as they were forced to sell livestock and other assets in order to repay debts: ‘If you sell now and then, you will be poor; if you are sick too, you will die’.

Metaphorically, farmers named the credit program amenmin, which literally means ‘a disease that makes a person lose weight over time’, having associated it with HIV/AIDS, as they have become poorer over time due to the disposal of assets in an effort to repay debts, thus being trapped in a vicious circle of indebtedness. GUUSH (2004) reported that prison and seizure of assets were the worst consequences of default that farmers experienced in Tigray. Similarly, EYASU (2002) reported farmers’ experiences in southern Ethiopia that they had to sell their draught oxen, or even part of the iron sheet roofing of their house to escape imprisonment because of debts.

To avoid the risk of losing assets, when the loan period is due, farmers borrowed from local moneylenders to repay their loans. In this way, they were considered successful and became eligible for another loan, which they immediately used it to repay the local moneylenders, with a resulting effect of paying interest both to the credit institution and the local moneylenders.
Farmers do not like to borrow unless it is absolutely necessary. The focus group discussions revealed that farmers took credit for fear of exclusion from Government benefits and due to political pressure from local leaders: ‘If you do not take credit, you are rich. The government will not help you’. In most cases, both sexes of the household borrowed and faced severe difficulty in repaying their loans. When one of the household member defaults, it is commonly covered by a new borrowing of the other household member. This husband-wife debt trap has occurred in many households in Tigray (GUUSH 2004).

Despite the theoretical literature’s claim that group lending can reduce the moral hazard behaviour of borrowers, farmers in Tigray used credit for consumption, repayment of loan and ceremonies (MENGISTU and DESTA 2005) due to their limited knowledge and ability to use loans effectively. This could be reduced by incorporating learning sessions about business development. Training usually involved general orientation and persuasion of farmers to take credit. Since most households are illiterate and lack financial literacy, this had consequences on their financial management and repayment capacity. It was evident that, because of the long tradition of food aid, farmers considered credit a gift or political patronage that does not need to be repaid. Although they were told that the credit needs to be repaid, they did not take this seriously, because they thought that it was merely advice and did not believe that the money would actually be reclaimed. In all, farmers appeared to be interested in improved inputs to increase their production, but the unpleasant approach of the credit program (its rigid terms and conditions) and the fear of indebtedness constrained their ability to continue using productivity enhancing inputs and methods.

5.4.3 Access to market

Access to market is an important factor for mobilizing resources by enabling farmers to make better use of their resources based on comparative advantages. There is no point in persuading farmers to use improved inputs when markets do not exist for agricultural outputs. Thus, the extension program must be directed and organized in terms of market opportunities and increasing production and household incomes. However, most emphasis to date has been on the production and technical aspects of agriculture. In the Tigray region, much work has been done on the identification of agro-ecological zones suitable for particular crops, and much associated research and development has contributed to a technical knowledge base to support agricultural production. Relatively little work has been done on the market implications of agro-ecology based production systems. This means that the market-oriented agricultural development policy has not been met by improved access to markets. There are only plans to investigate the market potential of high value crops under contract to domestic and international markets.

Farmers’ incentive to produce commodities for the market instead of their own subsistence depends on the prices of local markets. Low output prices after harvest discourage the use of productivity enhancing inputs and methods. Due to the shortage of liquidity, 

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21 The credit with education approach has been successfully applied in Burkina Faso (see MKNELLY and KEVANE 2002).
farm households sell their agricultural output after harvest and buy it back at a higher price during the deficit period (see Table 5.4).

The seasonality of agriculture makes it difficult for farmers to repay input loans over a longer period of time and in small instalments. Moreover, farmers have low negotiating power due to a lack of options in the face of poor product storage capacity. Buyers are aware of this, especially for vegetable production. The need for storage facilities arises from the fact that, for most agricultural products, production is only possible during a particular season, while the demand may be spread throughout the year. Storage facilities add a time value to agricultural products, increasing farmers’ control over the timing of sales, and provide options when buyers are dropping the price in times of high supply. Thus, given the focus on high value crop production, post-harvest technologies are important for farmers to extend the shelf-life of perishable products and to have control over timing to markets.

Output marketing is faced with a number of constraints, including an inadequate transport network and a limited number of large inter-regional traders with adequate storage and working capital; high handling costs; and inadequate market information system (Howard et al. 1995, 19; Techane and Mulat 2000, 145). The volume of the grain marketed falls sharply in the years of a poor harvest and prices rise considerably. On the contrary, grain prices are seriously depressed in good years and immediately after harvest. Low prices immediately after harvest and high seasonal price fluctuations discourage the use of fertilisers and improved seeds.

<table>
<thead>
<tr>
<th>Production Year</th>
<th>Maize June</th>
<th>Maize January</th>
<th>Sorghum June</th>
<th>Sorghum January</th>
<th>Finger Millet June</th>
<th>Finger Millet January</th>
<th>Tef June</th>
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<td>190</td>
<td>163</td>
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<td>1998/99</td>
<td>184</td>
<td>112</td>
<td>200</td>
<td>112</td>
<td>202</td>
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<td>270</td>
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<td>1999/00</td>
<td>180</td>
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<td>2000/01</td>
<td>150</td>
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<td>135</td>
<td>175</td>
<td>165</td>
<td>260</td>
<td>240</td>
</tr>
<tr>
<td>2002/03</td>
<td>216</td>
<td>191</td>
<td>217</td>
<td>208</td>
<td>250</td>
<td>212</td>
<td>286</td>
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<tr>
<td>2003/04</td>
<td>250</td>
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<td>185</td>
<td>142</td>
<td>214</td>
<td>187</td>
<td>250</td>
<td>240</td>
</tr>
</tbody>
</table>

Source: Compiled from monthly market study reports of Kola Temben woreda office of Agriculture and Rural Development

Infrastructure development affects prices since transport costs differ due to distance and the quality of infrastructure. High transport cost and poor market outlets discourage farmers from practicing irrigation or from adopting high value crops and more intensive practices. Vegetable production is seasonal and is affected by market fluctuation. The focus group discussions in Debre Birhan tabia showed that few traders came to the villages, and farmers had low bargaining power. Moreover, the farmers were unable to transport their produce to central markets because of high transportation costs and market saturation:
Traders come to our village and buy our produce on their own terms. We are not able to negotiate prices, so we give them as they wish. We tried to take our produce to towns, but the prices were low due to high supply. The traders in towns also give us low prices because they have connections with the traders who come to our village. The problem is that farmers produce a homogeneous product, and there are relatively few buyers. The local market is easily saturated and not able to absorb local production. Sometimes wholesalers buy products in bulk for sale in more distant markets, but farmers have low bargaining power and traders do not come to villages often. Due to a lack of post-harvest technologies, farmers fear the risk of product spoilage and tend to dispose of their products on traders’ terms.

In all, when production is high, farmers suffer from a heavy loss of profit, and when production is low, they also suffer because the middle man takes the proceeds. They are only producers of raw materials, but value addition at different levels of the production process is done by middle men, who also take the proceeds away. Therefore, unless farmers control the value addition process through their organisations, they cannot increase their profits significantly. And if there are no viable farmer organisations, everything done by extension may not ultimately benefit farmers.

5.4.4 Access to information

Access to knowledge in forms that can be used by farmers is a major constraint in rural development, but one in which information and communication technologies are creating many new opportunities for circumventing barriers to knowledge flow and bringing users into direct and rapid contact with external knowledge (Garforth 1986; World Bank 2002,13). Mass media can reach a large audience rapidly, create knowledge, spread information, and lead to change in weakly held attitudes. The formation and change of strongly held attitudes is usually accomplished by interpersonal channels which involve face-to-face exchange between two or more individuals (Rogers 1995). Radio is the most widely used medium of communicating agricultural information worldwide because of its advantage of cutting across literacy and geographical barriers and the widespread ownership of battery operated transistor radios (Omotayo et al. 1997; Ladebo et al. 1997; Chapman et al. 2003). It also appeals both to the literate and illiterate audience.

Agricultural radio programs

Radio has a tremendous effect in reaching local communities. In remote areas, radio is the only access the population has to vital information. The radio station in Tigray, Woyane radio, is established by the TPLF and devotes considerable air time to political and agricultural development issues, supplementing the extension service. Agricultural programs are broadcast twice a week in Tigrigna, the working language of the region. But the extension role of the Woyane radio is not well established because of poor integration between extension and radio programs. In the study areas, development agents did not see incorporating broadcasts into their extension activities as a primary role and were not also trained to do so. Development agents in Debre Birhan tabia explained: ‘The radio program is useful in providing new information. Often farmers come to us to ask for further
information, but we do not listen to it regularly’. Radio programs can help the extension service achieve credibility and conviction among its clientele through stimulating interest in farmers about the use of new inputs, production methods, and complementing the efforts of field development agents. Information which does not require practical demonstration can be effectively disseminated through radio, but, for a better impact, radio programs should be complemented by other communication channels, such as individual visits, demonstrations, group discussions, the print media, and training programs. Moreover, radio programs should be prepared and broadcast in a way that makes them accessible and useful to their audience. There should be consultation and feedback mechanisms to identify the subject priorities and the timing of broadcasts to fit into field extension activities and the training of farmers. This requires coordination between extension work and agricultural radio programs, so that information can easily be shared and resources better managed.

The integration of extension and radio broadcasting will be particularly important to support the activities of the newly established FTCs. Radio broadcasts can stimulate interest in farmers about training programs and encourage farmers to learn from each other. Agricultural radio programs should be participatory enabling development agents to encourage and assist farmers, when necessary, by documenting and communicating their experiences and making requests for radio broadcasts. Development agents should be trained in how to interview farmers, in scriptwriting, and how to integrate broadcasts into the curricula of FTCs and field extension activities. At present, there is little direct contribution from the extension service to radio programs; instead, the main contribution comes from the media staff by interviewing farmers and experts and attending meetings and workshops.

Box 5.2: The Radio Woyane

The main programs are geteratna, focuses on the rural sector, lessons from visits by local leaders and officials concerning rural development; women and youth programs, the participation of women and the youth in rural development; tehadso, messages with entertainment; and temokro, experiences and lessons from successful development programs, travelling visits, model farmers who adopted extension packages and received awards.

There appears to be weak cross-sectoral integration of communication and information flow. Most development actors do not seem to appreciate the value of the media as an important partner in the development process. According to sources in the radio station, the institutional cooperation between the media and development agencies is poorly developed. The bulk of information for broadcasting comes from grassroots interviews, meetings and conferences, and interviewing experts and officials. The annual development program of the region, which is compiled from annual programs of development actors, is the main source of information. The radio station uses it as a guide to make its monthly programs and collect timely information from various actors for broadcasting.

Agricultural press

Print materials can offer more practical and directly relevant information by encouraging farmers to describe their own experience in a way that other farmers can understand and utilise it. Despite the proliferation of the private press, agricultural press is non-existent in Ethiopia. There are no farm newsletters, newspapers or agricultural magazines that provide agricultural information to development agents, farmers and their organisations. The
press has poor coverage of agricultural information because political and economic motivations are predominant. Moreover, the private press is constrained by a low level of professionalism and poor material resources. It also operates under a variety of pressure and restrictions from the Government, which may lead to financial crisis and political complications if the press disobeys the government.

Newspaper circulation in Ethiopia is an arduous struggle in light of the absence of a good network of transport and communication facilities (SHIMELIS 2002). The widely distributed newspaper in Tigray is the Woyn Newspaper which contains a good balance of information on agricultural and political issues.

**Box 5.3: The Woyn Newspaper**

The Woyn is the voice of the ruling party, TPLF/EPRDF (Tigray People’s Liberation Front/Ethiopian People’s Revolutionary Democratic Front). It has been in operation since the inception of the TPLF, and its main objective is to inform the public about the various development policies of the ruling party and their implementation. It is published in Tigrigna, and its readership is mainly in the Tigray region. About 20,000 copies of the newspaper are distributed in the region weekly, with a well-integrated distribution system.

The Woyn has the following main sections: *engdot* reports the views of guests based on development policies and their implementation; *politics* focuses on the meetings and decisions of the parliament; *methiyat* reports experience sharing visits of officials; *seb wuray* reports activities and experiences of returnee soldiers; *dehay geler* offers information on rural conditions and successful rural development activities; *dehay ketema* reports based around cities and small-scale industrial development and its links to agriculture; *megabaeya* deals with justice and democracy and civil service reform; *maemet* features social, economic and political status of women, particularly rural women; and *mihznet* reports cooperation and experience sharing visits between regions concerning the implementation of agricultural and rural development programs.

The Woyn is a crucial actor in the development endeavour in the region. Regarding the newspaper’s sources of information, the Mekelle Branch coordinator explained that ‘information is collected by attending meetings held for woreda experts and administrators on rural development programs and interviewing experts and officials’. He went on to say that, ‘there is little appreciation of the value of the mass media, and there is no easy cooperation with development agencies in providing and sharing information’. Most institutions do not seem to view informing the public about their activities as one of their important organisational goals. At present, this problem is realised, and the Government is urging institutions to establish public relation services to inform the public about their objectives and activities.

### 5.4.5 Local governance and implementation capacity

The Government of Ethiopia is committed to the delegation of responsibility of development planning and implementation to local authorities. The issue of local participation in the development process is central to the Government’s decentralisation policy. This major reform is under implementation and remains a challenge of utmost importance in terms of developing local capacity for implementation and involving people in development through participatory consultation processes. At present, local governments are less effective in enhancing participation and group actions that would enable people to develop the competence to solve local problems. To a large extent, local administrative structures function according to old and well-established authoritarian practice (PAUSE-WANG 2002) with no accountability and responsiveness to the local community. Local of-
ficials are accountable only upwards within the bureaucracy. Bringing a fundamental change in relationships between regional and local governments remains a major challenge in developing decentralised service systems, and this requires a conducive political climate for public participation and local accountability.

There is poor capacity and little communication between experts and local administrators in implementing the agricultural and rural development policy. The interference of local leaders in technical matters in which they were not competent hindered effective implementation. There existed unhealthy relationship between experts and local administrators. Rather than working in harmony and cooperation, they are attacking one another. For example, local administrators complained: ‘Experts lack vision, initiative and commitment’. On the contrary, experts complained: ‘Local administrators are politically motivated, interfere in our work, and use the institution of gumgam, a regular evaluation or self-critique exercise, as a key instrument for discouraging refusal from us and gaining our passive support’.

There is poor awareness of the proper role and function of a responsive local government. Essentially, woreda and tabia administrators and councillors view themselves as representatives of the Government, so carrying out Government orders takes precedence over community concerns and needs (MEHERET 2002), thus reinforcing upward accountability. This has hindered the ability of local people to dialogue with local leaders and experts about their needs and problems and to come to meaningful ways of planning and evaluating extension programs. It is important that local people must be able to voice their interests and problems that need practical solutions. Thus, it is necessary to build the implementation capacity of woreda and tabia administrators in order to provide efficient services and improve the quality of local governments.

Local governments should be empowered to mobilise people in development through intimate knowledge of local knowledge and processes. It is important to develop the capacity and decision-making power of local administration through employing motivated and certified local leaders. Moreover, there should be continuous and regular technical and capacity building support to enable local leaders to discharge their duties and responsibilities in the interest of local people. At present, there is a grossly low capacity in local administration, causing the majority of the work to lay on the shoulders of a few experts, who have become frustrated, unmotivated, and inefficient.

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22 Gumgam was developed during the early periods of the TPLF and was supposed to work well. In principle, gumgam is a powerful tool of democratic accountability and an important aspect of the development process. According to Government officials, gumgam is ‘a democratic exercise intended to evaluate the performance of the elected council and ensure its accountability and responsiveness to the electorate’ (MEHERET 2002). In practice, however, gumgam is transformed into a tool of control and is open to manipulation by party cadres who decide when to hold a gumgam and which issues to raise (PAUSEWANG, TRONVOLL and AALEN 2002). It is largely a top-down process, and there is very little community initiative in the exercise. The initiative comes from party cadres and has a hidden agenda of punishing members whose ‘allegiance to the party line might be in question’ (MEHERET 2002).
This problem is exacerbated by the lack of integration within, and between various sectors. Local administrators must understand the agricultural and rural development policy; the local development goals which need to be set according to the policy; the problems that would be faced in achieving the development goals; and the measures which need to be taken in order to solve those problems. Coordination and implementation problems have to be identified regularly, and short-term training courses should be organised for local leaders in order to help them understand their specific responsibilities and perform them more effectively and efficiently.

Implementation capacity building is a crucial development tool and an integral part of the agricultural and rural development policy. It has three tiers: human resource (knowledge, skill, experience, work ethics, changes in attitude and work culture), system (polices, regulations, guidelines and manuals), and organisational structure and culture (a way of ordering necessary relationships). Each is important but will not have a significant effect on improving institutional effectiveness without the others. The Government of Ethiopia has formulated a comprehensive capacity building strategy and program to create the capacity that is needed to effectively implement the strategies of the agricultural and rural development policy, urban and industry development, and democratic system development. However, the efforts made so far have been isolated and limited due to a lack of a holistic and an integrated approach to capacity building. Government and donor efforts targeted institutional and human capacity building in isolation and did not make a significant contribution to improving the implementation capacity at all levels. Basically capacity building efforts have to emanate from the agricultural and rural development policy and should have contents that enable various actors to implement the actual development plans effectively. Coordination between the various development actors should also be strengthened. Capacity development efforts should not exclusively target public institutions, but also focus equally on the private sector, farmer organisations, and civil society in order to assure and enhance quality in service provisions. Research and higher education institutions can play a key role in evaluating performance levels, identifying constraints, designing training programs, and advising policy makers.

5.5 Recent policy frameworks and institutional developments shaping the Agricultural Knowledge System

Ethiopia recently underwent a major transformation with greater political, financial and administrative decentralisation to regions and districts within the Government system and demonstrated a strong commitment to agricultural and rural development through fostering the participation of the private sector and institutional coordination, thereby gradually moving in the direction of the development of an integrated AKS. This is well reflected in the Rural Development Policies, Strategies and Instruments (FDRE 2001), which provides a comprehensive framework for the development of the agriculture sector, comprising a set of innovative and practical strategies designed to create an environment enabling the commercialisation of the agricultural sector and increasing its productivity and profitability, leading to increased farm incomes, reduced rural poverty and enhanced food security, thus supporting the overall economic development. Within this framework, the Ti-
gray Bureau of Agriculture and Natural Resources (BoANR) has laid the following major directions for agricultural development in the region:

- Increasing agricultural production and productivity through agricultural development based on environmental rehabilitation and natural resource conservation.
- Using an extension system that considers the diversity of agro-ecological and farming systems and brings about visible changes at the household level through introducing diversified and integrated packages.
- Capacity building through providing continuous training and coordinated support to farmers and development agents in order to effectively implement watershed based and integrated household packages.
- Using every possible option to combat moisture stress.
- Introducing technologies and management practices that improve livestock productivity (BoANR 2002b, own translation).

In order to make the above directions operational, the Bureau has followed an extension approach with three tiers:

- **Regular extension** offers large-scale services to all farmers to meet wider societal objectives such as soil and water conservation, management of natural resources, livestock vaccination, and striga (*Striga hermonthica*) control campaign.
- **Conventional extension** transfers improved inputs in order to increase the production and productivity of farmers and the management of natural resources, using a model farmer strategy to demonstrate the use of new inputs and production methods to other farmers.
- **Household extension** promotes improved packages which are already introduced and accepted by farmers, focusing on diversified and integrated packages that envisage households to earn an annual income of about 18,000 Birr in three years (BoANR 2002b, own translation).

**Diversification and integration of extension packages**

The household extension program is based on the criticism that previous efforts in technology transfer lacked diversity and synergic effects between packages to have visible impacts on farm productivity and household income. In response to this criticism, a full package program has recently been launched with an integrated application of diversified packages to increase farm productivity and income, ensure household food security, and reduce rural poverty. The household packages include food and high value crops (fertilisers, improved seeds and agro-chemicals), livestock development (dairy cows, poultry, modern beehives, fattening and livestock feed), and natural resources management (agroforestry, soil and water conservation and small-scale water harvesting). The program focuses on the production of high value enterprises to maximise the comparative advantages of different agro-ecological zones. Development agents assist participating farmers in selecting packages considering their needs and capacity and the complementarity and suit-
ability of different packages. Participating farmers were selected by development agents and local leaders based on their credit history, farming experience, and ability to use improved inputs.

The household extension program uses a supervised credit system. Development agents assist farmers in the preparation of a production plan, which involves an estimate of the amount of credit needed to finance the new packages and the probable value of the increased production. On the basis of this plan, credit is provided to farmers either in cash or in the form of specific inputs, and the security for the loan is the estimated value of the production plan. Farmers received dairy cows, improved seeds and modern beehives on credit because they were not readily available in the market, whereas they took cash for buying oxen, sheep and goats for fattening, as well as for the purchase of fertiliser.

Different inputs may require different types of loans in terms of duration, security requirements, size of loan, and loan repayment. In the case of loans for buying livestock and modern beehives, a longer loan period is necessary with repayment in small instalments over several years, corresponding to normal periods for selling farm products. In the household extension package, credit is provided individually, and there are different repayment arrangements for different packages at different periods. Farmers have to repay input loans in two years, with the possibility of two years prolongation in case of understandable failure or difficulty. Regarding participation, farmers explained that they were not forced to take household packages. This is understandable in light of the goal of the household extension program and the volume of credit participating households require to apply full packages. In Begasheka, a Purchase Committee was established at community level to follow up the use of credit and assist farmers in buying goats, sheep and oxen for fattening. In cooperation with this committee, development agents follow up the use of credit and advise farmers to efficiently use the packages financed by the loan.

