

**OPPORTUNITIES AND CHALLENGES FOR PRIVATE SERVICE
DELIVERY: THE CASE OF PRIVATE CROP PROTECTION AND
COMMUNITY ANIMAL HEALTH WORKERS' SERVICE DELIVERY
IN ALABA SPECIAL DISTRICT, SOUTHERN ETHIOPIA**

M.Sc. Thesis

MATHEWOS MUKE

October 2010

Haramaya University

**OPPORTUNITIES AND CHALLENGES FOR PRIVATE SERVICE
DELIVERY: THE CASE OF PRIVATE CROP PROTECTION AND
COMMUNITY ANIMAL HEALTH WORKERS' SERVICE DELIVERY
IN ALABA SPECIAL DISTRICT, SOUTHERN ETHIOPIA**

**A Thesis Submitted to the Department of Rural Development and
Agricultural Extension, School of Graduate Studies
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**In Partial Fulfillment of the Requirement for the Degree of
MASTER OF SCIENCE IN RURAL DEVELOPMENT AND
AGRICULTURAL EXTENSION (RURAL DEVELOPMENT)**

**By
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October 2010

HARAMAYA UNIVERSITY
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As *Thesis* research advisor, I hereby certify that I have read and evaluated this thesis prepared, under my guidance, by **Mathewos Muke Munaje** entitled: **Opportunities and Challenges for Private Service Delivery: The Case of Private Crop Protection and Community Animal Health Workers' Service Delivery in Alaba Special District, Southern Ethiopia**. I recommend that it be submitted as fulfilling the *Thesis* requirement.

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DEDICATION

I dedicated this thesis manuscript with love to my mother, Bontole Tantu, for showing me the firm ground and for her love and affection. I feel very happy that her efforts have finally come to fruition.

STATEMENT OF THE AUTHOR

First, I declare that this thesis is my bonafide work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Haramaya University and is deposited at the university library to be made available to borrowers under the rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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ABBREVIATIONS

AI	Artificial Insemination
CBA	Cost Benefit Analysis
CBOs	Community Based Organizations
BoARD	Regional Bureau of Agriculture and Rural Development
CAHWs	Community Animal Health Workers
DAs	Development Agents
FAO	Food and Agricultural Organization
FDRE	Federal Democratic Republic Ethiopian, A Political Party that rule Ethiopia since 1991
FFS	Farmers Field School
FGD	Focus Group Discussion
FHHH	Female Headed House Hold
FMD	Foot and Mouth Disease
FTC	Farmer Training Center
GTZ	Gesellschaft für Technische Zusammenarbeit
Ha	Hectare
HH	Household
IPMS	Improving Productivity and Market Success of Ethiopian farmers' project
KIGs	Key Informant Groups
LVIA	Lay Volunteers International Association
MFI	Micro Financial Institution
MoARD	Ministry of Agriculture and Rural Development
NGOs	Non Governmental Organizations
OECD	Organization for Economic Co-operation and Development
PA	Peasant Association
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
PCPS	Private Crop Protection Service
PSD	Private Sector Development
SWOT	Strength weakness opportunities and threats
WoARD	Woreda (District) office of Agriculture and Rural Development
WTP	Willingness to Pay

BIOGRAPHICAL SKETCH

Mathewos Muke Munaje was born in *Wolaita zone, Damot Woyde* district, *Mayo Kote* PA to his father Ato Muke Munaje and mother W/ro Bontole Tantu. He completed primary and secondary school in *Wolaita zone, Boditti* Junior and *Boditti* Senior secondary school, respectively.

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In October 2008, he joined Haramaya University through self sponsor to pursue his Master of Science (M.Sc.) studies in Rural Development Stream in the Department of Rural Development and Agricultural Extension, which this volume is the partial fulfillment. The author is single.

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**OPPORTUNITIES AND CHALLENGES FOR PRIVATE SERVICE DELIVERY:
THE CASE OF PRIVATE CROP PROTECTION AND COMMUNITY ANIMAL
HEALTH WORKERS' SERVICE DELIVERY IN ALABA SPECIAL DISTRICT,
SOUTHERN ETHIOPIA**

ABSTRACT

CAHWs and PCPS are the two community-based private services operating in Alaba since three years. However, there was no systematic assessment of this initiatives have been made to learn lessons and develop a strategy for scaling successful experience. This research was initiated to fill this gap. Specifically the research attempted to address four important questions: i) What are the challenges and opportunities for emergence and expansion of these services? ii) What are the extent of service coverage and commercial viability to providers? iii) How do the private service providers perceive the entrance and expansion of service delivery? iv) Why some farmers use privately provided services and others don't? The key findings of research are i) the providers are different in their supply capacity. Although the PCPS providers were relatively better capacitated with basic equipments, CAHWs are lacking the minimum critical facilities for primary animal health care provision. The providers have also perceived many opportunities yet specific to each service. Constraints perceived are also different for each service and many of them are non-technical, but are issue of policies and institutional challenges for both services and require service- specific policy and institutional arrangement to promote the service delivery system; ii) PCPS service coverage has shown the dominance of herbicide service than that of pesticide as well as pre-harvest service coverage than that of post-harvest. In CAHWs, the coverage is cattle dominated than other species with focus of antibiotic treatment than other services. Overall, service coverage is an indicator of the performance of service provider. Analysis of financial viability of the service to providers has also showed its viability even if the current costs of chemical and drugs increased by 14 and 10% for CAHWs and PCPS respectively; iii) The PCPS better satisfied the nearby PA users, whereas in CAHWs service the far PA users were better satisfied with accessibility and effectiveness of the service; and iv) The survey has also revealed that majority of users are willing to pay the said charge if it will improve their income as farmers and empower them financially. The findings imply: i) the effective demand for herbicide than pesticide and confirms the cereal crop domination of the district than cash crop production; ii) the difference in performance of providers in respective PAs and effective demand for CAHWs and PCPS in far and near PAs, respectively; iii) The proportion of those who perceived the current CAHWs charge is lower are greater than that of PCPS. This implies these users might have satisfied by the benefit they derived from CAHWs service; and iv) An increase in income is an issue of ability to pay for services. The key recommendations to seize opportunities & address challenges include: i) For the future, the providers have to focus on existing opportunities at hand and should explore effectively; ii) In response to the challenges identified, it is recommended to develop supportive services and enabling policies and institutional arrangements; iii) In order to avoid unfair competition, enforcement mechanism is vital regarding licensing and policing. PCPS is quite new, needs service standards and guidelines; iv) the service delivery should go beyond mere increase in yields into more of income generating schemes and market facilities for users in order to sustain their income and this is an important condition need to be attached to WTP.