Capacity building of farmers and development agents

To successfully implement the household extension program, development agents must have and continue to have opportunities to learn, develop new skills and increase their specialized competence. They must be capable of more than just communicating messages to farmers and need to possess insightful economic management knowledge in order to advise farmers on more efficient use of household packages (CHANG 1986; BELAY and DEGNET 2004). Thus, special emphasis must be given to the training of development agents to upgrade their knowledge and improve their communication skills. For this purpose, Agricultural Technical and Vocational Education and Training (ATVET) programs have been launched to produce the personnel that would be working in the agriculture sector. Three development agents (crop, livestock and natural resources) were assigned in each tabia (community) to serve as both trainers and extension advisors. Likewise, the abilities of farmers and the decisions they make about their farming operations are crucial to accelerate agricultural development. This ability can be developed through training farmers, which is at the very heart of building local capacity. To achieve this, Farmer Training Centers (FTCs) have been established to give modular training for farmers on household extension packages. This will be discussed in more detail in Chapter 6.
Institutional coordination and integration

In the Tigray region, following the merger of the Ministries of Agriculture and Rural Development, the BoANR has been reorganised into the BoARD. The BoARD is the principal interface between research and farmers, providing agricultural direction, expertise and extension services. It is an umbrella organisation that provides guidance and directions to divisions, commissions, authorities and offices organised under its jurisdiction. The BoARD coordinates and oversees development, rehabilitation, and emergency programs in food security and poverty reduction, and is a central player in the AKS. Figure 5.2 shows the organisational structure of the BoARD with similar structures at the woreda level, which are accountable to woreda councils.

Figure 5.2: Simplified organizational structure of the BoARD

The BoARD occupies a central position in the development of the economy and improvement of food security and is responsible for taking measures toward efficient utilisation of land and water resources, transfer of improved technologies, and supply of farm inputs. It gives directions and guidance to the Food Security Coordination Office, the Disaster Prevention and Preparedness Commission, and the Tigray Agricultural Research Institute and operates through five Divisions which are made up of different authorities, offices, commissions, projects and programs that deal with the development of the rural sector. Despite the decentralisation process, there is still a stronger hierarchy between regional bureaus and woreda offices. In most cases, priority setting and planning is domi-
nated by regional bureaus, and the structures at woreda level are intended mainly for im-
plementing regional plans (MENGISTU and DESTA 2005).

As mentioned in Chapter 1, the extension service is a central component of the AKS. This
is because, of all governmental agencies, the extension service is the only one reaching
down to the village level, so messages, as well as material goods, have to pass through ex-
tension if they are to get to farmers. In other words, the essence of the extension service is
to facilitate the interplay and nurture the synergies within the AKS involving agricultural
research, agricultural education, a vast group of complex information and input providing
systems, and farmers and their organisations (NEUCHATEL GROUP 1999). In Tigray, the
BoARD organises, regulates and systematizes the extension service through its Division
of Agricultural Development. Within each department of the Division, subject matter spe-
cialists (SMSs) are designated as the main conveyors of knowledge and information and
as the crucial linkage groups between research and the extension service.

5.6 Mapping the Agricultural Knowledge System and the in-
ter-organisational field in Tigray

In order to achieve the full benefits from limited resources and maximise the best talents,
irrespective of organisational patterns, coordination and cooperation in the use of avail-
able resources is necessary. This section looks at the inter-organisational field by provid-
ing a general picture of the AKS and the institutional coordination and collaboration situa-
tion in Tigray within an on-going process. Having assessed this situation, the section pro-
cceeds to examine the potential benefits and limits of REACs in improving the situation
and draws critical preconditions and success factors necessary for achieving effective in-
stitutional coordination and collaboration.

5.6.1 Mapping the Agricultural Knowledge System

Mapping an AKS shows how a given AKS is organised, the directions and character of
the links between actors, the strength of the links, and the topics of the knowledge which
is exchanged (BLUM 1997). Before assessing the institutional coordination and linkage
situation in Tigray, it was necessary to look at the general picture of the AKS, featuring
its recent developments, the overall setting, and the linkages among its key actors. The
AKS map was drawn based on the preliminary analysis of the overall situation and was
subsequently improved in the course of the study.

Figure 5.3 shows the general picture of the AKS in the Tigray region. In the figure, vari-
ous actors formed sub-systems, each one performing more or less specified and often
overlapping functions. The lines show the relative strength of contacts, and the arrows the
direction of information flow. Double arrows are used to simplify the diagram, but flows
of information are not equally strong in both directions. Broken lines indicate a weak
component of the AKS. The map of the AKS depicts the most important players relevant
to agriculture and rural development along the knowledge generation-exchange-utilisation
continuum, but it by no means gives a complete picture of the system nor shows its actual
performance or effectiveness.
Figure 5.3: The Agricultural Knowledge System in Tigray
In the study areas, the AKS map was presented to groups of farmers to identify who they thought were the relevant sources of information and to investigate if there had been any introduction of improved technologies. Farmers were asked to identify contacts with the AKS institutions and describe the nature and usefulness of these contacts.

Before discussing the AKS map, information flows in the community were identified without the bias which could arise from discussing contacts with the AKS institutions. In Debre Birhan tabia, group discussions were held on changes in the community, and where the ideas for the changes come from. The discussions explored information flows both in and out of the community, between relatives in different villages and from the staff of the extension service and NGOs, and showed that other farmers and development agents were the main sources of information in the community.

**Table 5.5: Information sources of farmers in Debre Birhan tabia**

<table>
<thead>
<tr>
<th>Within community</th>
<th>Outside community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal observation, experience</td>
<td>Development agents, researchers, NGOs</td>
</tr>
<tr>
<td>Development cadres, model farmers</td>
<td>Teachers</td>
</tr>
<tr>
<td>Friends, relatives</td>
<td>Trainers (GOs, NGOs)</td>
</tr>
<tr>
<td>Local leaders, meetings</td>
<td>Exchange visits</td>
</tr>
<tr>
<td>School children</td>
<td>Traders, investors</td>
</tr>
<tr>
<td>Innovative farmers</td>
<td>Neighbouring communities</td>
</tr>
<tr>
<td></td>
<td>Travels to relatives</td>
</tr>
<tr>
<td></td>
<td>Radio, newspaper</td>
</tr>
</tbody>
</table>

### 5.6.2 Institutional coordination and linkage

Effective institutional coordination mechanisms provide a common framework in which all actors can operate. In Ethiopia, a lack of coordination at all levels limited the effectiveness of services in the agricultural sector. In practice, linkages between institutions involve occasional invitations to meetings, reviews, seminars and the exchange of reports rather than going into the arena of supporting knowledge processes in the broader sense (TESFAYE 1999). All too often consultations are isolated events and convened hastily, running through issues of substantive matter. Linkages are given inadequate attention in project planning and are usually considered when uncoordinated work creates problems. Such a lack of linkage and information flow between actors resulted in the replication of efforts, waste of resources, and unproductive rivalry between different actors.

To address this problem, the BoARD and its woreda offices serve as system oversight bodies, coordinating and integrating the activities of various sectors and improving their performance. Successful coordination emerges when most of the institutions see themselves and others as moving in the same direction, working for similar interests and shar-
ing the same meanings about the issues at hand. However, in Ethiopia, most sectors have organisational approaches and staff that have no orientation towards coordination and collaboration. The communication gap between research and other development agencies is wide due to institutional interests and lack of coordinating mechanisms. Most institutions focused on their mandated activities and did not see the necessity for collaboration. This means that various actors did not view themselves as an interconnected whole in the AKS.

How different actors see one another's roles and functions and their perception of the importance of collaboration is essential if institutional arrangements are to be established to strengthen linkages between different actors. As discussed in Section 2.2.2, effective links among various actors cannot be established without prior communication that establishes agendas, ground rules, appropriate media, and an understanding of internal processes and contextual factors (RÖLING 1990; HAVELock 1986a).

In this respect, as elsewhere in the country, the institutional coordination and linkage development in Tigray generally leaves much to be desired. This is exemplified with reference to the Operational Research and Capacity Building for Food Security and Sustainable Livelihoods program which was launched to develop capacity for a more farmer-centred participatory approach to agricultural research and extension in Tigray. The programme is implemented by a consortium, centred in Mekelle, and by farm households in two watersheds, Begasheka in Kola Temben woreda and Debre Kidan in Hawzen woreda. Members of the consortium include the Mekelle University, the Tigray Agricultural Research Institute (TARI) and its centres, the BoARD at regional, woreda and tabia levels, the Food Security Coordination Office, and the Relief Society of Tigray (REST). The Mekelle University is the leading member of the consortium and, as such, its guiding institution. The BoARD provides the day-to-day interface between research and farmers through its subject matter specialists and development agents.

Although efforts were made to analyse the interest and the potential of collaborating institutions and to develop a common understanding on the definition of program goals and activities, communication among the consortium members was weak, leading to misunderstandings about the ownership of resources, unhealthy relationships, and a lack of joint ownership of the program. Meetings of consortium member institutions were called when specific issues required attention. The TARI did not seem to feel that they participated equally and were not positive towards the mode of program implementation, leading to a lack of commitment and a failure to play assigned roles, as illustrated in the awareness-creation workshop held in May 2004 for all consortium members. Participating experts from the TARI explained: ‘When technical teams are formed, appropriate personnel are not assigned, and also their responsibility is not recognised as part of their regular duty. It is rather viewed as an add-on responsibility’. This seems to be a major disincentive factor for participating experts to continue contributing to the joint activities, but one which could easily be improved by better communication between the consortium members.

The coordinating institution lacked dynamism to keep the consortium member institutions actively involved. Consortium meetings involved only headquarter institutions, and woreda and tabia level members were not involved in meetings. This neglect of the dynamics at the lower level worked against the existence of a strong collaboration and in-
formation exchange. The program was executed through the structure of the BoARD, development agents being the main interface between the program and farmers. At present, the motivation for development agents to get involved in the program seems to be the expectation of incentives, and when this is no longer the case, it could be difficult to sustain their involvement or gain their continued support.

5.6.3 Benefits and limits of Research-Extension Advisory Councils as platforms to improving institutional coordination and linkage

Ethiopia is gradually moving towards an integrated Agricultural Knowledge and Information System. Efforts are being made to establish mechanisms that emphasize the integration and coherence of policy formulation, planning and decision-making. Following an integrated approach is key to the agricultural and rural development policy, which involves integration and coordination within the components of the agricultural sector and with other sectors such as education, health, road, industry and finance (FDRE 2001). The agricultural sector cannot be effective alone without closer cooperation from other sectors. Integrating and coordinating different sectors requires the identification of an enabling environment that one creates for the other and devising mechanisms to exploit favourable conditions. Coordination also involves identifying activities that should be carried out simultaneously and devising ways they can reinforce each other. This needs an overall system management or a coordinating platform to coordinate the timing and interaction of key actors, mediate conflicting interests and align routine procedures, making adjustments as they appear necessary on the basis of newly occurring problems and needs.

Two options exist for enhancing system coherence and synergy. The first is to establish a coordination committee that brings together and coordinates the activities of various institutions. However, without an explicit policy framework and oversight body, this option can be ineffective, making the task a part-time activity. The second option is to establish an institution responsible for overseeing and coordinating various efforts based on a uniform strategy and program. This requires formulating an AKS policy and strategic plan and establishing AKS units within key organisations to coordinate, foster collaboration, and evaluate system performance. Presently, the BoARD and its woreda offices are mandated to promote integration and coordination of development efforts, with REACs serving as system oversight bodies both at regional and woreda levels. The regional REAC is the highest responsible body for the overall policy guidelines with regard to research and extension program coordination and linkage arrangements with the private sector and support services.

The participation of local people is key to implementing the agricultural and rural development policy. This makes the primary function of REACs to create dialogue between local people and researchers in setting research agendas and priorities. The local importance of research priorities and the likelihood of adopting research results should be the most important consideration in the prioritisation of competing research proposals. REACs are crucial to create effective interactions and communication between different actors (Figure 5.3). However, like their predecessors (see Section 4.6.4), REACs are perceived as inefficient bodies, which limits their effectiveness from the start. Most woreda offices of
Agriculture and Rural Development demonstrated a weak coordination capacity, and in some woredas, heads of Agriculture and Rural Development offices were not agricultural professionals. In that case, woreda REACs were chaired by heads of woreda Agriculture and Rural Development offices, and this limited their effectiveness, given the existing implementation capacity limitation at the local level.

**Figure 5.3: Research-Extension Advisory Councils as platforms for institutional coordination and collaboration**

Representation and participation was another problem since the advisory councils consist of members drawn mainly from those involved directly with research and extension. The mass media and support systems were not actively represented in the advisory councils. The mass media can play a very significant role, and its input can help development agents establish farmer discussion groups. The village is the most appropriate to discuss information needs, as well as information disseminated by radio programs, facilitated by development agents and model farmers. This will have a significant contribution to improving the extension coverage and the dissemination of technologies by farmers themselves.

Advisory councils can offer many advantages. Higher agricultural output is possible when agricultural research and extension are responsive to farmers’ production problems, and this can be achieved through farmers’ participation in research and extension. REACs can give farmers a chance to participate in problem identification and decision making and to discuss their problems directly with researchers, input providers and marketing agencies. This, in turn, can increase the responsiveness and credibility of research and extension programs, thereby increasing their reputation and improving the working relationship between farmers and development agents, giving them more confidence in demonstrating
proven technologies to farmers. More importantly, REACs can serve as a policy advisory body or a coordinating platform, an important vehicle for information exchange and setting research and extension priorities. However, the advisory councils have demonstrated weaknesses that could restrain their effectiveness. In reality, REACs have limited power and means for exerting influence on the research and extension priority setting mechanisms. They are simply perceived as structures to endorse and give legitimacy to research and extension programs. Meetings were infrequent and decisions rarely adopted. Further, the influence of farmers on research and extension is weak, and their input into decision-making is rather rhetorical. Though farmers are represented in REACs, they have no leverage or means to ensure that their views are heard. Also farmer cooperatives do not view influencing research and extension priorities as an important organizational goal, and thus technology is not in their institutional objectives. They also have a limited organizational and negotiating capacity for influencing agricultural service providers and demanding services effectively.

There is a great need to establish an AKS unit within the BoARD with a responsibility for ensuring coordination among AKS institutions and instituting credible systems for monitoring and evaluating institutional coordination and system performance. REACs should be empowered to play a crucial role in the allocation of budgetary resources and in the evaluation of research and extension endeavours. They should be autonomous with defined power and authority and should be adequately funded in order to plan and execute linkage activities effectively. They should be dedicated to creating and facilitating linkages between research, education and extension, as well as between the private sector, farmers, and their organisations. Their membership should include all the relevant and competent stakeholders with a strong commitment for collaboration. Particularly, support from policy making bodies is crucial for REACs to play a meaningful role in overseeing and coordinating various institutions involved in agricultural and rural development.

5.6.4 Preconditions and success factors for effective institutional coordination and collaboration

As discussed in the previous section, coordinating and integrating agricultural and rural development efforts at all levels is necessary, but one which is often more easily said than done. Evolving effective inter-institutional relationships and linkages requires the necessary preconditions and success factors. OJHA and MORIN (2001) summarized these vital ingredients of success as continuous dialogue, resource sharing, local-based partners, support from leaders, flexibility, and active involvement of all partners. ETLING and MCGIRR (2005) also identified the characteristics, pitfalls and the cross-cultural dimension of partnerships. This section elaborates upon the guiding characteristics of effective partnerships and provides practical tips to improve the institutional linkage situation in the Tigray region, as well as in the country.

Enabling policy environment

The existence of a knowledge policy and a strategic plan is a primary condition for promoting institutional coordination and cooperation among various actors. It provides a rea-
son to work together for common goals. Joint planning is an important means of promoting cooperation, coordination and collaboration among AKS institutions and is a necessary step towards creating effective linkages (Rivera et al. 2005). The Rural Development Policies, Strategies and Instruments (FDRE 2001) highlights the need to promote strategic sectoral alignment where each sector would agree jointly on a set of priorities toward which each would then set out to achieve them in coordination with the other sectors. However, this requires the adoption of a specific policy and strategic plan that would provide a legal and operational framework for institutional cooperation. This could be achieved through mandating institutional cooperation and joint planning among the public sector, and between the private sector and providing inter-organisational support through strategic planning and supervision mechanisms.

**Participatory, demand-driven orientation**

User-orientation and demand responsiveness are necessary conditions for effective institutional collaboration. Farmers should be able to demand services effectively and exert pressure on service providers for local relevance. They should be involved in priority setting and evaluation of research and extension programs by working through and strengthening their organisations (Rivera et al. 2005). However, this requires a conducive socio-political climate and the adoption of policies that encourage impact-orientation and the participation of farmers and their organisations in the design, implementation and evaluation of research and extension programs.

**Initial communication**

Effective institutional cooperation starts informally and develops through time. Informal contacts are needed to develop mutual understanding and trust through workshops, continuous meetings and joint activities. Awareness, consensus and commitment are of the utmost importance for successful cooperation. Continuous communication is necessary to build and maintain trust and proximity among actors (Bennell 1990). Feelings and attitudes of trust, mutual respect, empathy and understanding underpin strong and healthy relationships (Röling 1990). Organisations are not just a formal structure, but since they consist of people, they are a social system as well (Albrecht et al. 1989, 201). In addition to planned formal relations, there are informal relations, and it is these informal relations that form the foundation for formal inter-institutional relations. Collaboration will be easier with better communication, which is improved through regular discussion of work, frequent contact between people with responsibility, reducing rivalry, mutual help when there is a high workload or difficulties occur, and by exchanging reports (Albrecht et al. 1989, 184). Time is needed to allow informal links to mature and to create a conducive environment for achieving a common understanding of the vision, philosophy and strategy of institutional collaboration.

**Clear and shared objectives**

The perception and consensus of a common goal is the cornerstone of institutional collaboration. Negotiating goals and strategies is essential to joint action. Negotiating goals requires that each stakeholder group appreciates each other’s potential and has the capacity to express and defend its own position: ‘If only the actors in an AKIS would begin to
see themselves and other actors as playing complementary roles, many AKIS would auto-improve' (ROLING 1990,14). It is important to make a careful assessment and optimal mixing of resources and activities and have a clear understanding of the costs among stakeholders (RIVERA et al. 2005). Strategic agreements on working procedures and protocols, meetings, information exchange, resource sharing and joint tasks must be documented and signed by the heads of the concerned institutions. Depending on their common purpose, actors should be free to decide on how they want to work, what they want to do, how often to meet, which resources to use, and how to exchange ideas.

**Defining roles and responsibilities**

Effective institutional cooperation is established and maintained through self-regulating mutual exchange and negotiation involving clear definitions of roles and responsibilities. Where the roles and interests of partners is not clear, sooner or later conflicts of interest and questions of legitimacy will arise. There must be careful matching between the comparative advantages of partners and the functions they perform. Once consensus is reached on joint goals, activities suited for each partner’s resources and capabilities must be identified and assigned. However, it is not wise to assume that, simply by dividing responsibilities, the partners would be able to play their assigned roles effectively. Thus, readiness and competence in managing interactive institutional relationships are also important.

**Appropriation of benefits and recognition**

Formulation of a common goal is a necessary but not a sufficient condition for a productive institutional cooperation. It requires several incentives that are necessary to make cooperation operational. Contacts are usually better initially but gradually fade due to the problems of resource sharing and different institutional interests. Voluntary cooperation between different partners can only be possible when the partners perceive an advantage or benefit from that cooperation. This provides an important information on the behaviour of partners in cooperation. Therefore, in the process of building cooperation, it is important that there are mutual gains and no losers, although this may not be really feasible. Having clear expectations right from the start is critical to have a win-win situation, and perceived benefits must outweigh risks.

**Procedure for evaluating process and impact**

Monitoring and evaluation (M&E) are crucial to drawing conclusions about the effectiveness of collaborative programs. It is important to initiate M&E on a regular basis and through a formal process to analyse experiences, draw lessons and share results through reports, reviews and workshops. Each partner institution needs to develop an evaluation culture (openness to self-evaluation and readiness to learn from evaluation) and evaluation capacity to improve data quality. Creative ways of developing a M&E framework, allowing for flexibility to accommodate the various interests of partners, should be developed. More specifically, strategies and guidelines for evaluation should be developed and understood by each partner institution in order to generate consistent and quality data. Partners should determine what indicators they want to measure and develop a system for collecting information. Besides self-evaluation by each partner, an overseeing body
should be established to plan, execute and use information from evaluation. It is also im-
portant that managers value and use evaluation information to assess progress toward col-
laborative goals.

Leadership commitment

Leadership is vital to improving the process of institutional collaboration. Trust, a mutual un-
derstanding of, and respect for each other’s strengths and weaknesses are key for a healthy institutional relationship. Strong support from top leaders facilitates the promotion of partnerships by those who implement joint activities. Leaders must provide support for technical teams through acknowledging their responsibility and instituting appropriate incentive system. Flexibility is important, and time is needed to learn from experience. Building collaboration is an evolutionary process, and thus partners should be encouraged and supported to learn over time through experience.

5.7 Concluding remarks

The analysis of the biographical interviews revealed that there is little interface between local and formal knowledge systems. The extension program must be founded on situa-
tion analysis of which local knowledge is particularly important in improving the produc-
tivity and stability of existing systems. The extension program should be designed, im-
plemented and evaluated with regard to the knowledge and experience already held by lo-
cal communities. It is when extension assesses farmers’ conditions realistically that it can help them adjust to rapidly changing environmental, production and marketing conditions.

Although farmers may be interested in the elements of technology packages, they rarely adopt whole packages in the form in which they are introduced. While this perspective is rapidly becoming the known, the actual practice tends to lag behind the rhetoric.

Most farmers seem to be willing to use improved technology packages and take realistic opportunities, but they lack the requisite resources and services to adopt improved inputs and practices. The institutional arrangements for credit, input supply and output marketing do not provide adequate incentives for farmers to continue using improved inputs. Although there has been significant effort in increasing agricultural production and productivity by diffusing fertilisers and improved seeds, the extension program has ignored the role of market literacy and market information services. Thus, the limited access and capacity of farmers to internalise the returns from the utilisation of improved agricultural technologies is one of the basic factors contributing to the low level of technological utili-
sation.
6 Agricultural Research, Education and Training in Tigray

6.1 Introduction

Chapter 5 dealt with the extension service, the institutional and human capacity constraints surrounding it, and its recent developments. This chapter deals with the role of educational institutions in improving the human capacity of the extension service. The aim of the chapter is to show the potential synergy that can be gained from close collaboration between agricultural education, research and extension. The rest of the chapter is organised as follows. Section 6.2 presents an overview of the research system in Tigray. The role of Mekelle University in the AKS of Tigray is discussed in Section 6.3. Section 6.4 focuses on the organisation and functions of the ATVET program and the FTCs, highlighting their innovative features and developments. Section 6.5 closes the chapter with concluding remarks.

6.2 Agricultural research

Agricultural extension cannot properly function without a continuous flow of appropriate technology and an effective link to research. Agricultural research is a powerful means to combat agricultural problems and increase agricultural production and productivity, because it identifies new opportunities and develops the knowledge base required for agricultural development. But this occurs when the capacity of research institutions to access and generate knowledge is strengthened, and when their endeavours are coordinated to avoid duplications and conflicting objectives and to utilize scarce resources more efficiently. This is why the IAR has been reorganized as the Ethiopian Agricultural Research Organization (EARO, now EIAR)\(^{23}\), which formulates research policies, coordinates research programs, and organises high-level training in the country. Following the reorganization of the IAR, the Mekelle Research Center (MRC) has been reorganized as the Tigray Agricultural Research Institute (TARI). The TARI is run by the Government of the Tigray Regional State and cooperates on joint research projects with the EIAR on research problems of major agro-ecological and national significance. It is set up with four directorates to oversee its activities and operates through newly established research centers in different agro-ecological zones to conduct situation specific adaptive research\(^{24}\) and contribute to a technical knowledge base to support the agro-ecology based agricultural development strategy of the region. The research centers are supposed to take agro-ecological and client-oriented approaches and deal with agro-ecologically specific problems to adapt new technologies to local needs and circumstances.

\(^{23}\) The EARO is re-named as the Ethiopian Institute of Agricultural Research (EIAR).

\(^{24}\) The research centers of TARI are Mekelle, Abergelle, Axum, Alamata, Maytsebri, and Humera. Seven agro-ecological zones are recognised in Tigray to design adaptive research to adjust new technology to a specific set of environmental conditions.
Because of its high resource requirement and the need for immediate solutions to farming problems, basic research is not a national priority in Ethiopia (FDRE 2001). As mentioned in Section 4.6.3, it is believed that technologies are available ‘on the shelf’, but their utilisation is limited by a lack of adaptation to local conditions. As a result, the research system focuses on a careful search for technologies, materials and practices, testing them for their usefulness locally and modifying them based on local conditions for promotion by the extension service. When a policy decision is located at the knowledge production level, there will generally be little knowledge about concrete production functions at the practice level. The closer one gets to the practice level, the more important feedback becomes as a control mechanism and identifier of areas needing scientific inquiry. On the other hand, when a policy decision is located at the knowledge application level, research results coming from basic and applied research may be of little operational value at the practice level. Thus, a certain level of freedom of choice is necessary in order to ensure creativity in the advancement and application of science (NAGEL 1980,40).

MOSHER (1966,80) advises that technologies introduced from outside must always be carefully tested locally before being recommended to farmers. However, this is more easily said than done. In reality, researchers blame development agencies for introducing materials which are not locally tested, whereas development agencies blame the research system for its inability to provide proven technologies.

Modifying new technologies to make them locally useful and acceptable requires adequate resources, local capacities and close collaboration. Qualified and competent leadership is vital for an effective management of agricultural research. This leadership includes ‘the ability to combine a reasonable amount of freedom for individual staff members and focus on high priority problems with mutual professional stimulation between staff scientists of varied specialities and with frequent contact with farmers and extension workers’ (MOSHER 1966,86). Moreover, appropriate polices and strategies will not be effectively implemented without adequate budget and resources. The recently decentralised research centers are poorly organised in facilities and human resources and have poor linkages with the extension service. There is no point in establishing research centers unless they can be adequately financed, giving their researchers adequate budget and good working equipment. To improve this situation, the TARI has established collaborative programs with the Mekelle University to transfer capacities from the university to its research centers in terms of joint research projects. The staff of TARI also teach and supervise students at Mekelle University in their fields of specialisation. Moreover, the university envisages to establish trial centers to transform research results into usable extension messages in close collaboration with the TARI and the BoARD.

6.3 Agricultural education

The Government of Ethiopia clearly understands that education is key in fostering social and economic development and is committing enormous efforts to reform the education system and expand higher education in light of its contribution to capacity building and development. Higher education development is an integral part of the overall development framework, and various policies, strategies and legislations have been developed.
based on the Government's vision to transform the economy, reduce poverty, and improve the livelihood of the population (MoE 1997; FDRE 2003). With the expansion of higher education, agricultural education is now offered in most higher educational institutions. At present, there are eight public universities and several public and private colleges, and the construction of twelve more public universities is planned in the near future. This expansion of higher education is important in creating the intellectual and institutional capacity to build and maintain an effective and viable AKS, which requires a ready supply of adequately trained and motivated workforce. Thus, agricultural education occupies a key position in the AKS and is central to the building of the capacity for the production, adaptation, dissemination, and utilisation of knowledge.

In the following section, the role of Mekelle University in the AKS of Tigray will be discussed, and the arguments here may be generalised for any higher education institution in Ethiopia.

6.3.1 Teaching, research and extension at Mekelle University

Earlier models of the AKS emphasized research, extension and farmers as the core components of the system. Today many more important actors are recognized as playing a major role in the AKS. For example, agricultural education is increasingly integrated into the AKS and holds a central position in the system, being responsible for producing the necessary experts who would work in the AKS institutions. In many developing countries, agricultural universities are becoming central parts of the AKS, playing an integrated role of education, research and extension. In Ethiopia, the *Capacity Building Strategy and Programs* document (FDRE 2002) identifies educational and training institutions, research institutes, and consulting firms as key instruments for achieving rapid socio-economic development. The new education and training policy is a key aspect of the ADLI strategy, and the expansion of higher education is one of its declared objectives.

Establishment and development of Mekelle University

The Mekelle University was established in May 2000 by the Government of Ethiopia as an autonomous higher education institution having its own legal personality (FDRE 1999). The merger of the two former colleges created the Mekelle University: Mekelle Business College and Mekelle University College.

The Mekelle Business College was first established as a School of Economics in 1987 by the TPLF in one of the liberated areas of Tigray, Dejen in western Tigray. The main objective of the school was to train middle-level experts who would assume the financial and administrative responsibilities of the public in the liberated areas during the armed struggle. After the fall of the Derg regime, the school made training needs assessment and revised its curriculum. In 1991, the school was upgraded to a college level offering diploma programs and was re-named the Mekelle Business College, marking the establishment of the first higher education institution in Tigray. The college received a full accreditation by the Ministry of Education after one year of its establishment at the then political training center of the Derg regime.
In 1993, the College of Dryland Agriculture and Natural Resources was established in Mekelle after facing a series of relocations. During the Derg regime, the idea was to establish a College of Arid Zone Agriculture in Seleklaka, north-western Tigray. However, for many reasons, it was first established at Asmara University as a faculty and then moved to Agarfa in southern Ethiopia when the Derg displaced Asmara University in 1990 due to political instability. In 1991, the faculty moved temporarily to Alemaya University. Finally, in 1993 the College of Arid Zone Agriculture was again relocated to Mekelle as a College of Dryland Agriculture and Natural Resources, established at Endayesus, which had been a military barrack since the time of Emperor Menelik (MEKELLE UNIVERSITY 2003).

With few personnel and limited facilities, the college began its teaching activities in the 1993/94 academic year. During this period, there was no adequate facility for students and academic staff. In such a situation, the academic staff was engaged in every activity that had been necessary to allow the teaching-learning activity to go smoothly. The college started with three major departments and a Division of Natural and Social Sciences, which supported the major departments. First year students were admitted to the Division and attended basic education with a good balance between physical, biological and social sciences. Upon successful completion of the first year, students are placed by the Selection and Placement Committee to the three major departments, based on their choice and gender. After two years, a new Faculty of Science and Technology was established at the same campus, and the college was then upgraded to a university college. Since then, the two colleges have worked together to create a full fledged university, which was materialised in May 2000.

The university has three campuses (Endayesus, Adi Haki and Ayder) and an outreach campus in Adigrat, 90 km from Mekelle. The site of the main campus is Endayesus, where the College of Dryland Agriculture and Natural Resources was founded. The university is at a fast rate of expansion in program coverage, physical infrastructure, and student population. At present, the university consists of the following sub-units:

- Faculty of Dryland Agriculture and Natural Resources;
- Faculty of Science and Technology;
- Faculty of Education;
- Faculty of Business and Economics;
- Faculty of Law;
- Faculty of Veterinary Sciences;
- College of Health Sciences;
- Institute of Distance Education;
- Micro-Finance Program;
- School of Post-graduate Studies; and
- Institute of Paleo-environment, Human Evolution and Cultural Anthropology.
The post-graduate program is coordinated on an inter-departmental basis, and curricula are discussed on a university basis, but the responsibility of curriculum development and program implementation lies in the respective departments offering graduate programs.

**Objectives and vision of Mekelle University**

The Council of Ministers Regulations No. 61/1999 has laid down the following as the strategic objectives of the Mekelle University:

- To cultivate, expand and transmit knowledge.
- To provide education that fully develops the personality and strengthens the respect for human dignity, on the basis of mutual respect, trust, mutual understanding and tolerance, and free from ethnic, nationality, gender, religious or other prejudices.
- To inculcate the dignity of work and dedication for the well being of the society.
- To produce competent persons imbued with a sense of social purpose and trained in science and technology, arts and various professions to enhance the socio-economic development of the Ethiopian people.
- To conduct research and studies in different fields in order to solve society’s problems and disseminate the fruitful results thereof.
- To provide professional service at the regional and national level to accelerate social and economic development.
- To provide training and consultancy services for service fee.

To achieve its teaching, research and community service objectives, the university has formulated a 20-years strategic plan with a vision ‘to be one of the leading higher institutions of teaching and learning in Ethiopia and to continually improve the reliability and quality of education, research and consultancy services to meet the needs of the country and the society at large’ (MEKELLE UNIVERSITY 2003). The strategic plan provides an overall framework and a guide to change and knowledge management within the university.

**Teaching at Mekelle University**

Within the framework of the ADLI strategy, the Government of Ethiopia is making tremendous effort in civil service reform and capacity building, and higher education is undergoing a major reform to meet the strategic objectives of the country. To be able to contribute to those objectives, Mekelle University puts emphasis to capacity building for its workforce. Staff development is a priority of the university to maintain the quality of its programs and services to society. A pedagogical resource center has been set up in the university to encourage instructional innovations and train junior staff in student-centered teaching methods and preparation of teaching packages.

Students are placed into different faculties and departments based on their choice, academic performance and gender. The university has adopted an affirmative action policy to correct the legacy of societal discrimination against specific sub-groups. For example, female students get priority to join their departments of choice and receive support to de-
velop their potential and creativity to combat academic and socio-cultural challenges during their study at the university (MAMUSA and MITIKU 2003). The number of years studied is different for different faculties, ranging from 3-5 years. There are also differences between the various faculties and departments with regard to the plan of studies and the requirements for graduation. In the Faculty of Dryland Agriculture and Natural Resources (FDANR), students are taught for 3 years in a two-semester system. The courses are distributed based on supportive and major courses with a good balance between basic and agricultural sciences. However, little attention is given to social sciences, which suffer from continuous mergers and reductions in credit hours. At the end of the second year, students undertake a three-month practical education. A total of 114 credit hours is required to graduate in the 3-year B.Sc. program in agricultural sciences.

The FDANR is the oldest and largest body of the university. It houses experienced academic staff and is more research-oriented. To carry out its teaching, research and extension activities, the faculty is organised in five departments:

- Dryland Crop and Horticulture Sciences;
- Land Resources Management and Environmental Protection;
- Animal, Wildlife and Range Ecology;
- Natural Resource Economics and Management; and
- Cooperative Education.

The strategic plan of the university expects a rapid expansion of the number of students over the next 20 years. To respond to this trend, the faculty is increasing its departments and revising its existing programs to open new streams and offer students a wide opportunity to specialize in different fields of study that correspond to the labour market needs. Further, the faculty has established relations with overseas universities, which enabled it to build the capacity of its staff and teaching facilities. The teaching and research capacity of the staff has been upgraded through various training workshops and overseas education.

Research and extension at Mekelle University

Research is of strategic importance at Mekelle University as reflected in its mission to create, disseminate and utilize knowledge (MEKELLE UNIVERSITY 2003). The academic staff is required to use 75% of their time on teaching and the remaining 25% on research and extension activities designated to solve social problems, supplement teaching programs, and promote their own professional development. However, there is a variation between faculties in research-orientation and the ability to have time for research. The newly established faculties have less-developed scholastic tradition with high teaching loads and limited experienced staff. The university devotes enormous effort to addressing this disparity through collaborative research programs to develop the research and teaching capacities of newly established faculties and colleges.

Engagement in society enhances the development effect of the university. The community service function of the university includes continuing education programs, consultancy
services, student placements, development projects, and knowledge dissemination through publications, training workshops and symposia. However, as the following sections show, the extension role of the university is diffuse, and there is no unit responsible for its organisation, unlike the teaching and research functions.

The Research and Publications Office: a crucial knowledge management center

The Research and Publications Office (RPO) is a crucial knowledge management center of the Mekelle University. The office gathers knowledge from various projects and units of the university and processes and disseminates this knowledge through publications and the mass media. Knowledge transformation and dissemination is as important a function as knowledge generation. Knowledge processed and presented in a useable form is useful to improve the teaching process in terms of teaching materials and texts and the development process in terms of extension messages and input into policy advice.

An exemplary work is the extension manual of the Zala-Daget project of Mekelle University (ZALA-DAGET PROJECT 2004). The project synthesized its research findings on soil erosion and water and soil conservation in the Tigray region and prepared an extension manual, which is intended for use by development agents, subject matter specialists, students of agriculture, and researchers dealing with natural resources. Similarly, the Indigenous Soil and Water Conservation (ISWC) project and the Dryland Husbandry Project (DHP) published newsletters and manuals and disseminated knowledge through training workshops, exchange visits and the mass media. However, as these examples demonstrated, knowledge transformation and dissemination is project based, and thus not a well-articulated function of the university.

Extension: a weak link at Mekelle University

The development effect of the university will be enhanced when its education, research and community service functions are developing organically and have a common purpose. Research is a mandatory duty of academic staff and an integral part of academic study for students. The strategic plan of the university sets out to ‘promote research collaboration with local, national and international organizations’ (MEKELLE UNIVERSITY 2003). However, the actual place of extension is not clearly stated in the research guidelines and policies of the university. As illustrated in Figure 6.1, there is an evident lack of synergy between research and extension, and less emphasis is given to extension in operational terms. For example, the organisational structure of research at the university does not incorporate the PAP which provides a crucial link between education, research and extension within the university, as well as between the university and research and extension organisations. This internal and external connectivity is vital in enhancing the development effect of the university. However, little attention has been given to the actual transformation, dissemination and utilization of research results, even more overlooked at the present situation where there is no department of extension education.

A research undertaking that ends in a publication is less useful, if not useless at all, and needs to be translated into knowledge that can be further developed to improve agricultural production and solve societal problems. There is a gap between the mass of knowledge accumulated at the university from its research and development projects and the
degree of utilisation of this knowledge for extension and teaching purposes. The strategic plan of the university has already identified this gap in knowledge transformation and utilization: ‘Though different types of research have been done at Mekelle University, there is poor utilization of available methods of disseminating research results’ (MEKELLE UNIVERSITY 2003).

**Figure 6.1:** Organizational structure of research at Mekelle University

![Organizational structure of research at Mekelle University](chart)

Source: RESEARCH and PUBLICATIONS OFFICE (2004)

The mass of knowledge generated through consultancy services, practical attachment programs, and research and development projects has not been efficiently transformed and packaged into usable forms for use as input into education, extension and policy advice. While information has been available in documents and databases, there have been inadequate process documentation and synthesising of results and experiences from research and development projects and less effort to transform and disseminate usable knowledge. Thus, there is a great need to strengthen the extension function of the university by adopting an integrated approach to teaching, research and extension and clearly defining it in the policies of the university and in the responsibilities of faculty members.

**Incentive and reward system**

Improving the knowledge environment requires the adoption of an effective academic reward structure for teaching, research and community service. A high level of motivation, as well as staff qualification and communicational infrastructure, is a crucial factor influencing the process of knowledge generation, transformation and utilisation both within the university and between the university and research and extension organisations. An appropriate incentive system is key to developing staff research orientation and knowledge sharing culture. This requires adopting evaluation criteria and procedures for staff
development and promotion that provide holistic treatment to teaching, research and extension activities. Distortions in incentive systems can be detrimental to the behaviour and attitudinal norms of faculty members in performing their public services (GERBER 1994; MCDOWELL 2001; LADEBO 2003). At present, teaching effectiveness (assessed by students, peers and department heads) is the most important criterion for horizontal promotion, competing for scholarships or training opportunities, and even for awards of recognition for outstanding performance. This, however, provides less motivation for academic staff to engage more in research and extension activities. Similarly, vertical promotion is based on scientific publications in peer reviewed journals, and less value is given to community services and publications such as extension manuals and newsletters.

This type of promotion criteria does not provide strong incentives for academic staff to consider the utilisation of their research results. For most academic staff, the local relevance of their research and its communication to extension personnel and farmers is less important. They are rather primarily oriented to the scientific community for whom their scientific publications are produced and upon whom their professional credibility and development depend. While this is equally important, it is most urgent that academic staff are committed to the application of their research results. They should hold an ideology wanting to serve the farming community with orientation and commitment to seeing the usability of their research results.

However, this requires the adoption of policies and actions that encourage and reward the execution of research useful to society and the dissemination of its results. And this may involve changing the notion of research and publication, encompassing a broader understanding of learning as a process of knowledge creation and application, and including local relevance in the job description of academic staff and in the evaluation criteria for their promotion and scholarship awards. Moreover, the scientific community needs to recognize research works and award fellowships to researchers with research works relevant to farmers and extension personnel in developing countries.

**Unlike research, extension is not a well established function in higher education**

In Ethiopia, the research role of higher education is well established and recognized by the national agricultural research system. This is why Mekelle University adopted policies and guidelines establishing research as its legitimate activity and emphasizing research and publication objectives. However, its extension function is diffuse. This is rooted in the lack of an equally deep recognition of the extension role of higher education by the national extension system. Thus, despite the emphasis given to knowledge transfer and community services in its strategic plan through publications, library services and database management systems, Mekelle University has not given adequate attention to extension in practical terms.

With reference to the work of NAGEL (1980,56), in his analysis of the extension role of two Indian agricultural universities, the extension role of Mekelle University can be viewed in terms of defining its complementary and supplementary role. As a complementary role, the university may undertake such responsibilities by which the contribution and efforts of the public extension service and its staff may be enhanced, such as in-service
staff development, operationalisation of knowledge, preparation of extension materials, advising extension personnel, and producing technical materials for the mass media. Involving experienced extension advisors as guest teachers in training and supervision of students and cooperation between them and university staff in the preparation of extension materials is crucial to reduce the gap between theory and practice. As a supplementary role, the university can conduct research on extension needs and methods and on new ideas and knowledge which have yet to be tested. The university can test and develop approaches on a pilot basis to be later undertaken by the extension service.

However, this requires the establishment of an extension unit within the university that will create and facilitate linkages between its education, research and extension functions, as well as with the extension service. Alternatively, as Figure 6.2 proposes, the office of the Associate Vice President for Research and Post-graduate Programs may be restructured as the office of the Associate Vice President for Research and Extension as an important AKS unit overseeing, coordinating and evaluating the development and performance of research and extension at the university and its linkage with the extension service.