1. INTRODUCTION

1.1 Background of the Study

Ethiopia is one of the poorest nations in the world, where agriculture is the basis of livelihood for the majority of the population. Real per capita income is very low, currently estimated to be 140 USD per year. Poverty is widespread with an estimated 44% of the total population living below the poverty line in the 1999/2000 and poverty incidence is much higher in rural areas than urban areas (FDRE, 2002). Agriculture contributes 50% of gross domestic production (GDP), employs 85% of the population and the main income-generating sector for the majority of the rural population. Despite the potential for market oriented agricultural economic development, smallholder farming performance and its contribution to poverty reduction and economic development has remained very low (Getahun, 2004). One, among many, of the reasons for this is lack of effective agricultural services delivery. To ameliorate the challenges and realize the potential of the sector, decades of efforts have been made to improve the provision of supportive services such as, credit, research and extension, post harvesting services and marketing of agricultural products but most of the service provision activities have been mainly carried out by the public sector through various development projects (Azage *et al.*, 2006).

Since 1991, Ethiopia has set forth a comprehensive economic development strategies that target economic growth and poverty reduction through efforts designed to promote a market-led transformation of the agricultural growth. Thus, PASDEP places a great emphasis on commercialization and diversification of agricultural production and exports, active private sector participation in supporting rural subsistence farming moving to small scale market-oriented agriculture. Hence, the focus of the agricultural support service delivery has to move from subsistence-orientation to a kind of service that supports improving the productivity and market success of smallholder production systems (FDRE, 2002). Besides, pluralism is required in service delivery with increasing involvement of the private sector, NGOs and farmer groups/cooperatives.

Globally, public monopoly in production of inputs and service delivery has recently become under serious challenge. The service reform trends include decentralization, cost-sharing and complete privatization/user fee. A range of pressures, both internal and external are forcing a re-examination of public agricultural services. Hence, the world is

experiencing a situation where many countries are finding it necessary to implement and experiment with different reforms including the option of complete privatization of agricultural services. However, appropriate service delivery reform and institutional arrangements in service delivery is context specific.

In Ethiopia, the agricultural service delivery system assessment revealed a weak demand side since farmers and communities are not well organized to be able to analyze their real needs and demand and validate it in view of their own resources. On the service provision side, the public sector has retained its monopoly and few emerging non public service providers are not working towards to the required level of effectiveness and efficiency (Puskur and Hagmann, 2006). This may result from factors such as regulatory environment, business linkages and lack of public support that affect organizational and institutional set ups to support, organizing and respond to demands. Hence, the need for understanding and analyzing the prevailing opportunities and challenges for the emergence of vibrant private service delivery systems is imperative. It is also equally important to look into the possible roles of and mechanisms for public support to private service development for efficient and equitable functioning of the service provision. This study contributes towards the same direction.

1.2 Statement of the Problem

In recent development strategy, Ethiopia has set forth a comprehensive set of development objectives that target economic growth and poverty reduction through strategies designed to promote a market-led transformation of the rural economy. PASDEP places a great emphasis on commercialization of agriculture, diversification of production and exports, and private sector investment in order to move the rural economy beyond subsistence farming to small scale market-oriented agriculture. However, past efforts of public agricultural service delivery system did not lead commercialization of smallholder agriculture moving (FDRE, 2002). Hence, with the main thrust of commercialization, to move a subsistence-oriented agriculture of the country to more productive and market-oriented production systems, the agricultural supportive service has to be transformed and should become more responsive, client-oriented and demand-driven.

After years of neglect, there is now renewed interest in privatization of agricultural services in many developing countries. However, the issue of how best to provide and finance private services remains controversial. This needs understanding the roles and capacity of the public and private sector, and civil society while ensuring demand-driven service delivery to meet the needs of farmers and making service provision more efficient and financially sustainable to maintain equity among poor female farmers and other marginalized groups have access to services. In view of this, the need for involving private sector either fully or partially supplementing public sector service delivery is being increasingly recommended in Ethiopia (World Bank, 2005).

Private sector development and the performance of private sector activities is now seen as crucial to economic growth and poverty reduction in developing countries. However, past experiences in many developing countries with contracting out indicate that it often takes time for NGOs and small private-sector enterprises with the ability to provide adequate services to emerge. This indicates the importance of public supportive services for the emergence and development of small private enterprise. Further, government has a critical role to play to create an enabling environment for private sector investment in various aspects through, among others, capacity building, appropriate regulatory frameworks and the implementation of competition law. Therefore, it is important to understand various mechanisms of public support to promote the development of vibrant private sectors in service provision. These have to remain public goods that the government will need to provide for the proper functioning of the market. As private enterprise is a prime engine of growth and development, it needs the public support that enhancing governance and the rule of law to attract more and broader private investment (Kurokawa *et al.*, 2008).

In the past, most developing countries have implemented various strategies from revitalization within the existing public service to privatization to reform publicly dominated agricultural services. These reforms have revealed that a public sector monopoly in provision of agricultural services is no more justifiable. As a result, many developing countries are taking various measures to improve national service delivery systems through the involvement of private service providers. This has created a growing trend for a state to move from being a simple provider of services to work of regulatory, quality assurance and capacitating and scaling-up the participation level of private sectors and farmers and their organization so that they would gradually shift from a passive

beneficiary clients to active partners in service delivery (Rivera and Qamar, 2003). Beyond improving the investment climate, the public can do more to support the private sector including expanding access to public goods and more importantly supporting and capacitating private sectors for efficient and equitable provision of services.

Providing adequate and stable funding for agricultural service in developing country has been a major problem due to lack of funding and other problems. In order to solve this problem, privatization of agricultural services is seen as a tenable policy option to meet problems associated with publicly funded agricultural service in developing countries. This needs the redefinition of the role of the public sector in the provision of service and the shift in financing the service system from government to producers. It is important to know that these shifts are not without risk and complication. This is because an excessive move to discard public sector roles in imperfect markets is often leading to chaotic market conditions and manifested by moral hazard and adverse of selection (Kurokawa *et al.*, 2008). Thus, the public sector should also play an important role in ensuring fair and equal treatment of all groups in a society, especially the poor and disadvantaged; and a principal-agent problem in the sense that the community is hiring private service providers to accomplish service delivery. This requires strong institutional mechanisms for regulating the behavior of agent, enforcing ethics and regular dissemination of information to minimize the information asymmetry. Hence this needs building a much stronger investment climate through the promotion of a stable, efficient and harmonized legal business framework, provision of infrastructure and increased access to finance including strong support for the development of rural micro-finance. However, while these private service providers are more common in the western world, they are slowly emerging in developing countries.