**Figure 6.2: Proposed organisational structure for Research and Extension at Mekelle University**
6.3.2 The Practical Attachment Program (PAP): linking agricultural education, research and extension

The education system of Ethiopia has been criticized for being too theoretical, having too little emphasis on practicum, and for not inspiring creativity and giving sufficient skills to students. This is a valid criticism as the function of education is not to cram students full of detailed knowledge to be used in later years. Learning how to learn and use knowledge is as important a concern of education as the knowledge itself. Since its establishment, the Mekelle University has been concerned about the quality of education. The university upholds the principle of practical education through introducing apprenticeship programs and community services to help students become critical thinkers and reflective practitioners. This type of education is widely referred to as ‘experiential learning’ (KOLB 1984), ‘double-loop learning’ (BROCKBANK and McGILL 1998; ARGYRIS and SCHON 1974), ‘knowledge-in-action’ (APPLEBEE 1996), ‘transformative learning’ (MEZIROW 1991), and ‘learning as a way of being’ (VAILL 1996).

History of the program

The strategic plan of the university emphasizes the infusion of the teaching and learning process with practical research results and cases from community services. The university articulates education and work through consulting various stakeholders about a set of knowledge, skills and attitudes which prospective graduates would need in the work environment in order to incorporate practical aspects of education in its curriculum. Based on input from stakeholders, the university designed a practical education program known as the Practical Attachment Program (PAP) and submitted a proposal to the Ministry of Education for funding the program. The ministry encouraged the university to solicit other sources of fund to pilot its innovative program. Accordingly, the university approached the Norwegian Embassy to solicit funds that would enable it to translate its program into a reality. With financial support from the Norwegian Government, the Mekelle University set out to implement its practical education program. The program was then evaluated by international experts whose feedback convinced the Ministry of Education to incorporate the program in the higher education system and provide funding for its implementation.

The organization of implementation of the program

The objectives of the PAP are to:

- Provide an opportunity for students to live and learn in rural areas.
- Help students gain first-hand experience with agricultural technology.
- Ensure that students appreciate the factors affecting the application of new knowledge.
- Develop communication skills.
- Help students develop a positive attitude towards the farming community.

The program enables students to gain a practical understanding of the realities of the farming community and to develop practical experience through exposure to research, development and extension activities in rural areas. Put another way, it socialises students
into the workforce for the future. The program was initially for six months but was reduced to four and then to three months as it was difficult to accommodate the four-year program of students (KIBWANA et al. 2001; MAMUSA and MITIKU 2003). The coordination office of the PAP organises the program in cooperation with the FDANR and its departments. The office develops implementation guidelines and forms to evaluate the performance of students and to get feedback from host organisations.

The key features of the program are the exit and re-entry workshops. The exit workshop is held before the field attachment to introduce students and host organizations to the objectives and requirements of the program. In this workshop, host organizations describe the context of their working area and present the Terms of Reference for students, which are then discussed and refined to accommodate the interests of both students and host organizations. Students also present their work plan and get feedback for improvement. Thus, the exit workshop is a vital forum for students, host organizations and faculty members to discuss common issues, develop a common understanding about the program, and express commitment to its successful implementation. Students clarify their expectations and become aware of the challenges in the field and get advice on how to approach different community groups and institutions.

Faculty members assist students in planning their fieldwork, visit them during the fieldwork, and guide them through writing and presenting their report after the fieldwork. Host supervisors are also identified to assist faculty members with the monitoring and supervision of students during the field attachment. However, the extent to which this is adequately performed varies depending on the availability and motivation of host resource persons. The method of field supervision that faculty members employ is group supervision where lecturers from the departments of the FDANR form a supervision team and visit students in the field. This system of supervision provides an opportunity for collective learning and enables the supervision team to assist students from different disciplinary perspectives as the team interacts with one another and sees field problems from different perspectives. During the field supervision, students present their work to the supervision team, reflect on their work experience and challenges, and discuss future plans and the organization of their report. Further, the supervision team meets with host institutions to discuss their observations. Upon completion of the field supervision, the team produces a report describing feedback from students and host institutions and making practical recommendations for future improvement of the program.

After the fieldwork, students write reports under the supervision of faculty members and give oral presentations about their findings and experiences at a re-entry workshop. Besides technical issues, supervisors assist students with report writing and oral presentation techniques. A Guide to Writing a Practical Attachment Report and Presentation at Re-entry Workshop (MAMUSHA 2000) has been prepared and provided for students to help them organise their reports and prepare for oral presentations. The re-entry workshop is attended by students, faculty members and host organizations. After the oral presentations, a general discussion is held on problems faced in the field, how students tried to address them, the quality of supervision, the duration of the program, and logistical matters. Representatives of host organizations highlight their observations, provide feedback and
suggestions for future improvement. More specifically, the re-entry workshop provides a unique opportunity for the university to interact with stakeholders and obtain their input into curriculum review and development. At the re-entry workshop, host organizations identify the weaknesses and strengths of students focusing on local development problems and make suggestions for curriculum review, emphasizing specific knowledge, skills and attitudes, thus contributing to keep the curriculum dynamic and relevant.

Problems and challenges facing the program

The researcher does not wish to leave his readers with the impression that all is golden with the program, which has gone through several learning cycles facing problems and challenges. Important problems, which are taken as opportunities for learning and communication, are faced before, during and after the attachment period. The main problem is the lack of continuity of experience in the organisation of the program due to the discontinuity in the coordination staff for abroad training. This makes it difficult to maintain the continuity of the knowledge and experience gained and the contacts established with host institutions.

Before the attachment, students are supposed to write proposal detailing their work plan and methodological approach based on the Terms of Reference, but this is usually done late, with haste and inadequate support from faculty members. This problem is exacerbated by the fact that host organizations send Terms of Reference late. This leaves little time for students to develop their proposal and work plan and consult their faculty advisors. Some Terms of Reference were general and did not reflect the educational objectives of students. This is because of the limited understanding of host organizations about the objectives of the program, which is again rooted in the discontinuity of the exit and re-entry workshops due to budgetary constraints. The rapidly growing number of students also poses the difficulty of getting adequate host organizations and providing adequate field supervision.

During the attachment, students lack team work, interdisciplinary interaction, and a holistic approach to field problems. Field supervision is late and inadequate to correct this problem and provide meaningful assistance to students. Moreover, students are supposed to submit monthly reports to their faculty advisors, detailing progress, constraints and assistance sought, but such reports are usually not critically seen by faculty advisors, and thus adequate feedback is not provided to students on time. In some cases, host organisations engage students in tasks which are not directly related to their educational objectives, such as distribution of fertilisers, improved seeds, and data collection. Host institutions provide inadequate follow up and technical support to students due to a shortage of staff and a lack of motivation. As a result, evaluation of student performance by host institutions is not usually serious and provides weak incentive for students to invest considerable time and energy during the fieldwork.

After the attachment, the main concern is the quality of reports. Most practical attachment reports have poor quality because of inadequate support from faculty advisors and the poor report writing background of students. Reports lack a standard format despite the preparation of a guideline on report writing, and there is no standard criteria or assessment
form for reports. This is mainly due to the incentive system of the university. Until recently, attachment student supervision has not been considered in staff promotion or reported as staff load. Thus, since the establishment of the program, a number of student reports have been produced, and yet there are no yearbooks on abstracts of practical attachment reports. Host organizations need to receive quality reports as input into their development programs, and the poor quality of reports may lead to their loss of commitment in supporting the program. More importantly, attachment student reports are useful input into defining researchable problems and priorities for the university.

To address some of these problems, the university is taking actions to strengthen its working relationships with the private sector and NGOs and to develop mechanisms to obtain feedback from host organisations. Making use of visiting instructors from NGOs and the private sector helped the university get more host institutions and field supervisors. Another advantage of this was that graduates had a higher possibility for entry into the job market. The university recognizes that social consensus and commitment are necessary for the continued success of the program and that more needs to be done to promote the importance of the program with regard to its long-term benefit of a better qualified employment pool. For example, the university acknowledges the contribution of host institutions and supervisors through certificates of participation in order to get their continued support for the program. Moreover, the university is exploring the possibility of placing students to their home village in groups in order to reduce budgetary constraints and the lack of adequate host organisations and to promote collective learning.

On the whole, the PAP is an important service to society and provides social continuity for the university, putting it in touch with rural communities and stakeholders. Students have learned the local realities and the importance of local knowledge and working with local people. In the exit workshops, they were skeptical about the program, but later on, attitudinal changes have been observed when they present their findings and reflections in the re-entry workshops. This critical awareness and self-reflection of students is an important learning achievement of the program. More importantly, students and host organizations are the primary evaluators of the relevance of the curriculum and the teaching and learning process. Host organizations and faculty discuss skills and orientations that prospective graduates would need in the workplace, and their comments and suggestions are incorporated into the curriculum review process. Looking outwardly, the Mekelle University makes efforts in disseminating its experiences within the higher education system, leading the Ministry of Education to decide to institutionalize the program into the higher education system and to support the program financially.

6.4 Agricultural Technical and Vocational Education and Training (ATVET) Program in Tigray

The existence of capacity building and backstopping institutions for farmers and development agents is crucial in order to accelerate agricultural and rural development. Development agents must have and continue to have opportunities to learn, develop new skills, and increase their specialized competence. Given the existing focus on market-oriented agriculture, the specialist knowledge of development agents is crucial. Thus, in-service
The post-graduate program is coordinated on an inter-departmental basis, and curricula are discussed on a university basis, but the responsibility of curriculum development and program implementation lies in the respective departments offering graduate programs.

Objectives and vision of Mekelle University

The Council of Ministers Regulations No. 61/1999 has laid down the following as the strategic objectives of the Mekelle University:

- To cultivate, expand and transmit knowledge.
- To provide education that fully develops the personality and strengthens the respect for human dignity, on the basis of mutual respect, trust, mutual understanding and tolerance, and free from ethnic, nationality, gender, religious or other prejudices.
- To inculcate the dignity of work and dedication for the well being of the society.
- To produce competent persons imbued with a sense of social purpose and trained in science and technology, arts and various professions to enhance the socio-economic development of the Ethiopian people.
- To conduct research and studies in different fields in order to solve society’s problems and disseminate the fruitful results thereof.
- To provide professional service at the regional and national level to accelerate social and economic development.
- To provide training and consultancy services for service fee.

To achieve its teaching, research and community service objectives, the university has formulated a 20-years strategic plan with a vision ‘to be one of the leading higher institutions of teaching and learning in Ethiopia and to continually improve the reliability and quality of education, research and consultancy services to meet the needs of the country and the society at large’ (MEKELLE UNIVERSITY 2003). The strategic plan provides an overall framework and a guide to change and knowledge management within the university.

Teaching at Mekelle University

Within the framework of the ADLI strategy, the Government of Ethiopia is making tremendous effort in civil service reform and capacity building, and higher education is undergoing a major reform to meet the strategic objectives of the country. To be able to contribute to those objectives, Mekelle University puts emphasis to capacity building for its workforce. Staff development is a priority of the university to maintain the quality of its programs and services to society. A pedagogical resource center has been set up in the university to encourage instructional innovations and train junior staff in student-centered teaching methods and preparation of teaching packages.

Students are placed into different faculties and departments based on their choice, academic performance and gender. The university has adopted an affirmative action policy to correct the legacy of societal discrimination against specific sub-groups. For example, female students get priority to join their departments of choice and receive support to de-
The German model of linking postsecondary education and apprenticeship arrangements is currently being explored in Ethiopia. The Government nationally legislates apprenticeship programs for ATVET colleges. In principle, the curricula of the ATVET colleges are practical-oriented with 30% theoretical and 70% practical education. Students undergo practical training for eight months. In the Tigray region, the Extension Department of the BoARD coordinates and oversees the program and is responsible for student placement and implementation of the program through its district offices in cooperation with local administrations. The apprenticeship coordination units of the colleges send the list of students to the Department which, in turn, sends the students to the woreda administrations from where they were recruited\(^{25}\). The woreda offices of Agriculture and Rural Development in cooperation with the woreda administrations place students to tabias and coordinate the program at the local level. The Division of Agricultural Development of the BoARD through its subject matter specialists provides technical support to the woreda extension teams in coordinating and implementing the program.

Initial observations and feedback showed that the apprenticeship program is useful in acquainting students with local situations and helps them develop confidence in their ability to work with farmers. However, there are issues and concerns that need to be addressed to make the program more effective. In the study areas, key informant interviews with extension team leaders revealed that inadequate orientation had been given to the local leaders about the objectives and organisation of the apprenticeship program: *The tabia administrators did not have adequate knowledge about the objectives of the apprenticeship program. They usually made students perform routine activities which were not directly related to their educational objectives*. Moreover, the tasks given for students are beyond their capacity and resource availability and require *practical equipment or demonstration farms*. These matters indicate a situation which could be improved by better communication and cooperation between the extension service, ATVET colleges and research centers.

Experience has shown that social consensus, commitment and coordination are crucial for successful apprenticeship programs (GITTER and SCHEUER 1997,19). However, as discussed in Section 5.6.2, there exists a weak institutional coordination and a poor feedback system. In Tigray, the apprenticeship coordination units of the ATVET colleges report problems to the Extension Department of the BoARD which, in turn, discusses the problems with subject matter specialists and advises the woreda offices of Agriculture and Rural Development to take action. The BoARD recognises that improving this situation requires evaluating the apprenticeship program in order to share experiences and create awareness about its objectives and organisational problems. The Bureau envisages to organise a national workshop to generate knowledge and share innovations in the organisation of the implementation of the program and to develop guidelines and handbooks about the program to improve its coordination, implementation and feedback system. The Bureau will also consider the possibility of forming inter-college networks to facilitate the

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\(^{25}\) For practical purposes, students are placed in their home village to carry out their apprenticeship program. This reduces the need for orientation, as the student already knows the community, and provides a solution to budgetary constraints and housing problems.
sharing of institutional and human capacities, research results, as well as instructional materials and information for improving the use of available resources.

Another critical challenge facing ATVET colleges is a lack of capacity. At present, most ATVET colleges lack facilities and experienced staff to offer practical and quality education. Staff members are not intent on learning and problem-solving in order to give students the kind of education and training they need and instil a scientific spirit and an inquiring mind. Most staff have conventional education and lack experience and practical skills. Despite many efforts to train the staff in practical training methods, there is a continued emphasis on knowledge transfer rather than developing effective lifelong learning. This hierarchical learning implants the behaviour of 'learning from above' and 'teaching to below' and deeply conditions graduates to believe that they know more than farmers and that their knowledge is superior to farmers' knowledge. The curriculum gives little focus on training in social sciences. Development agents need adequate training in social sciences in order to properly understand the thoughts and living conditions of farmers and their families. Without this understanding and ability regarding the complex process of facilitating behaviour change, an effective communication between development agents and farmers will not be possible (CHANG 1986; VAN DEN BAN 2001).

There is also a high turnover of staff due to the uncertainty of the colleges' future. The ATVET colleges are established and financed by the federal government to produce the workforce required to work in the agriculture sector with a national target of about 45,000 graduates. At present, it is not clear what would happen to the colleges by the time this target had been met. It is likely that the colleges will be run by the regional government, but there is so far no clear idea what to do if they are under the regional government. Despite this uncertainty, there is still a great possibility for the ATVET colleges to offer specialized training programs that respond to the labour market needs. However, this requires trained and motivated workforce and flexible organizational set up to establish linkages with the private sector, and this generally remains a major challenge for the ATVET colleges in the country.

6.4.2 Organization and functions of Farmer Training Centers

Small farmers have limited exposure to new things that might work for them and a limited view on possible services. Training farmers is thus an essential ingredient for rural development. Training empowers farmers to adapt to changing circumstances and to take advantage of new opportunities, thus enhances agricultural service utilisation.

FTCs are established at tabia level to provide training for farmers and demonstrate improved technologies and practices. They are the responsibility of the woreda offices of Agriculture and Rural Development, thereby ensuring closer links between extension and research centers at the local level. The FTCs have demonstration farms where new technologies are tested and adapted, and where farmers learn about the use of improved technologies. Thus, they are key to addressing the lack of agro-ecological specificity and local adaptability of extension packages (see Section 5.3.2). It is important that development agents are convinced about the effectiveness of improved inputs under local conditions.
before they demonstrate them to farmers, as illustrated by the focus group discussions with development agents in Begasheka: ‘We were merely persuading farmers to take improved inputs. We were not sure if the inputs would work under local conditions, and farmers knew this. They told us that we are forcing them because we are told to do so, or work for our salary’. As discussed in Chapter 5, farmers knew that development agents work under pressure from local leaders and supervisors, but the development agents try to disguise this, leading to a breach of trust and a communication problem. Given this situation, the FTCs are an important innovation in adapting and disseminating improved technologies and thus improving the basis for development agents’ communication with farmers.

Functions of Farmer Training Centers

The FTCs perform three key functions: training, adaptive research, and extension.

Training

Training development agents will not be enough to develop a wider agricultural workforce, which includes farmers and their families. The abilities of farmers and the decisions they make about their farming operations are crucial to agricultural and rural development. Thus, training is necessary for farmers to improve their technical skills and to enable them to express their needs and define programs. Training farmers is key to advancing technologies in agriculture and providing the knowledge and skill needed to create profitable small farm enterprises (Rivera et al. 2005, 65). FTCs can offer this training and facilitate interaction and contacts with development agents, researchers, agricultural colleges and support systems.

FTCs are established at the tabia level, and three development agents are assigned to serve as both trainers and agricultural advisors. Training undertakings are conducted for both ordinary and school-leaver farmers. The training for ordinary farmers involves 3-5 days of training on general agriculture and extension packages. The experience of model farmers with improved inputs is used as practical demonstration to show the use of new packages to other farmers. The training for literate farmers targets primary education leavers to a Green Certificate Level on specialised skills and commodities. Farmers are offered short courses on specific techniques to produce marketable enterprises. So far the BoARD has developed 14 types of training modules, comprising courses in vegetable production, livestock development, and natural resource management. Farmers are supposed to attend training courses for a total of three months on a modular basis and receive certificates after they successfully demonstrated the new knowledge. These farmers are expected to be outgrowers and to establish producer cooperatives and make contracts with marketing and agro-processing industries, thereby spearheading the market-oriented agricultural development strategy.

Technology adaptation

Another key function of the FTCs is adapting new technologies to local conditions. The demonstration farms of the FTCs provide an opportunity to link research centers and input agencies together to work in close cooperation with the extension service in testing the ef-
fectiveness of new agricultural inputs. As discussed in Section 5.3.2, the lack of agro-
egological specificity and local adaptation of technology packages has affected the per­formance of the extension program. Local testing helps development agents convince farmers that new inputs can be effective under their conditions. Thus, the FTCs provide an opportunity for researchers, development agents, input agencies and farmers to jointly adapt new technologies to local circumstances. Some efforts are being made in this direc­tion in the Kola Temben woreda, but a lack of qualified and adequate human resource seems to hinder the process from the start. Further, as mentioned earlier, the apprentice­ship program of ATVET colleges requires the support of research centers and demonstra­tion farms, and thus FTCs can serve as practical centers to support the program.

**Technology demonstration and evaluation**

Farmers' input into technology development is necessary. FTCs can help development agents and researchers demonstrate new technologies and receive initial feedback from farmers on their performance under local conditions. This helps development agents better understand the technology development process and facilitates their interaction with researchers. Further, the FTCs can support development agents in demonstrating new technologies to farmers by increasing their self-confidence in new technologies, thus solving communication problems between farmers and the development agents.

### 6.5 Concluding remarks

Improved productivity and competitiveness lie in improved knowledge, information and skills. A knowledge-based development strategy is thus key in developing the intellectual and institutional capacity to generate and harness knowledge in the pursuit of sustainable development and improved living standards (WORLD BANK 1999b). Agricultural research and education are powerful means to meeting agricultural problems and increasing agricultural production and productivity through identifying new opportunities and developing the knowledge base required for agricultural development and environmental protection. The capacity to benefit from knowledge depends on the ability to acquire and apply existing knowledge, and the ability to produce new knowledge. Higher education plays a key role in the AKS by training a specialized and adaptable labour force, generating new knowledge, and building the capacity to access existing stores of knowledge and to adapt that knowledge for local use (WORLD BANK 2002).

During the last decades, the policies of Ethiopia have drastically changed, and the Gov­ernment has made efforts to increase the role of research and higher education in develop­ment. The Mekelle University is integrated into the development strategy of the Tigray region and collaborates closely with national and regional development agencies by providing its competence as input into decision-making and involving its staff and students in action-oriented research and development. However, in order to enhance its development effect, the university needs to develop its education, research and extension activities or­ganically and manage its knowledge resources more efficiently.
7 Conclusions and Policy Recommendations

7.1 Introduction

The foregoing chapters dealt with specific issues in order to answer the research questions. Chapter 1 defined the research problem, objective of the study, and the research questions. Chapter 2 provided the theoretical background for the study. Chapter 3 presented the research process and methodology. Chapter 4 described the context of the study. Chapters 5 and 6 presented the research results. The present chapter seeks to integrate and discuss the results of the study and explain its policy implications. In Section 7.2, a summary of the main results and conclusions about the research questions is presented and explained within the context of the research and the body of knowledge established in Chapter 2. Section 7.3 presents the conclusion about the research problem. The policy implications of the study are discussed in Section 7.4. Finally, Section 7.5 presents issues that still need further research.

7.2 Conclusions about the research questions

In this section, the main findings for each research question are summarized and explained within the context of the research and the prior research examined in Chapter 2.