The Improving Productivity and Market Success (IPMS) of Ethiopian farmers project in Alaba Pilot Learning Woreda (PLW), in collaboration with public and NGO actors has initiated the private service delivery system such as private crop protection and community animal health workers' services. However, there is no systematic assessment of this initiative has been made to learn lessons and develop a strategy for scaling out successful experience. There are a number of issues that need to be investigated. On the one hand, farmers should have effective demand for privately provided service, and on the other hand, there is a need for workable organizational and institutional arrangement to

support the response to demands. More importantly, private service provision ought to be financially viable to survive and grow. It is also necessary to understand service users and potential users perceptions about quality and benefit of private services. Therefore, this study was initiated to address this knowledge gap with respect to private service delivery in Alaba PLW from pluralistic service delivery perspective.

1.3 Objective of the Study

❖ The general objective of the study was to assess the opportunities and challenges for private service provision both from users and provider's point of view.

The specific objectives were:

- ✓ to assess perceptions of service providers about the opportunities and challenges to enter and expand the service,
- ✓ to assess the coverage and commercial viability of private spray and CAHWs service providers,
- ✓ to assess perceptions of potential users and the level of satisfaction of users with the accessibility, effectiveness and benefit of privately provided services; and
- ✓ to assess the farmers' ability and willingness to pay for private crop protection and CAHWs service in the study area.

1.4 Research Questions

The study was designed to address the following research questions:

1. What are the challenges and opportunities for emergence and expansion of private service provision?
2. What are the extent of service coverage and commercial viability to service providers?
3. How do the private service providers perceive the entrance and expansion of private service delivery?
4. Why some farmers use privately provided services and others don't?

1.5 Scope and Limitation of the Study

Due to the large number of PAs in the district, the potential limitation of the study was that it is focused on four purposive samples of rural PAs. Moreover, lack of information at the grass root level and update in a timely manner constituted a major constraint for the study. The study also limited in depth owing to time and financial availability.

It focused mainly on finding out the potential challenges and opportunities of providing private service in general and private crop protection and community animal health service in particular. Finally, it is important to note that Ethiopia is diversified in agro-ecological, socio-economic, and cultural environment, and the study being location specific in nature, its results may not be generalized to the zonal or regional level with blind recommendation. However, the recommendations and policy implications of the study can be used for the areas of similar contexts and as a basis for further studies.

1.6 Significance of the Study

Alaba district is purposively selected being one of the Pilot Learning Weredas of IPMS, the sponsor of this research, and it is where both private crop protection and community animal health services coexist. The public sector agricultural service in which Ethiopia have invested large sums are achieving only limited impact but face unsustainably high recurrent costs. Further, the fundamental promise of public sector service that low income farmers are unlikely to obtain private services unless it is provided by government is increasingly being challenged. The significant contributions of the crop protection and livestock health services to the Ethiopian economy have been studied by different authors (Admassu *et al.* 2005). However, through a review of the literature and a series of informal discussion with major actors of the sector, it has been found that, despite its importance, it has not been studied to as great extent within the context of challenges and opportunities to private service delivery. But, determining the challenges and opportunities with regard to the capacity of the service providers' will help emphasis the strengths and weaknesses of existing services delivery system and will provide foundational data to potential providers and policy makers. However, currently, little information is available to this regard. Therefore, this study was conducted with the intention to fill this gap and its findings provide various insightful learning for service providers, researchers and students interested in similar research theme for further investigation and contribute to improving private service delivery system in the district.

1.7 Organization of the Thesis

This thesis consists of five chapters. Chapter one deals with the background, problem statement, objectives and significance of the study. Chapter two reviews various literatures related to the main research topic. Methodological issues including the study area

description is presented in chapter three. The fourth chapter puts the results of the study and discusses their interpretation. The final chapter summarizes and concludes the thesis and forward possible policy implications and recommendations.

2. LITERATURE REVIEW

In this chapter the key concepts and ideas pertinent to the theme of the thesis are discussed. In addition relevant empirical research and their findings are reviewed in order to inform the current analysis.

2.1 Concept and Definitions

CAHWs: are community members formally/informally trained by NGOs, CBOs or veterinarians who serve in the local communities in provision of animal health services (DVM, 2001).

Privatization: is the act of reducing the role of government or increasing the role of private sector in delivery of services or in the ownership of assets.

Market Orientation: when extension services relate to productivity and marketing advice and linking farmers to national or international markets and additional support systems.

Demand: is defined as what people ask for, need and value so much that they are willing to invest their own resources, such as time and money, in order to receive services (Sanne, 2006).

2.2 Why Private Sector?

Private sector development is crucial for growth, development and employment creation in Africa. This is being recognized by donors in their support programs for the private sector (Kurokawa *et al.*, 2008). Private sector investments have grown faster than official development assistance; in the early 1980s, yet, few developing countries attract 80 percent of private sector investments; it is necessary to catalyze private sector investments to the others. In Asian countries the focus in the past has been on project-lending to governments and on public sector-led growth; the current financial crisis has renewed appreciation of the private sector's role as an engine of growth. Strong challenges, including globalization, technological changes, the rise of e-commerce, continuing poverty, and population growth continue to press forward the need of private sector. The private sector is needed and suited for sustaining rapid growth. The emerging Asian countries experience shows that growth is the most powerful weapon against poverty and to create jobs that use labor- the main asset of the poor.

2.3 The Role of Private Sectors in Poverty Reduction

The private sector in Africa is diverse. The private sector's contribution to both employment and GDP shows a strong positive correlation with GDP per capita. Thus, as countries grow richer, there is an increase in the labor force employed in private enterprise and overall, they make a larger contribution to GDP. There are different views about the dynamic contribution of private sectors to grow. On the one hand, private enterprise may contribute to competition and entrepreneurship. Some argue they are more productive as long as key challenges are removed, and some argue private enterprise are better at generating employment, and hence at reducing poverty (Kurokawa *et al.*, 2008).

Private investment in service delivery can also create fiscal space and relieve pressure on public budgets, thereby enabling governments to redirect more resources to social spending. Private sector participation in infrastructure can also improve the delivery efficiency of essential services and extend these to where there is poor. Private provision of goods and services with public financing can also be well-suited to the social sectors, where the private sector can be engaged to operate not-for-profit social facilities, e.g., schools and health facilities (ADB, 2000). But, the private sector cannot be expected to undertake extensive poverty interventions on its own. However, in recent years major changes in rethinking of the role of state have taken place in development strategy. For decades the state was considered to be central to any development effort. Recently, development economists increasingly call for a new role of the public sector moving away from state interventions in economic activities and unleashing the creative forces of private entrepreneurship. Given the weaknesses of government services as regards efficiency and accountability and the ubiquitous challenges to public funding, the retreat of the state up till outright privatization appears to be an obvious solution.

2.4 The Rationale and Types of Public Support for Private Sector Development

There are three components of the rationale for public support for private sector development. First, there is the premise that private sector development is good for growth. Secondly, the private sector is affected by growth challenges of a different nature and magnitude (e.g. they may have less access to formal sources of external finance). Finally, the challenges are due to market failures so that, in principle, there is a role for government to address these.

Public support for private sector development is justified when markets fail to allocate resources efficiently. Markets fail to allocate resources efficiently when property rights, which define the control over assets and rights, are incomplete. There are various types for public support for private sector development. In principle, the existence of market and coordination failures justifies public involvement in private sector development. Again, the scope and type of public intervention large in theory. Despite a strong theoretical case, it is important to underline that public support may fail to improve private sector development. This could be for several reasons. First, it seems questionable to assume that governments can have perfect information and perfect foresight, or better information than private firms. Investment climate reform might address market failures by establishing rules and regulations when they are lacking. Secondly, government intervention can also suffer from moral hazard problems (Stiglitz and Uy, 1996 as cited in Kurokawa *et al.*, 2008). The development of new technology and adoption of existing technology is characterized by externalities which cannot be fully appropriated. Thirdly, there can be private non-market means that can solve market failures. Joint action may raise collective efficiency, by internalizing externalities. Fourthly, addressing national coordination failures based on scale economies is probably the most far-reaching, but also the riskiest. Finally, government intervention carries the risk of misallocation and rent-seeking behavior. The public sector that is supporting the private sector need to assess the benefits and weaknesses of each approach and weigh up their respective risks. Public can provide support at least at three levels:

- The macro level (Policy): this refers to the overall investment climate and enabling environment which can be shaped, amongst other things, by the government policies and regulatory frameworks.
- The meso level (Institutional): which refers to labor and capital markets at the national, regional or sectoral level. Public initiatives at this level aim to improve the functioning of markets are often come under the rubric ‘making markets work.’
- The micro level (farm-household): this refers to a single business unit or a collection thereof. Private sector support at this level may be in the form of a business development service or firm specific assistance (e.g. in value chains).

The World Bank’s World Development Report (World Bank, 2005) on Investment Climate emphasizes the need for creating an enabling environment for private sector

development, and argues that there needs to be a right balance between market and government failures, and that enabling environment reform essentially addresses both market and government failures. Several donors agree that effective private sector development is good for pro-poor growth and that further support for the investment climate is required to achieve this.

2.4.1 Strategic Thrusts for Private Sector Development

The new strategy for private sector development (PSD) has three integrated strategic thrusts which capitalize on capabilities and experience in both public and private sector operations (ADB, 2000). These include:

Creating enabling conditions

These include sound and stable macroeconomic management elements such as appropriate competition policy; investment, trade, and price liberalization; reduced barriers to competition; well-functioning financial and capital markets; flexible labor and land markets; good physical, social, and technological infrastructure; equitable tax systems; pension and insurance reform; sound environmental and social standards; and legal and judicial systems that protect property rights, enforce contracts, and provide for dispute resolution. This takes instruments like policy dialogue, economic and sector work, program loans, project loans, technical assistance, co-financing and credit guarantees.

Generating business opportunities

In order to create business opportunities, it needs active private sector participation in donor-financed public sector projects through contracts for supply, management, concession, and leasing; well-designed with poverty reduction impacts; and donor supported privatization programs. Program loans, technical assistance, co-financing, and credit guarantees are the possible instruments this to take.

Catalyzing existing private initiatives

This category should target on private sector projects with development impacts or demonstration effects; and priority to infrastructure facilities, investment funds, specialized financial institutions for small and medium-sized enterprises and pilot health and education projects. The instruments are loans without government guarantees, equity investments and co-financing (ADB, 2000).

Operational Priorities for Private Sector Development

The pursuit of the strategic thrusts should focus primarily on three priority areas of operations: governance in the public and private sectors; financial intermediation and public-private partnerships (PPP). These three areas of operational focus represent the key vehicles for promoting private sector development and pro-poor growth in context of developing countries. In each areas of operational focus, concentration should be on activities in which it has underlying comparative advantages either governance in public and private sectors, commercialization and privatization, and corporate governance. Whereas, financial intermediation should focus on financial institutions and markets, local currency financing, investment funds, and small and medium-sized enterprises. The PPP concentrates on physical and social infrastructure development, and agriculture and rural sector development. To implement these fundamental changes, two important operating principles will guide the delivery of public supports and concentrate the development organization's efforts on where it can contribute best. *Think PSD* in public sector operations which entails deliberate efforts by public sector operations to improve the enabling environment for the private sector and to use the experiences of private initiatives as inputs to these efforts; it means asking systematically whether components of public sector projects can be undertaken by the private sector; it also calls for "crowding in" the private sector. The second principle is *think development impact* in private sector operations which entails an orientation to achieve greater development impact, and work with governments to take deliberate steps to reduce poverty.

2.4.2 Major Types of Agricultural Services

Public and Private Goods

Based on nature, agricultural service can be categorized into public or private goods. The concept and principle for analyzing public and private goods is of particular importance when we deal with agricultural services. Two criteria determine whether a good or service is closer to being public or private, the principles of excludability and subtractability (rivalry). Excludability applies when access is denied to those who have not paid for the product, while subtractability applies when one person's use or consumption of a good or service reduces its availability to others. A purely private good is characterized by high subtractability and excludability and a purely public good has low subtractability and excludability (Table 1). In between public and private goods are toll goods and common

pool goods. According to Umali and Schwartz (1994), toll goods are e.g. coded TV broadcasts and semi privatized high ways and a common pool good can be a beach, lakes etc. Table 1 classifies the basic types of goods. Because of the lacking excludability and subtractability of public goods, it is impossible to define and claim private property rights for them.