Changing situation of farmers and implications for extension

The analysis of the biographical interviews reveals that farmers have limited strategies and that the general tendency is not an improvement but rather a decrease in livelihood options. Throughout the different government systems, the relationship between government representatives and farmers has not changed; politics controls all spheres of life. Down to the field level, people stick to administrative bureaucracy with upward accountability, and there is no separation of political roles and civil service functions. This has caused persistent role conflict of extension advisors and local administrators, thus hindering effective policy implementation and support to farmers.

The biographical interviews also show that there is little interface between local and formal knowledge systems. The data from Section 5.2 show that there is little evidence regarding the influence of newly introduced agricultural technologies on farmers’ practices and that farmers depend primarily on their own knowledge and practices in order to adapt to the rapidly changing environmental, production and market conditions. This is consistent with the literature analyzed in Section 2.3 and suggests that a careful combination of local and formal knowledge systems is crucial. The extension program must be founded on a realistic assessment of farmers’ situation and with regard to their specific knowledge, experience, rationality and livelihood systems in order to improve the productivity and sustainability of existing systems. It must be designed, implemented and evaluated with regard to the knowledge and experience already held by local communities and with respect to their needs and rationality.
Farmers' participation in the extension program

The more responsibility farmers take in planning, implementation and evaluation of an extension program, the more they accept it. In recent times, the participation of farmers in research and extension has attracted considerable attention in the literature (BIGGS 1989b; FARRINGTON 1998). For example, ENGEL (1991) presented a general typology of farmer participation in extension: participation in extension meetings or activities, participatory diagnosis, and participation through organisation. The findings in Sections 5.3.1 and 5.3.2 show that farmers' participation in Tigray is limited to participation in extension meetings or activities and that persuasion and pressure are the main thrust for involving farmers in the extension program, which is implemented based on a quota system and competition and with a poor feedback system that does not allow room for timely adjustments or to build-up adequately the capacity of farmers and development agents. This causes local leaders and development agents to make or accept unrealistic plans and force farmers to implement those plans. Development agents face difficulties in convincing farmers that the improved inputs are effective, and farmers are able to sense this, which creates a breach of trust and makes it difficult to establish a basis for learning and communication between the two groups. This suggests that development agents and local leaders must analyse and understand the conditions, problems and needs of farmers and use communication as a leverage instrument for extension rather than trying to persuade or force the farmers into compliance with top-down extension programs based on coercion and misleading measures. The literature analysed in Section 2.4 supports this conclusion.

Human capacity, organizational and institutional constraints facing the extension program

SIGMAN and SWANSON (1984) in their survey of the major problems facing agricultural extension in 59 developing countries (Africa, Latin America and the Caribbean, Asia and Oceania) concluded that directors of national extension systems view the lack of mobility, extension training, and communication and teaching equipment, along with organizational problems, as the most serious problems, while technology and linkage problems are not typically viewed as serious problems facing their organizations. However, this study showed different results about the regarding problems of technology and linkage. The results in Sections 5.3.2 and 5.3.5 show that, besides the problems that the directors of national extension systems viewed as important, the lack of technology appropriate to farmers' resources and livelihood strategies and the lack of effective linkage with research are the major problems affecting the extension service in Tigray. The extension program is persuasive, and the extension packages lack client group and agro-ecological specificity. To minimise risks and fit their circumstances, farmers adapt extension packages, but development agents do not value this, and instead persuade farmers to adopt improved inputs, which have not undergone adequate local adaptability trials to address the problems and specific situation of farmers.

The top-down, technocratic and campaign nature of the SG 2000-based extension program leaves no room for a realistic assessment of local conditions, capacities and experiences in order to make timely adjustments. The extension program fails to recognise farmers' situations, and how farmers respond to changing conditions. Without this under-
standing, a sustainable change cannot be expected. It is only when extension assesses farmers' conditions realistically that it can help farmers adjust to rapidly changing environmental, production and marketing conditions. The literature analysed in Section 2.3 suggests that persuading farmers to change increases their dependency on development agents, whereas creating a situation in which farmers make decisions themselves will increase their confidence and capacity to continue on their own with little outside support. Farmers' understanding of the basic principles behind a new technology is ultimately more important than its adoption. Actual extension work is more than simply extending new information, but also integrating it into structures of local resources, values and opportunities. This requires that development agents understand the principles of doing good extension work. A major task for development agents must be to develop the capacity of farm households to make informed decisions and solve their own problems.

Besides the problems of technology and linkage, shortage and poor capacity of development agents are critical problems limiting the performance of the extension program. Development agents lack adequate capacity and motivation to initiate change in the farmers' interest. As discussed in Section 2.4.3, development agents are the weakest stratum in the organisational pyramid of the extension service in terms of training, knowledge and skills, status and motivation. They are not involved in the decision making process regarding the objectives and methods of the extension program, and also their responsibilities are widespread. This affects their relationship with farmers and reduces their motivation and productivity. The data from Table 5.3 show that the shortage of development agents leads to inefficiency and a decline in the quality of the extension service. This problem is exacerbated by the development agents' poor access to information and technical support. The findings of Section 5.4.4 show that agricultural radio programs are poorly coordinated with the extension program, and there is no agricultural press to provide vital information for farmers and development agents.

Farmers in the study areas are generally willing to use improved extension packages, but this willingness has not led to a widespread adoption of the extension packages due to the institutional constraints surrounding the extension service. The findings of Section 5.4 show that the lack of effective linkage between extension, research and support systems affects the performance of the extension service. The institutional environment for credit, input supply and output marketing does not provide adequate incentive for farmers to use improved inputs. This means that technology adoption is not a purely voluntary behaviour and that farmers' resistance to adopt extension packages cannot be entirely explained by extension failure. Therefore, new knowledge and information require efficient input and output markets if they are to lead to innovation adoption and increased productivity.

The extension program is based on a modernist perspective, and its effect is measured in terms of an increase in agricultural production and productivity, which provides only a rough measure of the effects of extension. The data from Table 5.2 show that the effect of the extension program is measured by a comparison of average yields between farms under extension and farms under farmers' management for only one or two years. However, as Mosher (1966) noted, progress in agricultural development can only be judged accurately by looking at the trend in the production record over several years. It is not enough
to view agricultural development simply in terms of yields per hectare. Agricultural development can appropriately be viewed in the context of the rural family, their economic and cultural environment, needs, desires and expectations (Watts 1989). Therefore, rather than yield comparison, strategic issues such as farmers' decision-making behaviour, farmers' adaptive capacities, local adaptability of extension packages, and the financial and economic consequences of technology adoption (higher food security, less dependency, improved assets, better livelihoods and wider options) should be considered in the evaluation of the extension program. On-going extension work must be evaluated objectively from farmers' perspectives to learn about gaps and to make appropriate and timely changes to improve the extension program. It is also important to set realistic goals, remain flexible to unique local conditions, gain experience, and build the confidence and capacity of development agents and farmers.

Farmers' perception of development agents and model farmers

It is crucial that farmers interact with development agents who are concerned with their problems and are trying to find practical solutions in the farmers' interest (Albrecht 1982,165). The results in Section 5.3.3 show that farmers distrust development agents and do not feel the services of development agents are in their best interests. Farmers resent the development agents' involvement in non-extension tasks. The factors which reduce the effectiveness of development agents are: inadequate numbers, poor capacity, conflicting roles, inadequate support, and inappropriate incentive system. During the focus group discussions, farmers explain that the basic requirement for development agents is willingness and commitment to serve the farming community. Therefore, the willingness and the ability of development agents to accept ideas and criticisms from farmers and to respect their knowledge and practices are vital for successful extension work. Development agents must be accountable to farmers, and appreciation by farmers should be an important criterion in rewarding good development agents.

The extension program is implicitly based on the diffusion of innovations model and employs a model farmer strategy to increase extension coverage and acceptance of messages by farmers. However, the use of model farmers is unsuccessful due to personal and technical problems. The results of Section 5.3.4 show that the model farmers are selected based on favoritism rather than on their knowledge and skill in farming, willingness to assist other farmers, and ability to use new inputs because of expected incentives or benefits from the government. As a result, follower farmers do not actually believe that model farmers are really better farmers or useful sources of information. On the other hand, model farmers explain that follower farmers do not take their advice seriously, and persuading or forcing them affects their social relationships. To improve their effectiveness, model farmers must be selected by development agents and endorsed by the farming community. They must be credible and exemplary farmers, showing success on their own farms. It is also important to use desirable incentives for model farmers based on real achievements rather than they merely persuading other farmers to accept extension packages or credit programs.
The role of Research-Extension Advisory Councils in improving institutional coordination and linkage

In response to the weaknesses and criticisms of the SG 2000-based extension program, new policy frameworks and institutional developments have recently occurred reorienting and reorganizing the agricultural service systems. Ensuring effective institutional coordination and integration is a major concern of the new agricultural and rural development policy, and enormous efforts have been made to improve the coordination and flow of information between various agricultural and rural development actors. Unfortunately, the rhetoric of reform and the reality of its implementation are very different, leaving much to be desired regarding the institutional coordination and linkage situation. The results in Section 5.6.2 show that there is relatively little coordination and cooperation between the various levels of government. The different actors do not see each other as part of a system where efficient performance depends on synergy. The REACs are perceived as inefficient to improve this situation. They are neither an autonomous body with defined powers and authority nor are they adequately funded to plan and execute linkage activities. Therefore, in order to improve the institutional coordination and linkage situation, REACs have to play a key role in the budget allocation through requiring cross-institutional activity among AKS institutions and with farmers and in the evaluation of research and extension programs.

The role of agricultural research, education and training in the AKS

Agricultural research, education and training play a key role in the AKS. Recently, the research system in Tigray has been structurally integrated with extension and operates with decentralized centers addressing agro-ecologically specific problems. This is an important move in supporting the extension service and improving the adoptability of extension packages. However, the shortage of a qualified workforce and adequate resources limits the potential contribution of the research system. To address this limitation, the TARI is making efforts to establish collaborative programs with the Mekelle University to share human and other resources.

The Mekelle University is key to creating the intellectual capacity needed to build and maintain an effective AKS in Tigray. However, the development effect of the university will be enhanced when its education, research and extension functions are developing organically and have a common purpose. Research, unlike extension, is a mandatory duty of academic staff and is clearly defined in the policies of the university. The actual place of extension is not clearly stated in the strategic plan of the university. There is a lack of synergy between research and extension, and no emphasis is given to extension in operational terms. This is reflected in the fact that the organizational structure of research at the university does not incorporate the PAP which provides a critical link between education, research and extension within the university and between the university and research and extension organizations. There is a fundamental need to strengthen the extension function of the university by adopting an integrated approach to teaching, research and extension and by clearly defining extension in the policies of the university and in the responsibilities of faculty. More importantly, it should be recognized by the national extension system.
Access to timely information and the continuous updating of the knowledge and skills of field level extension workers are crucial for successful extension. The results in Section 5.3.2 show that while agricultural extension has a large number of practitioners, it has a limited number of professionals and that extension work is not being informed by a well developed body of knowledge in extension science. Development agents must be able to comprehend complex situations and possess economic management knowledge and skill in order to advise farmers on more efficient and sustainable uses for their resources (CHANG 1986; BELAY and DEGENET 2004). However, as the results in Section 5.3.2 show, development agents feel insecure working with farmers when they are confronted by tasks with which they have little knowledge and experience. Therefore, to be effective in the knowledge exchange process, development agents must have opportunities for on-going training and must be able to adapt to rapidly changing conditions.

Given the range of tasks that development agents are responsible for and their level of qualification, further training on new concepts, flexible forms of organization and management, participatory methods and process facilitation will be necessary to improve their productivity. However, efforts to upgrade the technical and communication skills of development agents have so far been unsatisfactory. To improve this situation, ATVET colleges and FTCs have been established, but their performance is constrained by a lack of effective institutional coordination and collaboration. However, they are generally viewed as a positive development and a vital strategy to improving knowledge transfer and communication.

7.3 Conclusion about the research problem

The objective of the study was to generate knowledge on the history, current status and direction of the AKS in the Tigray region which policymakers can use as they strive to improve the effectiveness of the system. The study observes that a host of factors such as agro-ecological, socio-economic, institutional, and human resource factors have hindered the performance of the AKS. More specifically, a lack of a policy environment that is conducive to institutional coordination and collaboration, a weak capacity for planning and implementation, a poor feedback system, and an underdeveloped support structure have limited the effectiveness of the system.

Although the recent policy frameworks and institutional developments have laid the foundation for improving the performance of the system, there is a fundamental need to improve the functional performance of research, extension and education, the interaction between them and the private sector, and the linkages with farmers and their organisations through systematically coordinating different aspects of agricultural policy. It is necessary to develop a national AKS policy and strategy that provides a framework for pluralistic and coordinated service systems. It is also important to build a knowledge system management capacity and develop the demand capacity of local people and their organisations in order to improve the effectiveness of the AKS. More specifically, the Government should provide a facilitating environment for pluralistic, decentralised and coordinated service systems and farmer participatory approaches to research and extension by making the institutional arrangements for credit, market and input supply systems function prop-
erly together and by creating a socio-political climate conducive to the formation of local groups and allowing them to express their voice in the development planning and decision making process.

The recent AKS reforms are encouraging, but the challenge is how to make them working effectively. Despite all top-down ordered policy reforms, which come and go, there is the danger of persistence of attitude and behavior of extension advisors. Field-level extension advisors feel to be the lowest representatives of government, who must control and guide the peasantry. However, the reforms must be seen as a positive start toward improvement, and getting them working effectively asks for a political commitment and a long-lasting organisational development process. There are deficiencies everywhere in the system, and imperfections will continue, but over time, there will be an improvement that would turn the direction to a positive development. Success requires effective interactions between enabling policy, demand, supply and support systems. The AKS reform will not be effective without accompanying political, socio-economic, and cultural and value changes. Therefore, the AKS will be as good as the total system of government, society and economic growth. The whole system of doing good extension must be understood, and the best compromise between supply- and demand-driven extension systems must be sought and developed.

**Figure 7.1:** Finding a compromise between supply- and demand-led agricultural service systems

### 7.4 Policy recommendations

The insight gained from this study suggests a number of issues for policy consideration. The main policy implication is the need for systems- and user-orientation through pluralistic and coordinated service systems and a shift from an approach based on technology packages to technology options and human resources development. A package approach based on blanket recommendations is not appropriate for improving the livelihoods of the rural population. The specific policy recommendations are elaborated upon below.
Moving from a purely agricultural to a broad-based rural advisory service. The agenda for extension programs in developing countries must shift from an exclusive focus on agricultural production (technology function) to a broader range of services (information and training function) relating to marketing, input supply, credit, farmer organizations, environmental conservation, poverty reduction, and off-farm activities (ALEX et al. 2004). The extension program in Ethiopia is production-oriented, focusing on technology supply functions. Thus, to be a feasible means for poverty alleviation and broadening farmers’ livelihood choices, it needs to be reoriented. The current market-orientation of agricultural development is most similar to the TOT model, with a consequent neglect of low-resource farmers, their knowledge and practices. Therefore, the building of knowledge systems based on problem-solving and learning rather than technology transfer is necessary (NaGel 1997). This requires a fundamental shift from strategies of change to strategies of choice and enabling, where extension provides farmers with information, advice and training in a wide range of areas, and decision-making remains with the farmers.

Extension is more than just a delivery vehicle for production technology and plays a key role in delivering social services relating to the wider production context, such as environmental issues, health and safety issues, mobilization of groups, and market literacy and information. There is a fundamental need to move away from a transfer approach to an approach based on socio-economic advisory work that provides advice and information taking into account not only production technologies but also the interrelationship between farm, household, and family. Socio-economic advisory work emphasizes crucial decisions and long-term perspectives for the farm family (ALBRECHT 1982,157). It is necessary to look at extension work with regard to poverty alleviation and food security from a livelihoods perspective within a wider, poverty-focused policy environment (FARRINGTON et al. 2002a,b; CHRISTOPLOS 2003; ALEX et al. 2004) and to broaden client groups and differentiate the technologies to be promoted, thereby moving from a uniform extension message to a broad-based rural advisory work.

Solutions for reducing vulnerability rarely lie in the transfer of production technologies as such, but in improved access to information on wider livelihood choices and institutional support and in the development of farmers’ knowledge and organizational and leadership capacity to define problems and demand services effectively. Farmers need a wide range of services, with improved access to markets, research, credit, inputs and information (SULAIMAN and HALL 2002). Thus, the extension program must be flexible and geared towards supporting local learning and problem-solving processes, and development agents must have a wide range of expertise and operate as facilitators through working with farmer groups and organizations. Development agents must provide advice based on local demands and circumstances, instead of a centrally determined agenda.

Improving technology multiplication and supply systems. Access to inputs is crucial for farmers to increase their agricultural production. Efficient and competitive input supply systems need to be developed to provide agricultural inputs to farmers timely and adequately at reasonable prices and packaged to suit their needs and resources. The participation of the private sector should be encouraged in seed multiplication and marketing. Particularly, innovative farmers, community seed banks and cooperatives can be certified as
improved seeds growers and distributors. A small amount of improved seed can be given to a few knowledgeable farmers in order to multiply for use by other farmers. This approach can reduce the problems of maintaining the purity of seed since seed multiplication occurs under the eyes of farmers who would like to use it. It can also decrease the operating administrative problems involved in government seed multiplication farms and the cost of transporting improved seed. Furthermore, farmers witness the process and observe how seeds are handled, and seeing improved seed growing locally can encourage farmers to try it for themselves, thus improving seed adoptability. Agricultural research and education institutions can play an important role in the supervision and quality control of secondary seed multiplication efforts by farmers and community seed banks.

Promoting cross-sectoral integration of information and communication. Public services need to make their functions visible, and information needs to be directed towards the mass media. Without a concerted effort to ensure greater access to information, current development programs cannot be effectively implemented. There must be coordination in the planning and financing of extension and agricultural radio programs. Field extension activities and farmer training programs have to be coordinated with the design of radio programs. More importantly, there is a great need for coordination in cross-sectoral financing of radio programs. NGOs and cooperatives can play a major role in financing radio programs to promote cooperative education and extension. Radio programs and the print media are particularly important in making the extension service more effective and supporting the activities of the FTCs. There is also a great need for research, extension, marketing, credit and input supply systems and cooperatives to jointly establish and finance agricultural newsletters and radio programs, addressing environmental and farm issues of wider relevance.

Improving post-harvest, market development and access. Development efforts in Ethiopia over the past decades have focused on input provisions for farmers and increasing agricultural production and productivity. However, post harvest production, market development and access for agricultural products have been neglected. Market literacy and market information services are particularly important for agricultural producers in order to improve their marketing efficiency. It is important that post harvest technologies, food processing technologies, and product chain and product development receive attention. This again requires the input of knowledge and information into production and marketing through human resource development and strengthening farmer organizations. Therefore, innovative educational and training programs that emphasize agri-business management, strategic business planning, entrepreneurship development, market and marketing extension, self-help promotion, and knowledge management will be important. Currently, these are not found in most agricultural curricula and may be possible areas of improvement for the ATVET colleges.

Enhancing the demand articulation of farmers and their organizations. The pressure from local and supervisory levels of government regarding the relevance and responsiveness of research and extension programs is pitifully low. Since farmers are not well organized, they lack the capacity and mechanisms to articulate their demands and control over research and extension programs. Agricultural development, especially in areas with less-
potential, and farmers with poor resources require interventions to create active utiliser constituencies (farmer organizations and cooperatives) to enhance client-orientation and down-ward accountability (ROLING 1988,145; AXINN 1987,112; METTRICK 1993,18). Efforts to make technology development and transfer relevant to resource-poor farmers and marginal areas cannot be successful without creating strong local farmer organizations in order to effectively articulate their needs and local demands. Successfully organizing farmer organizations, which make claims from below, can lead to more efficient and effective research and extension (CARNEY 1996; CHIPETA 2006). In Ethiopia, this can be achieved through farmer cooperatives, but more effort needs to be directed at developing their organizational, leadership and negotiating capacity in order for them to play a meaningful role in research and extension. With training and support, the organizational efficiency of farmer cooperatives can be increased, and they can then play a key role in research and extension.

Funding research and extension programs should be contingent on active participation from farmers in conjunction with development agents and local governments. Possibilities for demand-oriented, pluralistic and fee-based research and extension systems should be explored. It is most likely that only by paying for services themselves will farmers get the power to decide what they want, be able to present their views on the recruitment and development of extension workers, and hold extension accountable to them (NEUCHALTTEL GROUP 2002).

**Promoting client-oriented, pluralistic and coordinated service systems.** Agricultural extension policy in many developing countries has been exclusively production-focused, institutionally monolithic, centrally directed, and based on the premise that public sector extension structures can effectively reach down to the village level (FARRINGTON et al. 2002; CHRISTOPLOS 2003). Agricultural development can only be effective in pluralistic, decentralized and coordinated service systems, and the goal of rural development is the development of functioning service markets. Institutional pluralism and farmer participation are important conditions for facilitating effective extension (FARRINGTON 1994). However, a primary challenge in a pluralistic extension system is coordination and dialogue among various agencies, the absence of which could lead to conflicting information and creating confusion among farmers (QAMAR 2000; 2005; ALEX et al. 2004). Each development agency has its own strengths and weaknesses.

Agricultural education, research, extension, and support systems must be strategically aligned as a system rather than as separate entities in order to work towards mutual goals, but this requires interfaces for the exchange of information. A coordinated approach to agricultural education, research, extension, and support systems is essential to maximizing efficiency and improving the performance of the whole AKS. Thus, it is important to institute appropriate incentive systems as a means of promoting coordination and innovative institutional changes through competitive funding and grants requiring cross-institutional activity and the setting and planning of joint priorities between the AKS institutions.

**Incorporating local knowledge into agricultural education, research and extension.** Farmers have a bank of experience and knowledge based on sound observations of events, processes and trends. Local knowledge responds more effectively to farmers' changing
situation, provides quick solutions, and alerts scientists to local realities. An understanding of rural people and their production systems should be an integral part of agricultural education and training (Van Crowder et al. 1998). Local knowledge should form the basis for the training of researchers and extension workers. This means that ATVET colleges must pay more attention to local knowledge through developing outreach programs in order to understand local knowledge processes, and integrate this knowledge into their educational programs. Similarly, FTCs should focus on farmer innovation and experimentation as entry points for participatory technology demonstration and adaptation. Local knowledge is the basis for participation. People participate in what they know, and what they know best is their knowledge and practices. It is when their knowledge and practices are the basis for extension and research programs that farmers participate actively. Thus, research and extension should start from an understanding of local knowledge and practices and should build on this knowledge to develop the knowledge and adaptive capacities of local people to solve their own problems.

**Strengthening Farmer Training Centers.** FTCs should have a clear vision of the desired state, with a clearly developed mission and objectives within the agricultural and rural development policy. The following issues regarding instructional units and institutional arrangements are key areas for improvement.

- **Selection of participants.** Procedures and selection criteria for participants must be developed and approved in communication with local leaders and development agents. Local leaders should not be expected to simply play instrumental role and should rather be key actors in the selection process and post-training activities. It is only when they clearly understand the purpose of training that they would be able to select the right client groups for the right purposes. Development agents should also be key players in developing selection procedures and criteria and selecting farmers, because they are the ones who would be following-up and working with farmers after the training, encouraging and assisting farmers to put the new knowledge into practice.

Gender is an important consideration in the selection of participants. FTCs have to cater to women in training courses, and the composition of participants should be homogeneous in terms of age, sex and farming systems.

Selecting farmers from adjacent sub-locations or villages and forming clustered networks of farmers can help development agents make an easy follow up and can also enable participating farmers to work together with new ideas after a training. Development agents can use farmer groups to stimulate experimentation and the exchange of new ideas. In doing so, a critical mass of experimenting farmers can be created, leading to significant improvements in agricultural practices. Farmers are chosen as participants from different villages in the expectation that they would have a demonstration effect after returning from training courses. However, picking one or two farmers from each village may slow down the process and make the training effect invisible. Further, participants must be representative of the farming community; otherwise, they will be rejected by their neighbours, and thus a demonstration effect will not materialise.
• **Training contents and methods.** As the current focus is on market requirements, there is little scope for problem-oriented courses from the viewpoint of farmers. Training contents should be specific to farmers' present activities, evolving in accordance with their demands and needs. Training should be offered in response to the specific needs that farmers have identified, and farmers must be encouraged to use the new knowledge to solve their problems and exploit new opportunities. Thus, it is important to relate training activities to farmers' understanding of their own life situations and felt needs (local knowledge and practices). Moreover, training must be coordinated with field extension activities; otherwise, any learning that occurs is unlikely to influence behaviour or improve existing practices.

Farmers need competence in linking agricultural production to agro-processing and marketing. Thus, training contents should include managerial and organisational skills, negotiation skills, market literacy and marketing strategies that will enable farmers to demand services effectively and organise services themselves.

Training methods must be interactive, practice-oriented and meaningful to farmers. A link must be drawn between farmers' knowledge and experience and new training contents. Development agents must know how learning contents can be expressed in terms that are already fully familiar to farmers and establish facilitative relationships with farmers that produce non-conformist and reflective learning. The learning situation must be such that farmers interpret and reflect upon their practices and experience and have sufficient feedback on their learning progress. In this way, learning can be stimulated, and farmers can develop inquiring minds and make sound generalisations about their situation. Moreover, farmers learn better when they see the need for it, and when it best fits their programs. Thus, the time of training must correspond to the seasonality of agricultural activities and market opportunities.

— **Unit of instruction and post-training support.** The unit of instruction must not be a general subject of study. Training must be organised around specific new knowledge and practices. Further, realistic and tangible opportunities must be available for farmers to try out the new methods. Post-training support, such as technologies, land and credit, should be provided. However, in reality, when farmers are trained in new practices or skills, they do not usually get the opportunity to translate the new knowledge and skills into action. And it is useless to train farmers if opportunities for enacting their new knowledge are not available. Thus, an important role for development agents is to organise farmers into groups and provide assistance in putting the new knowledge into practice. Village libraries need to be set up to stock newsletters, magazines and guidelines and increase access to reading materials and other information in rural areas.

— **Human resource development.** Human resource is key to an effective performance of FTCs. Organising farmers into groups can make the effect of training more visible. Thus, FTCs should give emphasis to organisational and leadership training that would eventually lead to sustained processes of technology development and dissemination by farmers themselves. Moreover, FTCs should consider organising agricultural shows, exhibitions, field days, and visits to share experiences and information related to new agricultural technologies and problem-solving approaches. However, this requires competent person-
nel, a high level of organisational skill, and the cooperation of a wide range of institutions.

- **Institutional coordination.** Problem identification, technology adaptation, and training of farmers and development agents require a closer cooperation between research centers, FTCs, ATVET colleges and the mass media (Figure 7.2). Effective links between FTCs, research centers and input supply agencies are necessary to conduct joint adaptability trials and inform research and input agencies of local problems, so that appropriate packages can be prepared for promotion by the extension service. This can also avoid problems related to demand estimation and distribution of improved inputs. Further, to be effective in the knowledge exchange process, development agents must have adequate theoretical and practical knowledge. Thus, cooperation between FTCs, ATVET colleges and research centers is necessary to improve practical training by supporting the apprenticeship program.

**Figure 7.2: Improving linkages supporting Farmer Training Centers**

The apprenticeship program can play a key role in putting ATVET colleges in touch with local people to understand their circumstances, thereby making their training programs relevant and encouraging students to define their learning objectives. Besides this theory-practice link, the program can help development agents get technical support and information materials from ATVET colleges. However, making use of such benefits requires the adoption of strategies which provide incentives for various actors to develop and incorporate mechanisms that promote effective institutional collaboration and joint activities into their programs.

### 7.5 Suggestions for future research

The study explores the general picture of the AKS in the Tigray region, focusing on the overall setting, the linkages between the different actors, and its recent developments. The study reflects the specific context in which the system operates, clarifies the extent to which it is institutionally pluralistic and coordinated, assesses its overall strengths and weaknesses, and offers policy recommendations for its improvement. However, there are
many important issues that are insufficiently explored in this study and require further investigation.

Adequately addressing the AKS requires integrating the wider political, social and economic context into the assessment. The study took place at a point early on in the decentralization process of government structures. Recent policy frameworks and institutional developments are in their infant stages. The study was conducted when many key elements of the *Rural Development Policies, Strategies and Instruments* (FDRE 2001) were at a fledgling stage. Thus, continuous research and documentation of processes will be helpful in composing a detailed analysis of the efforts that are being made to develop an integrated AKS in the country.
8 Summary

8.1 English summary

Research problem and objective

As a national vision for agricultural development, the Government of Ethiopia designed an overarching strategy known as the Agricultural Development-Led Industrialization. Within this strategy, the Government adopted several policies, strategies and instruments. However, actual policy implementation is hindered by a lack of systematic coordination of different aspects of agricultural policy. Ensuring effective institutional coordination and linkage at all levels of government has become a major challenge for development. Recently, new policy frameworks and institutional developments have taken place in order to coordinate and integrate the activities of various sectors at all levels, reorganizing and redirecting the Agricultural Knowledge System (AKS) towards a more decentralized, coordinated and client-oriented system. This requires knowledge of how the whole system operates and the frame conditions affecting it. The study is motivated by this challenge to provide a systemic perspective for a better overview that highlights the linkages and information flow between the AKS institutions in the Tigray region, with a focus on the extension service as a core component of the system, and its institutional linkages.

Theoretical framework and methodology

A knowledge systems perspective forms the theoretical foundation for the study. The whole idea behind the systems approach to agricultural knowledge is that agricultural development is the result of the interdependent and coordinated activities of a whole set of actors, rather than of individuals, interactively processing and sharing knowledge and information. Agricultural extension is a core component of the AKS because it facilitates the interplay and nurtures the synergy within the system, focusing on the actors whose knowledge and information contribute to agricultural development and facilitating interaction and the flow of knowledge between the different actors. The overall complex of relevant factors related to successful extension work can be structured as an inter-system model enabling the analysis of conditions on the side of farmers, the extension organization, and the interaction between the two sides. A key feature of the farmers is that their knowledge and practices form the basis for not only their participation in research and extension programs but also for effective and equitable partnerships between local and formal knowledge systems.

The study used empirical data collected between May 2004 and June 2005 using narrative interviews and focus groups in two districts (Hawzen, Debre Birhan tabia and Kola Temben, Begasheka tabia) in the Tigray region. The study was undertaken at community and institutional levels in order to analyse interfaces between the two sub-systems. The investigation at the community level began with understanding the past situation and converging into the present situation, depicting interfaces between local and formal knowledge systems. At the institutional level, the study analysed the organisational and human capacity constraints affecting the system, the inter-institutional field, and the potential of recent
AKS reforms to improve the effectiveness of the system. The narrative interviews and focus groups were supplemented by personal experience and a thorough review of the documentation surrounding the evolution of agricultural extension services and the current extension program in Ethiopia.

Results and conclusions

The analysis of the biographical interviews revealed that there is little interface between local and formal knowledge systems and that farmers depend primarily on their own knowledge and practices to adapt to changing conditions. The Sasakawa-Global 2000-based extension program is not based on a realistic assessment of the specific situation of farmers and a closer understanding of their knowledge and livelihood strategies. It was implemented in campaign based on a quota system and competition and with an inadequate feedback system. Farmers ‘participated’ in the extension program through coercion and pressure in multiple forms. Development agents were burdened by tasks for which they lacked adequate training and resources. They also worked under pressure from local leaders and supervisors, which reduced their motivation and productivity. Farmers did not perceive the development agents’ services to be in their best interest and also resented their involvement in non-extension tasks. Development agents must use communication as a leverage instrument for extension rather than persuading farmers to comply with top-down extension programs based on coercive and misleading measures. They must be oriented towards cultivating a high degree of understanding and insight among farmers rather than meeting extensive contact quotas.

The extension packages lacked agro-ecological and client group specificity and were inadequately tested under local conditions before they were widely disseminated. To minimise risk and accommodate their available resources, farmers adapted extension packages, but development agents failed to understand the farmers’ rationality and viewed their adaptations as deficiencies and considered the farmers off-types and troublemakers. Unfortunately, this limited the development agents’ opportunity to learn from the farmers’ adaptation processes and to teach other farmers. Furthermore, the use of model farmers to reach more farmers was unsuccessful due to personal and technical problems. Social relationships influenced the selection of model farmers, and how they served other farmers. Thus, the selection mechanisms for model farmers should be revisited and developed in communication with the farming community. It is also important to use desirable incentives for model farmers based on real achievements rather than on how well they persuade other farmers to accept extension packages. Appreciation from farmers must be an important criterion in rewarding good model farmers.

 Farmers are willing to use improved inputs and take realistic opportunities, but they lack the necessary resources and services. The institutional environment for credit, input supply and output marketing failed to provide adequate incentives for farmers to continue using improved inputs. Extension can only be effective in decentralised, pluralistic and coordinated agricultural service systems with strong interactions between farmers and other actors. The mass media can play a major role in extension, but this role is poorly established due to insufficient coordination and funding. Generally, the institutional coordination and linkage situation in Tigray leaves much to be desired. The Bureau of Agriculture
and Rural Development (BoARD) and its woreda offices serve as system oversight bodies to coordinate and integrate the activities of various sectors, but most sectors have isolated organisational approaches that have no orientation towards collaboration. The Research-Extension Advisory Councils (REACs) are largely perceived as inefficient bodies towards improving this situation.

The Tigray Agricultural Research Institute (TARI) and the Mekelle University are well integrated into the development strategy of Tigray and closely collaborate to share expertise and resources. The development effect of the university can only be enhanced when its education, research and extension functions are integrated and developing organically. The Practical Attachment Program (PAP) of the university provides this crucial link between education, research and extension within the university, as well as between the university and research and extension organisations. However, there is an evident lack of synergy between its research and extension functions. Presently, neither the PAP is integrated into the research policies and guidelines of the university nor an actual place for extension is clearly stated in its strategic plan. This lack of effective institutional mechanisms to linking education, research and extension also affects the performance of the Farmer Training Centers (FTCs), the Agricultural Technical and Vocational Education and Training (ATVET) colleges, and the research centers. Therefore, there is a great need for better communication and cooperation between these actors in order to share institutional and human capacities and research results and to use available resources more effectively and efficiently.

**Policy recommendations**

While the recent policy frameworks and institutional developments have laid the foundation for improving the AKS, enormous efforts still need to be made in building the capacity and improving the institutional environment for decentralised, pluralistic and coordinated agricultural service systems. There is a great need to adopt an explicit AKS policy and strategy that provides a framework for pluralistic and coordinated service systems and to develop an effective capacity for local demand through diagnostic, client-oriented and problem-solving approaches. The Government must provide a facilitating environment for pluralistic, decentralised and coordinated service systems and farmer participatory approaches towards extension by making the institutional arrangements for credit, market and input supply systems function properly together and by creating a socio-political climate conducive to the formation of local groups and the expression of their voice in the development planning and decision making process. The AKS reforms will not be effective without accompanying political, socio-economic, and cultural and value changes. The AKS will be as good as the total system of government, society and economic growth. The whole system of doing good extension must be understood, and the best compromise between supply- and demand-driven extension systems must be sought and developed.
8.2 Deutsche Zusammenfassung

Problemstellung und Zielsetzung


Theoretischer Rahmen und methodisches Vorgehen


Ergebnisse und Schlussfolgerungen


Bauern sind bereit, verbesserte Betriebsmittel einzusetzen und realistische Möglichkeiten zur Verbesserung ihres Betriebsergebnisses wahrzunehmen, jedoch fehlen ihnen meistens die erforderlichen Ressourcen und Dienstleistungen. Die Institutionen für Kredit, Be-


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SPIELMAN, David J. 2005: Innovation systems perspectives on developing country agriculture: A critical review. ISNAR Discussion Paper 2, IFPRI.


The books of this series deal with empirical research, problem oriented and decision and action oriented investigations, and not primarily with building theories or even basic research.

The orientation is critically optimistic, based on the confidence into human strength, into positive development of personalities, groups, societies and cultures.

Change processes are analysed, aiming at showing up, how to help and to support effectively. The studies shall document examples of successful transformations, adaptations and innovations, without being trapped by blind progress enthusiasm. The readers shall experience Social Science as living, understandable and orientating, as offering sense in an increasingly intransparent and crazy appearing world.

While the themes can be as manifold as life, and do not exclude any country or problem of this earth, the different authors have in common to strive for the quality criteria of the editors, like interdisciplinarity, methods pluralism, pragmatism, ethics and aesthetics in the design and presentation of this research.

**List of published titles so far:**

**Band 1, Jochen Currie**

*Landwirte und Bodenabtrag*

Empirische Analyse der bäuerlichen Wahrnehmung von Bodenerosion und Erosionsschutzverfahren in drei Gemeinden des Kraichgaus

1994, 244 S., ISBN 3-8236-1239-5, EUR 25.60

Explorative Studie zur bäuerlichen Wahrnehmung des Umweltproblems Bodenerosion, das mit zunehmender Intensivierung und Mechanisierung der Landwirtschaft immer mehr an Brisanz gewinnt.

**Band 2, Petra Feil**

*Endogene Neuerungsverbreitung als Teil des sozio-kulturellen Wandels*

Eine Analyse der kleinbäuerlichen Lebenswelt in zwei Dörfern im Südbenin


Eine kleinbäuerliche Lebenswelt wird analysiert, insbesondere die Wechselwirkungen zwischen kulturellen, sozialen, wirtschaftlichen und technischen Veränderungen.

**Band 3, Ulrike Eigner**

*Messung der Lebenshaltung auf kommunaler Ebene*

Konzeption und empirische Überprüfung eines Bewertungsinstruments im andinen Hochland Perus


Entwurf eines Bewertungsinstrumentes zur Messung des Lebensniveaus auf kommunaler Ebene anhand des Komponenten-Indikatoren-Ansatzes.

**Band 4, Thomas Becker**

*Bauern - Schnecken - Enten*

Die Reaktion der Bauern eines philippinischen Dorfes auf die Einführung der Schadschnecke Golden Apple Snail

1995, 93 S., ISBN 3-8236-1247-6, EUR 15.30

Explorative Studie am Beispiel eines Dorfes in Zentral Luzon, die die Situation der Bauern, deren Wissen und Erfahrungen und deren Lösungsansätze für das Problem beschreibt, daß sich die auf den Philippinen eingeführte Schnecke innerhalb von kürzester Zeit zu einem gravierenden Reisschädling entwickelt hatte.
Band 5, Klaus Hummler
*Striga-Beratung*
Entwicklung eines visuell unterstützten Beratungsprogrammes zur Kontrolle von *Striga hermonthica* in der Nordregion Ghanas
Thema ist die partizipative Erarbeitung eines visuell unterstützten Beratungsprogrammes, das afrikanischen Bauern und Beratern Problemlösungen bei der Bekämpfung des parasitischen Unkrauts *Striga hermonthica* bietet.

Band 6, Eberhard Bauer
*Beratung in der Entwicklungszusammenarbeit*
Empirische Analyse erfolgversprechender Vorgehensweisen und wiederkehrender Probleme zur Begründung von Verbesserungsvorschlägen
Zunächst werden erfolgversprechende Vorgehensweisen in der Beratungsarbeit der deutschen Technischen Zusammenarbeit beschrieben; anschließend wird die Eignung partnerzentrierter Ansätze für die Praxis der Zusammenarbeit überprüft.

Band 7, Barbara Mehlig
*Probleme der Beratung existenzgefährdeter Gartenbaubetriebe*
Erfahrungen verschiedener Beratungsinstitutionen
Bei Unternehmenskrisen im Gartenbau haben Beratungskräfte verschiedener Institutionen unterschiedliche Ansätze im Vorgehen bei der Beratung. Eine Zusammenarbeit der Institutionen ist im Interesse der Betroffenen.

Band 8, Klaus-Dirk Seibold
*„Agrimanagement“ in Frankreich*
Untersuchungen zum Informationsverhalten von landwirtschaftlichen Unternehmern und zum landwirtschaftlichen Wissenssystem im Département Cher
Die Arbeit liefert wichtige neue Erkenntnisse für die weitere Forschung in den Bereichen Unternehmensführung und Wissenssystemforschung und kommt zu plausiblen und relevanten Schlußfolgerungen für die landwirtschaftliche Praxis.

Band 9, Wolfgang Bokelmann et al.
*Landwirtschaftliche Beratung im Land Brandenburg*
Eine Evaluierung erster Erfahrungen
Ohne konkrete Vorbilder aus den alten Bundesländern wird in Brandenburg ein Beratungsansatz durch private Träger mit öffentlichen Zuschüssen praktiziert, eine Vorgehensweise, die sich, insgesamt gesehen, bewährt hat. Dieses Beratungssystem wurde 1994 von einem interdisziplinären Forschungsteam wissenschaftlich evaluiert.

Band 10, Petra Haug
*Kommunikationssituation und Gesprächsbedarf von Bäuerinnen, die pflegebedürftige Angehörige versorgen*
Eine explorative Studie bei vier Betroffenen im Großraum Stuttgart
Ein Kernproblem für Bäuerinnen, die pflegebedürftige Angehörige zuhause versorgen, ist, daß sie einmal frei darüber sprechen können. Authentische Gesprächsausschnitte werden scharfsichtig interpretiert. Aus der Problemanalyse läßt sich eine Fülle von Maßnahmen zur Verbesserung der Situation der Betroffenen ableiten.

Band 11, Niko von der Lühe
*Landwirtschaftliche Beratung oder Tauschhandel?*
Zur Funktionsweise des T&V-Beratungssystems in den CARDER Atlantique und Borgou, Republik Benin
Information, Beratung und fachliche Weiterbildung in Zusammenschlüssen ökologisch wirtschaftender Erzeuger
Horst Luley


Deutsch-italienische Ehepaare
Bettina Dengler
Analyse ausgewählter Fälle zum Umgang mit kulturellen Unterschieden und zur Migrationssituation


Anlageberatung in Banken
Ulrike Kallhardt
Ein Versuch zur Bewertung der Beratungsqualität anhand von Testberatungsgesprächen
1997, 121 S., ISBN 3-8236-1275-1, EUR 15.30

Hier wird der Versuch unternommen, anhand von Testberatungsgesprächen, welche die Autorin selbst durchführte, die Qualität von Anlageberatung zu bewerten. Da große Mängel in der Beratungsqualität festgestellt wurden, werden Lösungsansätze beschrieben, die zu einer Verbesserung der Beratungsqualität führen könnten.

Transformation und Autonomie im Leben tunesischer Bäuerinnen
Dorothee Dersch
Eine struktural-hermeneutische Analyse eines Beratungsprojekts

Am Beispiel eines Beratungsprojekts der GTZ in einem neugeschaffenen Bewässerungsgebiet in Nordtunesien wird der schwierige Weg von Bäuerinnen in die Moderne nachgezeichnet und Entscheidungsmuster und Handlungsorientierungen werden nach der Methode der strukturalen Hermeneutik fallrekonstruktiv analysiert.