Table 1. Economic Classification of Agricultural Services

		Excludability		
		Low	Low	High
Rivalry	Low	Public Goods		Toll Goods
	High	Common Pool Goods	Private Goods	

Ill-defined property rights, in turn, prevent private contracts on the production and exchange of a public good or service and hence its supply. Private sectors will not provide public goods, because it is difficult to restrict their use or make people pay for using them. Public goods, therefore, are chronically undersupplied setting narrow limits for their commercialization (Kurokawa *et al.*, 2008). This public good problem can only be overcome by collective institutions and full-fledged privatization is excluded. The public good problem may also appear where a particular service is of private good nature in principle, but its production and use affects public interests. This is the case of externalities, which arise when individual actions affect others. However, from privatization point of view services further can be classified into the following three categories.

Services to be privatized

Services recommended for privatization fall into four categories depending on whether they could be left to the private sector or whether they require initial or continuous government support and /or regulatory supervision. They could use either of the following forms; services to be left wholly to the private sector; services to be left to the private sector with initial public sector support; services requiring regulatory supervision by the government; or services requiring continuous government support and regulatory service.

Services to be commercialized

The distinction under this category is based on whether the services can be contracted to a commercial agency and whether they can be subjected to full or only partial recovery

depending on the location of the beneficiaries of the service. They include: services to be contracted to the private sector; services to be subjected to full-cost recovery; or services to be commercialized and strengthened as full-cost recovery (GTZ, 1999).

Services to remain in the public sector

This category consists of those services which should exclusively be delivered by the public sector because either: public sector has a distinct comparative advantage over the private in service delivery; or public policy dictates that the public sector directly discharges the service in fulfillment of the social contract; or the service falls under the natural mandate of a restructured and rationalized public sector. This class consists of two categories: services that require relocation within the government; or services to remain in the domain of the MoARD.

2.4.2.1 Process of Selective Privatization

According to Umali and Schwartz (1994), animal health services cannot and should not all be privatized. Instead, a policy of selective privatization should be pursued. The services that are purely private goods should be shifted to the private sector as the first step. Then other services can be slowly transferred to the private sector. They suggest that, to achieve this, the government should lower trade barriers, remove price subsidies on publicly provided drugs, eliminate restrictions on private practice, subcontract services to the private sector, promote livestock and crop insurance plans, create a suitable environment for the development of smallholder producer organizations, and provide targeted, subsidized delivery in areas where animal health services are necessary but unprofitable for private providers. In this connection, FAO (1998) has pointed out that, even when services are recognized to be a state responsibility, they can be and often should be delivered by the private sector with supervision from the state authorities. As long as private practitioners can make a decent living, some services should be provided by private practitioners and not the staff employed by government. The government may also encourage private financing of the delivery of public or common pool services through judicious use of information and regulation. Hence, considerable opportunities exist for governments to overcome the fiscal constraints that presently limit the efficiency and quality of service delivery in developing countries by privatizing many of the activities that are presently being executed by the public sector.

2.4.2.2 Focus on Poor Areas and HHs

There is widespread agreement in the literature that conventional approaches of private service delivery may not be suited to marginalized and resource-poor areas. These areas rather require approaches that can overcome the structural constraints of high transaction costs and low demand for services resulting from poor awareness and subsistence-orientated production systems. A number of alternative models have emerged that are effective in addressing the issue of service delivery in poor areas. These include CAHWs, producer associations, community-based crop protection services, SHGs etc. These kinds of groups can be very useful for improving access to private services in poor areas and the government can play a significant role in promoting and facilitating them. However, most countries have yet to develop the supportive institutional and legislative frameworks that are necessary for these groups to be successful (Ahuja, 2004).

It is a myth to say that poor households in remote areas are not willing to pay for services at all: in a number of such areas, some of the NGOs are already charging a fee. In southern Sudan, for example, CAHws have been providing treatments and vaccinations on a cost recovery basis. In areas where there are genuine problems in paying, the government has the additional responsibility of nurturing the development process in a way that empowers the farmers to demand quality services (Ahuja 2004). This implies targeted subsidy to poor or building partnerships with local NGOs and channeling some of the public funds through them. This requires an effort that aims at community empowerment and awareness building to generate demand for these services.

2.4.3 Crop Protection Services

Crop protection research and extension services in Ethiopia dates back to the establishment of the then Imperial Ethiopian College of Agriculture and Mechanical Arts (now Haramaya University) in the late 1950s. The Establishment of the Institute of Agricultural Research (now Ethiopian Institute of Agricultural Research, EIAR) during the second half of the 1960s saw a more focused and organizational approach to crop protection research in general. Currently Ethiopia is implementing an extension approach called Participatory Demonstration and Extension Training System (PADETS). As part of this extension system, food crops, post harvest services and improved inputs are the main ingredients of crop extension package (Carlsson *et al.*, 2005). In connection to this, a large

number of insect pests have been recorded to affect major crops in Ethiopia, but only a few of these are considered to be of economic importance. Crop protection service is totally undertaken by ministry of agriculture, except for individual effort on farmers' plots. No producer developed so far to license the private sector in crop protection. Although there is legislation governing pesticide registration, clear guidelines on the importation, testing, and use of pesticides, legislations have not been enforced effectively. Another issue in crop extension is pesticides restricted in industrialized countries are observed while widely used in Ethiopia. Furthermore, no pesticide has been officially banned in this country.

2.4.4 Livestock service delivery

According to World Bank (2002) livestock services can be grouped into two major functional categories: health and production services. Health services include curative and preventive services and the provision of pharmaceuticals. Curative services include the provision of clinical care, while preventive services consist of vaccination, vector control, and disease control measures such as quarantines and movement restrictions. On the other hand, production services include research and extension relating to improved livestock husbandry and the provision of input supplies such as seeds, feeds and artificial insemination (AI). Production services try to improve livestock productivity by such means as genetic upgrading of livestock through artificial insemination, the improved formulation of feeds, the use of improved forages and changes in management practices.

Consequently, the major players that shape the livestock services sector are veterinarians and veterinary paraprofessionals, herders, consumers, government, NGOs in developing countries, and private entrepreneurs providing specialized services. In some countries, the limited number of trained veterinarians and their unwillingness to serve in remote rural areas has made paraprofessionals very valuable. Increasing competition in the livestock sector market has led to complementary livestock services extension, designed to promote and strengthen customer loyalty and expand market shares (Umali *et al.* 1994). They foresee strong support for livestock development in the near future as there is now increasing realization, that livestock development programs can play an important role in reducing rural poverty in the developing world. Second, the demand for animal products in the developing world is growing fast, and it can be expected to continue. Recent

projections show that over the next twenty years, the demand for meat in developing countries will increase by about 2.7% and the demand for milk by 3.2%.

2.4.5 Approaches to Extension Services

The World Bank (2002) prefer to focus on specific approaches to extension that have appeared in the last three decades as an attempt to overcome some of the weakness inherent in the public extension systems. These include Training and Visit, decentralization, privatized extension and Farmer Field Schools (FFS). In contrast, Rivera *et al* (2001) distinguishes between a variety of public sector reform strategies supporting the new paradigm market-driven income-generation (Table 2). According to this distinction, market reforms encompass four major reform strategies. These include: revision of public sector systems, pluralism, cost recovery and total privatization.

Table 2. Extension Market Reform Strategies

		Funding	
		Public	Private
Delivery	Public	Revision of public sector via downsizing and some cost recovery	Cost recovery (fee-based) systems (OECD countries, previously in Mexico)
	Private	Pluralism, partnerships, power Sharing (Chile, Estonia, Hungary, Venezuela, S.Korea, Taiwan)	Privatization (total), commercialization (The Netherlands, New Zealand, England and Wales)

Source: Rivera *et al.*, 2001

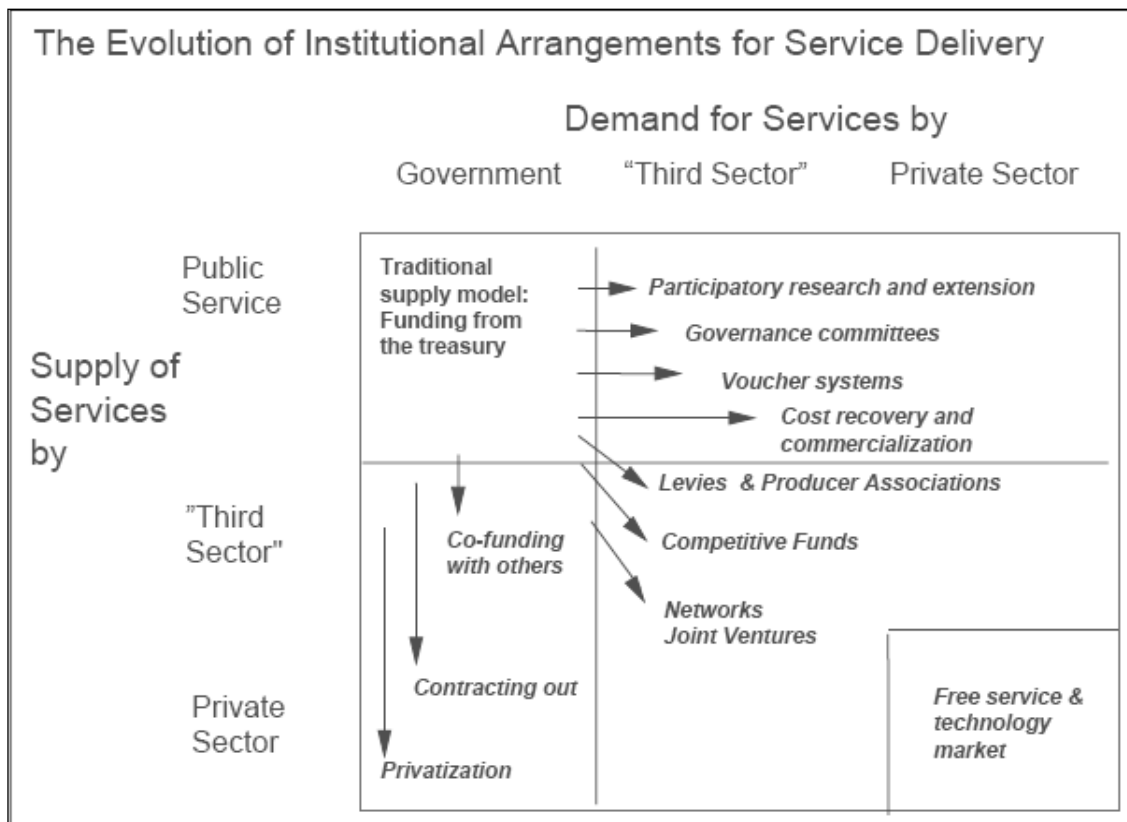
2.5 Evolution of Institutional Arrangements for Private Sector Development

Public service delivery is in many cases characterized by low efficiency of service delivery, isolation from customers and low degree of client orientation, lack of accountability and poor guidance by policies and weak public demand and control. The still dominant model of a public service - combining funding and service delivery - has been questioned for quite some time. Alternative institutional arrangements and forms of service delivery are emerging (Box 1). In the evolving arrangements, private and third sector organizations take a role both on the supply as well as on the demand side of the service system. Cost recovery and commercialization of public services indicate a greater

role of non-public actors on the demand side, whereas subcontracting and, at the extreme, full-fledged privatization leaves the supply of services to market actors.

Most goods actually fall in between the private / public distinction or are affected by some public concern. Hence, in most cases the provision of services requires the participation of both public and private actors to be generated. Therefore, institutional environment and institutional arrangement are another group of fundamentally important concepts which refer to the relationship between various, notably public and private actors. The term institutional arrangement describes the property rights, norms and mutual contractual

Box 1. Evolution of Institutional arrangement for private sector development



Source: GTZ, 1999.

obligations that govern the way in which economic units cooperate and/or compete. Institutional arrangements are embedded in the institutional environment that is the set of fundamental political, social and legal ground rules that establishes the basis for production, exchange and distribution (Box 1). For a private market to function, a strong

state is needed enforcing property rights and contracts. A weak state may be tempted to undermine market development by arbitrary confiscation or rent extraction (GTZ, 1999).