Das Wissenssystem der Schafhaltung in Brandenburg
Thomas Aenis
Eine Analyse von Kommunikationsbeziehungen der beteiligten Institutionen und Organisationen aus Produktion, Forschung und Beratung
1997, 105 S., ISBN 3-8236-1278-6, EUR 15.30

In dieser Studie werden die Kommunikationsbeziehungen im Wissenssystem schafhaltender Betriebe in Brandenburg analysiert.

Reorientation of Extension
Wilhelm Ehret
A case study of participatory action research with a Non-Government Organization in Northern Nigeria

A reorientation process of five years is documented which the author accompanied as a „participative action researcher“ in Nigeria. First the methodology of extension was changed, followed by a reorientation of the entire organization including the integration of sectors such as agriculture, health, rural water supply and sanitation.

Privatisierung von Beratungsdiensten
Lorenza Schlotmann
Drei Fallstudien zur landwirtschaftlichen Beratung in Ecuador
1997, 134 S., ISBN 3-8236-1280-8, EUR 15.30

Der Privatisierungsprozeß landwirtschaftlicher Beratungsdienste des Südens wird anhand von drei Fallstudien aus Ecuador problematisiert. Dabei geht es insbesondere um die Frage, wie eine größtmögliche Orientierung an den unterschiedlichen Zielgruppen und deren maximale Beteiligung am Beratungsprozeß erreicht werden kann.
Band 19, Hong Yu
Chinas bäuerliches Wissenssystem im Wandel
Fallstudie in vier Dörfern der Hebei-Provinz
1997, 185 S., ISBN 3-8236-1284-0, EUR 25,60
Erkenntnisse über die veränderten Verhaltensweisen und Handlungsmöglichkeiten der Zielgruppe werden auf die Betrachtung des „bäuerlichen Wissenssystems im Wandel“ verengt. Die vier explorativen Fallstudien in vier unterschiedlichen Dörfern der Provinz Hebei in China zeigen, daß Entwicklungsinitiativen, sowohl im landwirtschaftlichen als auch im außerlandwirtschaftlichen Bereich ihren Anstoß und ihre Energie im wesentlichen von der Basis her, also durch die ländliche Bevölkerung selbst, erhalten.

Band 20, Ulrich Klischat
Beratung von Agrargenossenschaften in den neuen Bundesländern
Eine qualitative Studie über Beratungsbedürfnisse und Methoden aus der Sicht von Beratern und Beraterinnen

Band 21, Sabine Gündel
Participatory innovation development and diffusion
Adoption and adaptation of introduced legumes in the traditional slash-and-burn peasant farming system in Yucatan, Mexico
An innovative legume-based green manure system has been successfully introduced in several regions of Central America. However this innovation has only been adopted by very few rural Mayan communities in Yucatan although they are facing a severe socio-economical and ecological crisis.

Band 22, Michael Waithaka
Integration of a user perspective in research priority setting
The case of dairy technology in Meru, Kenya
In this book the author recollects the problem of priority setting for dairy research at programme level at the Kenya Agricultural Research Institute (KARI).

Band 23, Reto Ingold
Zur Wirksamkeit umweltbezogener Beratung
Drei Fallstudien aus der kantonalen landwirtschaftlichen Beratung in der Schweiz
Erstmals wird in der Schweiz die Rolle der kantonalen landwirtschaftlichen Beratungsdienste im Bereich der Umweltberatung wissenschaftlich beleuchtet. Am Beispiel von drei Fallstudien werden die Grundlagen für eine Qualitätssicherung in der umweltbezogenen Beratung erarbeitet.

Band 24, Mohan Dhamotharan
Tradition und Umbruch eines lokalen Wissenssystems
Fallstudie zur Struktur und sozialen Organisation lokalen Wissens am Beispiel des Niembaumes in Tamil Nadu, Indien

Band 25, Alexander Gerber
Umweltgerechte Landbewirtschaftung in der landwirtschaftlichen Berufsbildung
Situationsanalyse und Perspektivenentwicklung am Beispiel Baden-Württembergs
Da die landwirtschaftliche Berufsbildung für die Umsetzung einer umweltgerechten Landbewirtschaftung eine zentrale Rolle spielt, wurde von der Agrar- und Bildungspolitik das umweltbezogene Bildungsangebot reformiert und erweitert. Das vorliegende Buch beschreibt Art, Umfang, Qualität und Erfolg dieser Maßnahmen.
Planen, handeln, bewerten: Lernen durch Leittexte
Eine explorative Studie zu ihrem Einsatz in der landwirtschaftlichen Ausbildung in Baden-Württemberg und Niedersachsen

Action Research in Extension Material and Message Development: The Striga Problem of Northern Ghana revisited
Documentation of an action research approach to the development of extension messages and material in regard to the Striga problem of Northern Ghana. The book provides methodological tools on how to tackle complex issues with a clientele mostly embedded in their oral culture. The result of the action research is approved by both extension workers and farmers.

Ungleiche Partner
Handlungsoptionen von lokalen Selbsthilfeorganisationen und Forstprojekten im Norden Bënsins
1999, 316 S., ISBN 3-8236-1313-8, EUR 25.60

Learning Together for Change
Facilitating Innovation In Natural Resource Management Through Learning Process Approaches in Rural Livelihoods in Zimbabwe
1999, 330 S., ISBN 3-8236-1314-6, EUR 25.60
Documentation of an intensive joint learning process in research and extension with small farmers for sustainable natural-resource management in Zimbabwe from 1990-1995. Description of the action research program in concept development and of the operationalisations of the learning process approaches.

Aktivieren für den Umweltschutz
Aktionsforschung mit sechs Stuttgarter Kirchengemeinden im Projekt „Mitdenken & Handeln – Ökologie in die Kirche“
Aus der Analyse des Projektes werden Empfehlungen für kirchliche Ökologie-Projekte und für die die Kommunikation und Arbeitsorganisation in Kirchengemeinden, -Bezirken und der Landeskirche abgeleitet.

Biotop oder Psychotop?
Untersuchungen zum Konzept des Naturgartens und zu seiner Akzeptanz im Stadtgebiet Stuttgart
Es wird beschrieben, welche Bedeutung Gärten im Laufe der Geschichte hatten, wie sich dieses Bild mit der veränderten Einstellung der Menschen zur Natur wandelte und wie mit zunehmenden Umweltproblemen das Konzept der naturnahen Gartenbewirtschaftung entstand und verbreitet wurde. Faktoren für das Gelingen wie das Scheitern von Verbreitungprogrammen werden in der empirischen Analyse aufgezeigt.

Beratungsstrukturen für die biologische Landwirtschaft
Österreich im Vergleich mit ausgewählten europäischen Ländern
Für die Zeit zwischen 1997 und 98 wird die Beratungssituation im österreichischen Biolandbau dargestellt. Gute Lösungsansätze für Problembereiche in Österreich bieten die im Vergleich untersuchten Beratungsleistungen und -methoden und Organisationsmodelle des europäischen Auslandes.
Nachhaltigkeit und Landschaftsnutzung. Neue Wege kooperativen Handelns
(Herausgegeben von: Müller, Toussaint, Bork, Hagedorn, Kern, Nagel, Peters, Schmidt, Weith, Werner, Dosch, Piorr).
Nachhaltigkeit ist kein statisches Konzept, es bedarf der ständigen Fortentwicklung und Erneuerung. Im Rahmen des BMBF-Förderschwerpunktes «Ökologische Konzeptionen für Agrarlandschaften» entwickelte und erforschte das Verbundforschungsvorhaben GRANO über 5 Jahre in zwei Modellregionen neue kooperative Ansätze zur nachhaltigen Landschaftsnutzung. 2002; 410 pp.; 60 ills., 17x24 cm; paper; ISBN 3-8236-1383-9; EUR 30.00

Müller, Klaus et al.
Wissenschaft und Praxis der Landschaftsnutzung. Formen interner und externer Forschungskooperation.
(Herausgegeben von Müller, Dosch, Mohrbach, Aenis, Baranek, Bueckmann, Siebert, Toussaint);
2002; 374 pp.; 21 x 15 cm; 25 figs & 3 photos; paper; ISBN 3-8236-1388-X; Euro 25.00

Gunda Matschonat, Alexander Gerber
Wissenschaftstheoretische Perspektiven für die Umweltwissenschaften
In diesem Buch analysieren führende Wissenschaftstheoretiker den Stand der epistemologischen Diskussion in den Umweltwissenschaften und zeigen Perspektiven für deren Weiterentwicklung auf.

Uwe Jens Nagel, Thomas Aenis, Axel Dosch, Katrin Prager, Verena Toussaint
Zur Wirkungsanalyse Transdisziplinärer Forschung.
Ein Untersuchungskonzept der Nachhaltigkeit des Landnutzungsprojektes GRANO.
2004, 132 pp.; 15 x 21 cm; ISBN 3-8236-1429-0; Euro 22.00

Anja Christinck, Eva Weltzien, Volker Hoffmann (Editors)
Setting Breeding Objectives and Developing Seed Systems with Farmers
Setting objectives and priorities is a crucial component of successful breeding programs as it determines the future course of action, maximizes chances for success and the impact achieved, and clarifies roles and responsibilities of partners. The book provides valuable insights not only for plant breeders but also development workers who seek to encourage farmer innovations with regard to variety development. Bio-diversity specialists involved in in situ management of plant genetic resources, as well as educators and trainers in the above mentioned fields will find useful tools and overviews.
2005, 188 pp.; 20 x 26 cm; paper, ISBN 3-8236-1449-5; 28 Euro
Band 26, Nicola Supke

Planen, handeln, bewerten: Lernen durch Leittexte
Eine explorative Studie zu ihrem Einsatz in der landwirtschaftlichen Ausbildung in Baden-Württemberg und Niedersachsen

Band 27, Patrick A. Fischer

Action Research in Extension Material and Message Development: The Striga Problem of Northern Ghana revisited
1999, 253 S., ISBN 3-8236-1312-9, EUR 25.60
Documentation of an action research approach to the development of extension messages and material in regard to the Striga problem of Northern Ghana. The book provides methodological tools on how to tackle complex issues with a clientele mostly embedded in their oral culture. The result of the action research is approved by both extension workers and farmers.

Band 28, Eva Sodeik

Ungleich Partner
Handlungsoptionen von lokalen Selbsthilfeorganisationen und Forstprojekten im Norden Bénins
1999, 316 S., ISBN 3-8236-1313-8, EUR 25.60

Band 29, Jürgen Hagmann

Learning Together for Change
Facilitating Innovation in Natural Resource Management Through Learning Process Approaches in Rural Livelihoods in Zimbabwe
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Documentation of an intensive joint learning process in research and extension with small farmers for sustainable natural resource management in Zimbabwe from 1990-1995. Description of the action research programm in concept development and of the operationalisations of the learning process approaches.

Band 30, Meike Peschke

Aktivieren für den Umweltschutz
Aktionsforschung mit sechs Stuttgarter Kirchengemeinden im Projekt „Mitdenken & Handeln – Ökologie in die Kirche“
Aus der Analyse des Projektes werden Empfehlungen für kirchliche Ökologie-Projekte und für die Kommunikation und Arbeitsorganisation in Kirchengemeinden, -Bezirken und der Landeskirche abgeleitet.

Band 31, Maria Gerster-Bentaya

Biotop oder Psychotop?
Untersuchungen zum Konzept des Naturgartens und zu seiner Akzeptanz im Stadtbereich Stuttgart
1999, 266 S., ISBN 3-8236-1316-1, EUR 25.60

Band 32, Andrea Gruber, Sabine Fersterer

Beratungsstrukturen für die biologische Landwirtschaft
Österreich im Vergleich mit ausgewählten europäischen Ländern
Für die Zeit zwischen 1997 und 98 wird die Beratungssituation im österreichischen Biolandbau dargestellt. Gute Lösungsansätze für Problemkreise in Österreich bieten die im Vergleich untersuchten Beratungsleistungen und -methoden und Organisationsmodelle des europäischen Auslandes.
Band 33, Marianne Kusemann

**Soziodkonomische Beratung landwirtschaftlicher Familienbetriebe**

Eine Untersuchung der Situation in Westfalen-Lippe und Brandenburg

Seit über 30 Jahren gibt es Bemühungen um sozio-ökonomische Beratung in Europa, um die Auswirkungen des Strukturwandels in der Landwirtschaft für die Betroffenen zu lindern. Am Beispiel sehr unterschiedlicher Lösungsansätze in den beiden Bundesländern werden Empfehlungen für die Verbesserung der sozio-ökonomischen Beratung insbesondere in Brandenburg abgeleitet.

Band 34, Stefan Vogel

**Umweltbewusstsein und Landwirtschaft**

Theoretische Überlegungen und empirische Befunde
2000, 142 S., ISBN 3-8236-1323-5, EUR 15.50


Band 35, Mohamed Salem Saleh Almagdi

**Sozialer Wandel und Agrarentwicklung im Delta Abyan im Südjemen**

Eine empirisch-historische Analyse der bäuerlichen Lebenswelt


Band 36, Barbara Adolph

**People’s Participation in Natural Resource Management**

Experiences from watershed management projects in India
2000, 253 S., ISBN 3-8236-1331-6, EUR 25.60

During two years of fieldwork, farmers’ perception of project approach and project impact was analysed in a range of watershed management projects, using both qualitative and quantitative methods. In collaboration with both governmental and non-governmental agencies, strategies associated with project success were identified and recommendations for implementing these strategies were elaborated.

Band 37, Katrin Hauler

**Energieberatung durch deutsche Energieversorgungsunternehmen**

Ein Überblick und eine Fallstudie zur Neckarwerke Stuttgart A.G. (NWS)

Energieberatung in Deutschland wird charakterisiert, und in einer Fallstudie wird die Qualität der Energieberatung der Neckarwerke exemplarisch durch Klienten beurteilt.

Band 38, Volker Hoffmann, Bettina Moritz (Hrsg.)

**Marktplatz Internet**

Empirische Studien zu seinen Potentialen und Problemen


Band 39, Gitta Röth

**Lokales Wissen im Beratungskontext**

Vernetzung von lokalem bäuerlichem Wissen mit dem landwirtschaftlichen Beratungsangebot in der Dominikanischen Republik

Verschiedene Aspekte des bäuerlichen Wissens zum traditionellen Pflanzenschutz- und Bodenfruchtbarkeitsmanagement werden auf ihre Einbettung in die landwirtschaftliche Beratungsarbeit von NGOs und von staatlichen Institutionen in der Dominikanischen Republik hin untersucht.
Band 40, Andreas Kress

**Die Rahmenbedingungen für partizipative Beratungsprozesse**

Eine Analyse des Einflusses externer Faktoren auf die nachhaltige Wirkung forstlicher Programme in Bolivien

2001, 227 S., ISBN 3-8236-1345-6, EUR 25.60

Diese Arbeit beruht auf Untersuchungen im Arbeitsbereich von forstlichen Beratungsprogrammen in Bolivien. Als Ansatzpunkte zur Erfassung der Veränderungsprozesse dienen dabei die Betrachtung des traditionellen kleurbauerlichen Partizipationsverhaltens und der historischen Entwicklung der forstlichen Beratung in Bolivien.

Band 41, Patricia Fry

**Bodenfruchtbarkeit: Bauernsicht und Forscherblick**


Band 42, Kai Stahr

**Dörfliche Kommunikationsnetzwerke**


Band 43, Stefan Rist

**Wenn wir guten Herzens sind, gibt's auch Produktion**

Entwicklungsverständnis und Lebensgeschichten bolivianischer Aymarabauern: Wege bei der Erneuerung traditioneller Lebens- und Produktionsformen und deren Bedeutung für eine Nachhaltige Entwicklung


Die qualitativ-strukturelle Auswertung von fünf autobiographischen narrativen Interviews mit Aymarabauern aus Bolivien ergab, dass Pachamama ("Weltenmutter") ein zentrales Deutungsmuster ist. Es steht im Zentrum eines seelisch-geistigen Bewusstwerdungsprozesses (Individuation) der sowohl eine persönlich-individuelle, als auch gemeinschaftlich-gesellschaftliche Dimension aufweist.

Band 44, Lorenz Bachmann

**Review of the Agricultural Knowledge System in Fiji**

Opportunities and Limitations of Participatory Methods and Platforms to Promote Innovation Development


The author describes the articulated agricultural knowledge system of the Small Island country Fiji with all its major actors. Local farmers, the agricultural research and extension departments of the Ministry of Agriculture are in the centre of analysis. The study examines the potentials of participatory methods and platforms to improve the process of agricultural innovation development.

Band 45, Andrea Knierim

**Konflikte erkennen und bearbeiten**

Aktionsorientierte Forschung zwischen Landwirtschaft und Naturschutz in Brandenburg


Band 46, Hubert Hugle

*Mensch und Pflanze*
Intuitionen über Wechselwirkungen von menschlichem Bewusstsein und Problemen im Kulturpflanzenbau

Wichtige Beiträge zum Thema Kommunikation zwischen Mensch und Pflanze, zu Intuition und zur Erschließung des Unbewussten werden zusammengefasst, und aus dieser Perspektive wird eine Selbstüberlieferung des Autors geschildert und interpretiert. Eine Pflanzenenergie wahrzunehmen, intuitiv ein Rezept für die Herstellung einer Pflanzenessenz zu finden, sind Fähigkeiten, die man im herkömmlichen Sinn nicht erlernen kann. Als Funktionen des Unbewussten sind diese schon im Menschen angelegt und müssen nur wieder erschlossen werden. Mit diesem Buch wird beschrieben, wie der Autor versucht, in diese Bereiche vorzudringen und erste Erfahrungen im praktischen Kulturpflanzenanbau zu machen.

Band 47, Anja Christinck

"This seed is like ourselves"
A case study from Rajasthan, India, on the social aspects of biodiversity and farmers' management of pearl millet seed

This book is based on fifteen months of intensive field studies carried out in the semi-arid state of Rajasthan, India. This work contributes to the actual debate on the conservation of genetic resources, seed systems and participatory plant breeding, and, more generally, the re-orientation of international agricultural research.

Band 48, Katrin Prager

Akzeptanz von Maßnahmen zur Umsetzung einer umweltschonenden Landbewirtschaftung bei Landwirten und Beratern in Brandenburg
2002, 172pp., ISBN 3-8236-1382-0, EUR 25.60


Band 49, Kirsten Probst

Participatory Monitoring and Evaluation: A Promising Concept in Participatory Research?
Lessons from two case studies in Honduras

Based on action research undertaken in two case study projects in Honduras, the book assesses the potential benefits and limitation of using Participatory Monitoring and Evaluation (PM&E) in participatory research and elucidates key conditions for its success in its implementation. It contributes to the actual debate on participatory research, and adds new aspects to the age-old topic monitoring and evaluation.

Band 50, Petra Jacobi

Supporting Urban Agriculture.
The Case of Dar es Salaam, Tanzania
ISBN 3-8236-1387-1, EUR 25.60 (noch nicht erschienen))

Band 51, Angelika Thomas

Landwirtschaftliche Bildung und Beratung zum Gewässerschutz in Deutschland
Eine Analyse der Erfahrungen in den Bundesländern

Das Buch fasst die Erfahrungen, die seit dem Ende der 80er Jahre in der Gewässerschutzberatung, aber auch innerhalb der allgemeinen landwirtschaftlichen Beratung und in der landwirtschaftlichen Aus- und Fortbildung gewonnen wurden, zusammen. Grundlage für die im Buch diskutierten Probleme und Potenziale, durch landwirtschaftliche Bildung und Beratung zur Umsetzung einer gewässerschonenden landwirtschaftlichen Praxis beizutragen, bilden Gespräche mit über 100 Experten aus den verschiedenen Bundesländern. Durch die in Deutschland anstehende Umsetzung der Wasserrahmenrichtlinie erhalten die dargestellten Erfahrungen zum Gewässerschutz in der Landwirtschaft besondere Bedeutung und Aktualität.

Band 52, Uta Bracken

Wie die Leute so reden
Eine Untersuchung von öffentlicher Kommunikation und gesellschaftlichem Wandel
bei den Lobi in Burkina Faso.
2003, ISBN 3-8236-1393-6, EUR 25.60
In diesem Buch geht es darum, wie Kommunikation dazu beitragen kann, dass die Ideen und
Wahrnehmungen oder Problemlösungen eines Einzelnen in der Öffentlichkeit Verbreitung finden
und schließlich die Wahrnehmung und das Handeln einer ganzen Gruppe beeinflussen.

Band 53, Marion Adams, Brigitte Kaufmann
_Tierhalter und lokales Wissen_
Indigene Charakterisierung lokaler Kamelpopulationen und Zuchtmaßnahmen
von Nomaden in Nordkenia
2003, ISBN 3-8236-1394-4, 100 pp., 10 Farbseiten, EUR 25.60
In der vorliegenden Studie wurde mit Hilfe einer semistrukturierten Methode das indigene Wissen
nomadischer Tierhalter in Nordkenia zur Charakterisierung ihrer Kamel-Lokalrassen, sowie das
damit im Zusammenhang stehende nomadische Zuchtkonzept ermittelt. Dabei wurden Merkmale
und Merkmalsausprägungen separat berücksichtigt um die von den Tierhaltern verwendeten
Unterscheidungskriterien systematisch zu identifizieren.