2.6 The Economic Aspects of Privatized Service Delivery

Efficient market functioning requires strong institutions and organizational arrangements, and it is therefore very useful to discuss the economic issues together with the larger political economy and the issue related to governance because this can be one area where future thinking in service delivery will need to focus. Farmers make economic decisions. The first principle of economics must therefore be the point of departure in thinking about the most efficient way of organizing service delivery. The first fundamental theorem of welfare economics states that ‘if there is no externalities, both buyers and sellers have symmetric information, there are no increasing returns to production, all buyers and sellers take price as given (that is no one has any market power), and there are no transaction costs’; then the competitive equilibrium is pareto-efficient. This result significantly influenced early thinking on the delivery of services (FAO, 1998) which in turn drove the policy for service delivery in many countries around the world in eighties and nineties.

Public Sector: Services that have a significant public good component such as compliance monitoring, quarantine, quality control, planning for emergencies and reporting to international bodies and neighboring countries, oversight of safety, import and export inspection of inputs and certification according to international standards; regulation, monitoring and support of other partners, accreditation of personnel, creation of enabling environment for the private sector and general formulation of policy should remain the responsibility of public sector to deliver the service (Ahuja and Redmond, 2001).

Private Sector: Pure private goods which do not involve any externalities or moral hazard problems should be delivered by private firms.

Shared responsibilities: Services such as continuing education and training, research, extension and advisory services should be provided by partnership.

2.6.1 Economic Impact of CAHWs Services

Contribution to HH livelihood

In Malawi the saving from increased livestock production in areas where CAHWs were active was \$57,000 in the year 1998-99. Farmers with CAHW services were more likely to afford a tin roof, window glass, horse cart, plough and radio, than farmers without access to CAHW services. Similar result was reported from Afghanistan where CAHW programs reduced mortality by 5% in calves, 10% in lambs and 38% in kids, compared with control areas without CAHWs. The benefits to farmers estimated to be \$120,000 per district per annum, while the costs of the program were \$25,000 per district. In Kenya farmers without access to CAHWs reported 70% more cattle deaths than those farmers who had access to CAHWs. The decrease in mortality provided benefits worth \$48 a year to each farmer using CAHWs (Holden 1997 as cited in Leyland and Catley, 2002).

Considering CAHWs from an economic perspective, the issue of transaction costs is paramount. The research in Senegal pointed out the comparative advantage of CAHWs in many areas, that in the current economic climate, they appear to be the only economically viable mechanism for delivering veterinary services. It also describes the emerging institutional linkages between private veterinarians to CAHWs and a mechanism for extending the ethical commitment of the veterinary profession into remote areas, and of reducing the government's transaction costs in coordinating CAHWs to provide public goods. This shows CAHW systems are the most economically efficient way to provide privatized veterinary services. Despite evidence of the impact of CAHWs, relatively few countries have officially recognized this level of support to CAHWs systems through appropriate policies and legislation.

Control and treatment of Disease

There are now more than 1500 government and NGO-trained CAHWs in Ethiopia (Wolmer and Scoones, 2005). Despite improved communication and collaboration, significant policy and institutional challenges remain. And, as Ethiopia's privatized system of CAHWs becomes more established, there will also be questions of affordability for poorer users, the need to identify who is excluded, and how to reach them.

In the Afar Region of Ethiopia, (Pan African Rinderpest Campaign) PARC demonstrated that CAHWs can carry out rinderpest vaccination rapidly, effectively and cheaply. In

1995, in neighboring districts of the Afar region, a CAHW project vaccinated 70,000 cattle using 22 CAHWs, 2 veterinary service staff, 1 vehicle and no cold chain. The efficiency of vaccination was 84%. No outbreaks of rinderpest have been reported since this campaign and the area has now been declared provisionally free from disease. The conventional government vaccination teams vaccinated, concurrently, 140,000 cattle using 14 vehicles, 56 staff and a full cold chain. The efficiency of vaccination was 72%. In Somaliland CAHWs achieved 95% vaccination efficiency using heat stable rinderpest vaccine – the highest efficiency reported in Africa since the PARC began (Mariner *et al.* 1994 as cited in Leyland and Catley, 2002).

Reporting and Surveillance of Disease outbreak

In Ethiopia, in 1996 an unknown respiratory disease of camels was first reported by an Afar CAHW to local PARC authorities. The disease subsequently spread to the Ogaden, Somalia and northern Kenya. In the 1980s and early 1990s, Ethiopia received very few reports of rinderpest from the Afar pastoral area due to the paucity of staff in the region and limited contact between the veterinary services and the pastoral community. Numerous reports of epidemic rinderpest were received from more sedentary communities surrounding the Afar, who had more regular access to services. This information bias led authorities to further focus rinderpest control resources around the Afar area but not in the Afar. When it was realized, through active surveillance, that the Afar was the endemic area, a CAHW system was introduced that resulted in appropriate surveillance and vaccination control efforts. Rinderpest was eradicated from Afar and the surrounding communities within 3 years (Mariner *et al.* 1994 as cited in Leyland and Catley, 2002).

CAHWs in pastoralist areas have good diagnostic skills. e.g. the 1998 rinderpest outbreak information in S. Sudan rapidly went from Livestock owner → CAHWs → Supervisor → radio message to the UNICEF veterinary program. The outbreak was dealt with quickly using CAHWs. A study of the activities of over 1000 CAHWs in Ghana found over half were having good to excellent impact on animal health service delivery. CAHWs provide a regular flow of information to veterinary professionals including reporting disease outbreaks (anthrax and newcastle) and the referral of difficult cases. It is evident from empirical evidence that CAHWs can not only provide valuable veterinary care, but also

act as reporters of disease outbreaks and contribute to disease surveillance systems other such report include Leyland and Catley (2002) and Admassu *et al* (2005).

2.6.2 Market Efficiency and Access to Market Information

The market efficiency argument also rests on the assumption that both buyers and sellers take prices as given which, in turn, is based on the assumption of many buyers and sellers in the market. Most service markets in developing countries are likely to violate this condition especially in poor remote areas. Whereas it is feasible to generate some competition among the service providers in high potential high density areas, the effective aggregate demand in poor marginal areas is often not adequate to support many providers leading to monopoly situations. While competitive bidding at short intervals can dissipate the monopoly advantage conferred by contracts (Ahuja and Redmond, 2001); this leads to the role of state in establishing transparent processes and institutional structures to facilitate efficient functioning of the market.