Band 54, Walter von Danwitz
_Berufsfeldanalyse: Meister und Techniker im Gartenbau_
2003, ISBN 3-8236-1395-2, EUR 25.60
Mit den vorliegenden Ergebnissen einer Berufsfeldanalyse der Absolventen/-innen von Gartenbaufachschulen der
Die Untersuchung liefert Ansatzpunkte zur Evaluation des Lehrengesetzes sowie für bedarfs- und zukunftsorientierte
Reformen der Fachschule. Sie führt damit letztlich zu einer Abstimmung des Weiterbildungsangebotes auf die
Anforderungen des Arbeitsmarktes.

Band 55, Simone Helmle
_Identitätsfindung und Wohlbefinden_
Über die Symbolik der Handlung «Einkaufen im Bioladen» auf der Grundlage lebensgeschichtlicher
Erzählungen
2004, ISBN 3-8236-1412-6, EUR 25.60

Band 56, Khin Mar Cho
_Guidelines for the Implementation of a Participatory Extension Approach_
An Empirical Study of the Training Needs of Agricultural Extension Agents in Myanmar
2004, ISBN 3-8236-1416-9, EUR 25.60
This book attempts to assess the training needs of extension agents for the improvement of the quality of their
knowledge and skills as well as their major duties and responsibilities. Other points of assessment were factors
affecting the performance of extension activities, the agents’ understanding of the existing extension approaches,
their awareness of and attitudes towards the participatory extension approach, and to point out guidelines for the future development of the participatory extension approach in Myanmar.

Band 57, Marianne Kusemann
_Bewältigung von Existenzgefährdung in landwirtschaftlichen Familienbetrieben_
**Band 68, Bettina Dengler**

*Approaching Vulnerability: Rural Livelihoods in the West Bank, Palestine*

While Palestine and respective pictures of violence are almost daily on the agenda of news magazines, this book approaches the West Bank, the people and their realities from an illuminating and different perspective. Departing from three rural villages in the West Bank, the priorities, resources and strategies of households and individuals are profoundly described and analysed.


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**Band 69, Halle Ekane Ignatius**

*The Rationality of African Cultural Dynamism: A Case Study in Bakossiland, South-West Province of Cameroon*

To change the culture of a people is not an easy undertaking. But changes and adaptations are necessary to ameliorate the welfare and wellbeing of the people in a changing world. This study about institutions in Africa provides necessary insights to discuss appropriate changes.

2005, XVIII + 258 pp.; ISBN 3-8236-1474-6, EUR 25.60

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**Band 70, Jutta Werner**

*Nomades entre marginalisation, entreprenariat et conflits: Stratégies des éleveurs mobiles du sud du Maroc face aux bouleversements du contexte pastoral et aux impératifs d'un développement durable*

Ce livre met en lumière le comportement économique des ménages nomades à travers leurs stratégies personnelles. Il se base sur des études de cas des nomades marocains. En reflétant le contexte et les conditions socio-économiques complexes de la pratique pastoral, ce livre comble une lacune scientifique en adaptant des approches méthodologiques existantes aux spécificités de l'élevage mobile.


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**Band 71, Carmen Kuczera**

*Der Einfluss des sozialen Umfeldes auf betriebliche Entscheidungen von Landwirten.*

Agrarpolitische Neuerungen stellen Landwirte immer wieder vor geänderte Situationen, die Betriebsanpassungen verlangen. Solche betrieblichen Entscheidungen waren bereits häufig Gegenstand wissenschaftlicher Untersuchungen, jedoch meist aus ökonomischer Perspektive. Im Kern dieser empirischen Studie steht dagegen das soziale Umfeld der Landwirte als Entscheidungsfaktor, der mittels verschiedener methodischer Ansätze umfassend untersucht wird. Das Buch geht einseitig der Frage nach, auf welche Weise das soziale Umfeld der Landwirte Einfluss auf ihre individuellen Entscheidungen nimmt. Andererseits werden soziale Prozesse und Strukturen identifiziert, die die Einflussnahme des sozialen Umfelds erleichtern bzw. erschweren.

2006, XII + 198 pp.; ISBN 3-8236-1481-9, EUR 25.60

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**Band 72, Teklu Tesfaye Toli**

*Coffee Forest Conservation: Local-level Institutions Influencing the Conservation and Use of Coffee Forests in Southwest Ethiopia*

In this book, Teklu Tesfaye argues that a number of interacting local-level institutions, both formal and informal, influence the conservation and use (management) of coffee forests in South West Ethiopia. Formal institutions were found to have been acting in a unilateral mechanism through top-down and narrow technocratic processes. They offer little chance, if any, for the participation of the ultimate resource users and thus failed to respond to their felt needs. They therefore were not in a position to safeguard coffee forests from the rampant deforestation...

2006, XVI + 188 pp.; ISBN 3-8236-1485-1; 978-3-8236-1485-2, EUR 25.60

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**Band 73, Rebecca Kemunto Raini**

*iPM information network analysis: Case study on information flow in integrated tomato pest management in Kenya*

This book addresses network mechanisms and the subsequent role they play in promoting or impeding information flow among the actors involved in tomato integrated pest management (IPM) in Kenya. Limited coordination between farm and non-farm actors in Kenya has contributed to poor IPM information flow and accessibility. Using social network analysis methods the existing emergent interaction structures underlying the organisations are revealed...

2006, XVI + 110 pp.; ISBN 3-8236-1486-X; 978-3-8236-1486-9, EUR 25.60
In diesem Buch geht es darum, wie Kommunikation dazu beitragen kann, dass die Ideen und Wahrnehmungen oder Problemlösungen eines Einzelnen in der Öffentlichkeit Verbreitung finden und schließlich die Wahrnehmung und das Handeln einer ganzen Gruppe beeinflussen.

Band 53, Marion Adams, Brigitte Kaufmann

**Tierhalter und lokales Wissen**

Indigene Charakterisierung lokaler Kamelpopulationen und Zuchtmaßnahmen von Nomaden in Nordkenia

2003, ISBN 3-8236-1394-4, 100 pp, 10 Farbseiten, EUR 25.60

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Band 54, Walter von Danwitz

**Berufsfeldanalyse: Meister und Techniker im Gartenbau**

2003, ISBN 3-8236-1395-2, EUR 25.60


Band 55, Simone Helmle

**Identitätserfinden und Wohlbefinden**

Über die Symbolik der Handlung „Einkaufen im Bioladen“ auf der Grundlage lebensgeschichtlicher Erzählungen

2004, ISBN 3-8236-1412-6, EUR 25.60


Band 56, Khin Mar Cho

**Guidelines for the Implementation of a Participatory Extension Approach**

An Empirical Study of the Training Needs of Agricultural Extension Agents in Myanmar

2004, ISBN 3-8236-1416-9, EUR 25.60

This book attempts to assess the training needs of extension agents for the improvement of the quality of their knowledge and skills as well as their major duties and responsibilities. Other points of assessment were factors affecting the performance of extension activities, the agents' understanding of the existing extension approaches, their awareness of and attitudes towards the participatory extension approach, and to point out guidelines for the future development of the participatory extension approach in Myanmar.

Band 57, Marianne Kusemann

**Bewältigung von Existenzgefährdung in landwirtschaftlichen Familienbetrieben**


Dynamiques de la Participation au Bénin :
Rôles et stratégies de différents groupes d'intérêts des processus de recherche agricole

La participation des différents acteurs, organisations et institutions du secteur du développement rural est devenue ces deux dernières décennies un des points centraux autour duquel tournent tous les projets et programmes visant l'amélioration des conditions de vie des agriculteurs au sud de Sahara. Ce regain d'intérêt a inévitablement conduit à une inflation du sens et du contenu du concept de « Participation ». Celui-ci semble devenir une machine qui tourne à vide, une sorte de slogan ou une formule magique et incantatoire dont l'objectif premier semble être le captage de la rente financière internationale.

Band 59, Judith Riehle, Vanessa Tegge
Landwirtschaft erleben
Wirken Schulbauernhof und Kurzpraktikum gegen Imageverlust?


Band 60, Ulrich Schmidt
Finanzierung privater landwirtschaftlicher Beratung in Transformationsländern
Untersuchungen zur Wirtschaftlichkeit von Beratung am Beispiel der Erzeugergemeinschaft „Federatia Agriculturilor de Munte Dorna” in Rumänien


Band 61, Thomas Aenis
PROZESSION - ORGANISATION - TEAMS
Gruppenkommunikation und dezentrale Steuerung anwendungsorientierter Forschung

In dieser Arbeit wird ein praxisgetestetes Modell zur Steuerung anwendungsorientierter Forschung entwickelt, das Managern zukünftiger Projekte als Orientierungsrahmen dienen kann. Dafür werden in einem iterativen Ansatz der „Aktionsforschung zu Metathemen“ ein theoretisches Konzept zur dezentralen Steuerung mittels Gruppenkommunikation erarbeitet und ein konkreter Fall, das Verbundforschungsprojekt GRANO, untersucht. Drei zu steuernde Kommunikationsbereiche werden identifiziert: der Forschungsprozess, die Organisation und die Teams.

Band 62, Iris Lehmann
Wissen und Wissensvermittlung im ökologischen Landbau in Baden-Württemberg
in Geschichte und Gegenwart


Band 58, Guy Nouatin
Band 59, Judith Riehle, Vanessa Tegge
Band 60, Ulrich Schmidt
Band 61, Thomas Aenis
Band 62, Iris Lehmann
Ausbildung im Ökologischen Landbau


Partizipation und Partnerschaft
Bauern, Forscher und Berater in Brasilien

Spannungen in der Zusammenarbeit zwischen Forschung, Beratung und Bauernorganisationen können die Entwicklung nachhaltiger Formen der Landwirtschaft und des Ressourcenmanagements empfindlich behindern. Der Autor beschreibt anhand zweier Fallstudien im brasilianischen Amazonasgebiet die Konflikte, Machtbeziehungen sowie die Organisationsdynamik der beteiligten Akteure und diskutiert zentrale Elemente partizipativer Forschung und Beratung: Identifizierung des Bedarfs, Verhandlung, Vertrauen und Einfluß persönlicher Faktoren, wie Einstellung, Motivation und Fähigkeit der Forscher und Berater.

Mensch und Natur in Mauretanien
Zum Verhältnis ehemaliger Nomaden zur Natur und deren Schutz


The Local Knowledge System for Plant Protection and Soil Conservation in Rain-Fed Agriculture in the West Bank, Palestine

Agriculture in the West Bank, Palestine lost very much of its former importance and is endangered. Land and water resources are permanently menaced by confiscation through the Israeli Authorities. And young people look for better education and employment outside agriculture. With this development the respective local knowledge, especially about rain-fed agriculture is endangered as well. Quite a reason to assess and to document it, especially because rain-fed agriculture is the most sustainable option for the future, in an increasing struggle about water resources in the region.

Linking Small-Scale Farmers to Markets. A Multi-Level Analysis with Special References to Malawi, Kenya and South Africa.

The international development targets for poverty alleviation have shifted attention to specific linkages between trade liberalisation and poverty with the growing importance of the WTO. The linkages between trade and poverty are generally interpreted in two perspectives. Mainstream economists take an aggregate macro-economic approach and are generally positive about the impact on trade liberalisation on poverty. On the other hand, a micro-level approach, focussing on a wider socio-economic perspective on livelihood level displays the alternative. The two perspectives occupy different "domains" and are not easily integrated.

This study aims to confront these two approaches and relates the findings to the general discussion regarding appropriate development strategies of the small-scale farming sector in developing countries.
Band 68, Bettina Dengler

Approaching Vulnerability
Rural Livelihoods in the West Bank, Palestine

While Palestine and respective pictures of violence are almost daily on the agenda of news magazines, this book approaches the West Bank, the people and their realities from an illuminating and different perspective. Departing from three rural villages in the West Bank, the priorities, resources and strategies of households and individuals are profoundly described and analysed.


Band 69, Halle Ekane Ignatius

The Rationality of African Cultural Dynamism
A Case Study in Bakossiland, South-West Province of Cameroon

To change the culture of a people is not an easy undertaking. But changes and adaptations are necessary to ameliorate the welfare and wellbeing of the people in a changing world. This study about institutions in Africa provides necessary insights to discuss appropriate changes.

2005, XVIII + 258 pp.; ISBN 3-8236-1474-6, EUR 25.60

Band 70, Jutta Werner

Nomades entre marginalisation, entreprenariat et conflits
Stratégies des éleveurs mobiles du sud du Maroc face aux bouleversements du contexte pastoral et aux impératifs d’un développement durable

Ce livre met en lumière le comportement économique des ménages nomades à travers leurs stratégies personnelles. Il se base sur des études de cas des nomades marocains. En reflétant le contexte et les conditions socio-économiques complexes de la pratique pastoral, ce livre comble une lacune scientifique en adaptant des approches méthodologiques existantes aux spécificités de l'élevage mobile.


Band 71, Carmen Kuczera

Der Einfluss des sozialen Umfeldes auf betriebliche Entscheidungen von Landwirten.

Agrarpolitische Neuerungen stellen Landwirte immer wieder vor geänderte Situationen, die Betriebsanpassungen verlangen. Solche betrieblichen Entscheidungen waren bereits häufig Gegenstand wissenschaftlicher Untersuchungen, jedoch meist aus ökonomischer Perspektive. Im Kern dieser empirischen Studie steht dagegen das soziale Umfeld der Landwirte als Entscheidungsfaktor, der mittels verschiedener methodischer Ansätze umfassend untersucht wird. Das Buch geht einseitig der Frage nach, auf welche Weise das soziale Umfeld der Landwirte Einfluss auf ihre individuellen Entscheidungen nimmt. Andererseits werden soziale Prozesse und Strukturen identifiziert, die die Einflussnahme des sozialen Umfelds erleichtern bzw. erschweren.

2006, XII + 198 pp.; ISBN 3-8236-1481-9, EUR 25.60

Band 72, Teklu Tesfaye Toli

Coffee Forest Conservation:
Local-level Institutions Influencing the Conservation and Use of Coffee Forests in Southwest Ethiopia

In this book, Teklu Tesfaye argues that a number of interacting local-level institutions, both formal and informal, influence the conservation and use (management) of coffee forests in South West Ethiopia. Formal institutions were found to have been acting in a unilateral mechanism through top-down and narrow technocratic processes. They offer little chance, if any, for the participation of the ultimate resource users and thus failed to respond to their felt needs. They therefore were not in a position to safeguard coffee forests from the rampant deforestation...

2006, XVI + 188 pp.; ISBN 3-8236-1485-1; 978-3-8236-1485-2, EUR 25.60

Band 73, Rebecca Kemunto Raini

IPM information network analysis
Case study on information flow in integrated tomato pest management in Kenya

This book addresses network mechanisms and the subsequent role they play in promoting or impeding information flow among the actors involved in tomato integrated pest management (IPM) in Kenya. Limited coordination between farm and non-farm actors in Kenya has contributed to poor IPM information flow and accessibility. Using social network analysis methods the existing emergent interaction structures underlying the organisations are revealed...

2006, XVI + 110 pp.; ISBN 3-8236-1486-X; 978-3-8236-1486-9, EUR 25.60
The Agricultural Knowledge System (AKS) in Ethiopia is undergoing a significant transformation process as the demands and challenges facing it grow. In this book, the author analyses the history, current status and future direction of the AKS in Ethiopia with a particular reference to the Tigray region, focusing on the overall setting, the linkages between the different actors, and its recent developments.

2007, XII + 164 pp.; ISBN 978-3-8236-1496-8, EUR 25.60

Also published by Margraf Publishers:

Volker Hoffmann (Hrsg.)
Beratung von Familien mit existenzgefährdeten Betrieben in der Landwirtschaft
Dieses Buch gibt einen breiten Überblick über die Probleme, die Aufgaben, die Methoden und die Organisationsformen der Unterstützungsangebote. Es geht auf die Geschichte der letzten 30 Jahre ein, und gibt einen Einblick in das Geschehen quer durch Deutschland mit einem Ausblick auch auf die Nachbarländer.

Hoffmann, Volker
Bildgestützte Kommunikation in Afrika
Grundlagen, Beispiele und Empfehlungen zu Angepassten Kommunikationsverfahren in Ländlichen Entwicklungsprogrammen südlich der Sahara.
2001; 350 pp.; numerous b&w and coloured ills.; 21 x 15 cm; paper; ISBN 3-8236-1343-X; EUR 35.80

Hoffmann, Volker
Communication sous-tendue par l’image en Afrique
Principes, examples et recommandations concernant les méthodes de communication adaptées dans le cadre des programmes de développement rural conduits en Afrique subsaharienne.
2001; 340 p; numerous b&w and cloured ills.; 21 x 15 cm; paper; ISBN 3-8236-1344-8; EUR 35.80

Hoffmann, Volker
Picture Supported Communication in Africa
Fundamentals, Examples and Recommendations for Appropriate Communication Processes in Rural Development Programmes in Sub-Saharan Africa.
2000; 352 pp.; numerous b&w and cloured ills.; 21 x 15 cm; paper; ISBN 3-8236-1342-1; EUR 35.80
Nachhaltigkeit und Landschaftsnutzung. Neue Wege kooperativen Handelns
(Mitbetreuung von: Müller, Toussaint, Bork, Hagedorn, Kern, Nagel, Peters, Schmidt, Weith, Werner, Dosch, Piorr).
Nachhaltigkeit ist kein statisches Konzept. Es bedarf der ständigen Fortentwicklung und Erneuerung. Im Rahmen des BMBF-Förderschwerpunktes «Ökologische Konzeptionen für Agrarlandschaften» entwickelte und erforschte das Verbundforschungsvorhaben GRANO über 5 Jahre in zwei Modellregionen neue kooperative Ansätze zur nachhalten Landschaftsnutzung.
2002; 410 S., 60 Ills., 17 x 24 cm; paper; ISBN 3-8236-1383-9; EUR 30.00

Müller, Klaus et al.
Wissenschaft und Praxis der Landschaftsnutzung. Formen interner und externer Forschungskooperation.
2002; 374 S., 21 x 15 cm, 25 figs & 3 photos; paper; ISBN 3-8236-1388-X; Euro 25.00

Gunda Matschonat, Alexander Gerber
Wissenschaftstheoretische Perspektiven für die Umweltwissenschaften
In diesem Buch analysieren führende Wissenschaftstheoretiker den Stand der epistemologischen Diskussion in den Umweltwissenschaften und zeigen Perspektiven für deren Weiterentwicklung auf.

Uwe Jens Nagel, Thomas Aenis, Axel Dosch, Katrin Prager, Verena Toussaint
Zur Wirkungsanalyse transdisziplinärer Forschung. Ein Untersuchungskonzept der Nachhaltigkeit des Landnutzungsprojektes GRANO.
2004, 132 S., 15 x 21 cm; ISBN 3-8236-1429-0; Euro 22.00

Anja Christinck, Eva Weltzien, Volker Hoffmann (Editors)
Setting Breeding Objectives and Developing Seed Systems with Farmers
Setting objectives and priorities is a crucial component of successful breeding programs as it determines the future course of action, maximizes chances for success and the impact achieved, and clarifies roles and responsibilities of partners. The book provides valuable insights not only for plant breeders but also development workers who seek to encourage farmer innovations with regard to variety development. Bio-diversity specialists involved in in situ management of plant genetic resources, as well as educators and trainers in the above mentioned fields will find useful tools and overviews.
2005, 188 pp., 20 x 26 cm; paper, ISBN 3-8236-1449-5; 28 Euro
The author

Mamusha Lemma, born in 1971 in the Shoa province of Ethiopia, completed his Bachelor of Education in English at Kotebe College of Teacher Education in 1993 with a great distinction and received the Gold Medal award. Immediately after, he was employed at Mekelle College of Dryland Agriculture and Natural Resources (now Mekelle University) as a Graduate Assistant. After two years of service, he obtained a Master of Arts in Rural Social Development from Reading University (UK) in 1996. Returning to Mekelle University, he served the university as the Assistant Dean of Students and the Research and Publications Officer. He was also on various standing committees and a coordinator for the Indigenous Soil and Water Conservation (ISWC) Ethiopia project, where he jointly published articles and book chapters. In August 2003, he got the DAAD scholarship award and started his studies at ZEF (University of Bonn), and later moved to Hohenheim University where he obtained his PhD in March 2007. During his studies at Hohenheim University, he held a teaching assistantship position in Rural Communication and Extension and Knowledge and Innovation Management in the Institute for Social Sciences in Agriculture. He is currently a lecturer in Rural Sociology, Extension Education, and Co-operative Theory and Practice at Mekelle University in Ethiopia.

The book

The Agricultural Knowledge System (AKS) in Ethiopia is undergoing a significant transformation process as the demands and challenges facing it grow. In this book, the author analyses the history, current status and future direction of the AKS in Ethiopia with a particular reference to the Tigray region, focusing on the overall setting, the linkages between the different actors, and its recent developments. Taking the extension service as a core component of the system, the book analyzes interrelationships between local and formal knowledge systems; identifies institutional, organizational and human capacity constraints facing the system; and assesses the potential of recent policy reforms and institutional developments to improve the effectiveness of the system. The book reflects the specific context in which the system operates, clarifies the extent to which it is institutionally pluralistic and coordinated, assesses its overall strengths and weaknesses, and offers policy recommendations for reorienting it, enabling it to effectively respond to the varied and changing conditions in the country, as well as to the developments and challenges shaping extension globally.