The first fundamental theorem requires that both buyers and sellers know and do not know the same thing. But in developing countries where there is imperfect market, the service providers have significantly more information advantage than the user and there are incentives to exploit the rents to that information. This asymmetry of information leads to two types of market failures-moral hazard, and adverse of selection. Although Umali and Schwartz (1994) and others recognized the problem of moral hazard, according to them this problem was likely to be limited to functions such as drug quality control in animal health service. The problem of opportunistic behavior can be minimized through contract design, administration and requires defining the quantity and quality of the service as well as specifying the condition under which the service will be delivered.

2.6.3 The Equity Dimension of Privatized Service Delivery

The first fundamental theorem of welfare economics is a pure efficiency result than equity. According to Ahuja and Redmond (2001), it completely side-steps the notions of fairness, distribution and equity, and is obviously silent about the welfare of those who are excluded from the market. Due to the importance of services in supporting the livelihoods of poor farmers throughout the developing world, and the assumption that the market will

exclude poor due to poor paying capacity, the governments in a large number of countries chose to build and heavily subsidize large systems and networks for delivering even those services that could be most efficiently provided through the market. A large number of African and Asian countries opted for that route to maintain equity.

2.7 Empirical Studies

A number of empirical studies have been conducted by different people and institutions on agricultural supportive services worldwide. The studies are mainly concentrated on describing the operation and effectiveness of the current government dominated service delivery system, experience of transforming the public services, demand for private service, and farmers' willingness to pay for service. But studies conducted on private crop protection spray service are minimal.

2.7.1 Privatization of Agricultural Services in Kenya

In its first phase, between 1994 and 1998, a consultative process initiated within the Ministry but involving only a few external stakeholders. These services were then classified according to whether the services were in the nature of public or private good as a starting point. This was meant to assist in determining which of the services should continue being rendered by the public sector and which ones should be privatized and handed over to the private sector where the private sector was in a position to profitably, effectively and sustainably deliver the services. In the case of those services that were of a public good nature, it was recommended that they should continue being rendered by the public sector but should be strengthened for greater effectiveness, efficiency and economy of delivery. Most of these services are those that have to do with creating an enabling environment for private sector development. There were, however, some services which, though being of a private good nature could not be effectively delivered by the private sector. This depended on the existence of a vibrant private sector establishment and the capacity of the service recipients to pay for the services (GTZ, 1999).

2.7.2 Privatized Agricultural Extension service delivery in Uganda

Under the umbrella of the Neuchâtel Initiative, Uganda showed the first exemplary advances in the decentralization and reform process in the African context. The country is

undergoing a rapid reform at present in the context of the Government's four policy pillars of decentralization, privatization, liberalization and democratization. Change is aimed at bringing about poverty eradication and the overarching policy objective. It is widely perceived that Uganda has made great advances in ameliorating the policy environment of the agriculture sector (Ibid). On a macroeconomic level the government has taken liberalization of the economy, decentralization and transfer of responsibility to Local Governments, privatization of para-statal, Public Service Reform and the Land Act of 1998. Such measures have made Uganda the much-publicized darling of the donor community in SSA.

2.7.3 Issues and challenges of Privatization of Agricultural Services in Africa

A very common problem with privatization is in many cases lacking clarity of policies and strategies. In some cases privatization is seen as the corollary of the prevailing market ideology, as the case in Peru and Uganda or models are simply copied and transferred from one country or region to another one where the basic conditions are not yet in place (GTZ , 1999). Rather than leaving the initiative to the market, the issue is or should be an improved interplay between the state and civil society. In many developing countries, especially in Sub-Saharan Africa, we encounter a prevalence of market failure problems. The room for privatizing public agricultural services is very limited. In Ethiopia subsistence orientated farming and diversity of areas, the ensuing small market sizes and rural poverty are ubiquitous problems preventing the development of service markets. There is a need to pursue an active policy of supporting private sectors.

2.8 Delivery Efficiency and Sustainability Issue

Long-term sustainability of demand-driven services requires continuous capacity building of farmers, their organizations and providers. It is important to emphasize that the sustainability of such systems requires that basic economic principles are respected; if service delivery systems are to be sustained, costs must be recovered from the users. Cost recovery through direct charges has several advantages. It provides the right incentives for the providers to deliver the services that the farmers want, makes them accountable to the farmers, and builds in a genuine quality control mechanism. It requires the existence of backstopping institutions (Sanne, 2006). The main principles for demand driven service

delivery systems are: services shall be driven by user demand, accountable to the users and should have a free choice of service providers.

2.9 Willingness and Ability to Pay for Private Services

Estimates of the Willingness to Pay (WTP) for services are often used to assess the demand for those services which are not traded in the market. These estimates are derived from either the direct survey methods such as contingent valuation or methods which are based on the observed behavior of the buyers in related markets. These methodologies are appropriate for cases in which farmers are not familiar with fees for private agricultural services. Some authors have recently questioned the use of WTP estimates for policy purposes on the grounds that it is the ability and not willingness which should form the basis of social policy (Ahuja and Redmond, 2001). This is because the principles such as willingness to pay may not take into account the problems connected with the ability to pay. The majority of previous studies focus on the willingness to pay of services. Conversely, the intention of the affordability parameter is to assess the ability of poor households to pay for services.

2.10 The Conceptual Framework

In light of the changing environment in terms of privatization, an increased emphasis on private delivery of services and a change of attitude towards institutional innovation helps to see clients as capable of demanding the services they need, rather than being mere beneficiaries (Sanne, 2006). Frameworks and strategies cannot be prescriptive and universal as before, but must be flexible and adaptable to fit the diverse local realities which people find them in. The framework put service provision to comprise three levels of intervention, those that should not be addressed individually and in isolation but rather be regarded as a system and seen as interdependent. Thus, the first and second levels must be addressed simultaneously for the planning of interventions for improvement and change of the system (Ehret *et al.*, 2005). The policy level not only sets the rules and defines mandates but creates an enabling environment which allows the system to function and – it is hoped – that development will happen (Figure 1). The three levels are:

1. The local level where people live, the realities they find themselves in, and the needs which they perceive and prioritize to improve their livelihoods referred as ‘Organizing the demand’.
 2. The service providing organizations and their responsiveness to assist and support people in their identified needs and referred as ‘Responding to the demand’.
 3. The wider support mechanisms at political and organizational levels, which allow for the above to happen and creating enabling climate is called ‘Supporting the Response’.
- Hence, the framework helped to structure the analysis of possible interventions to improve the system for innovation and impact.

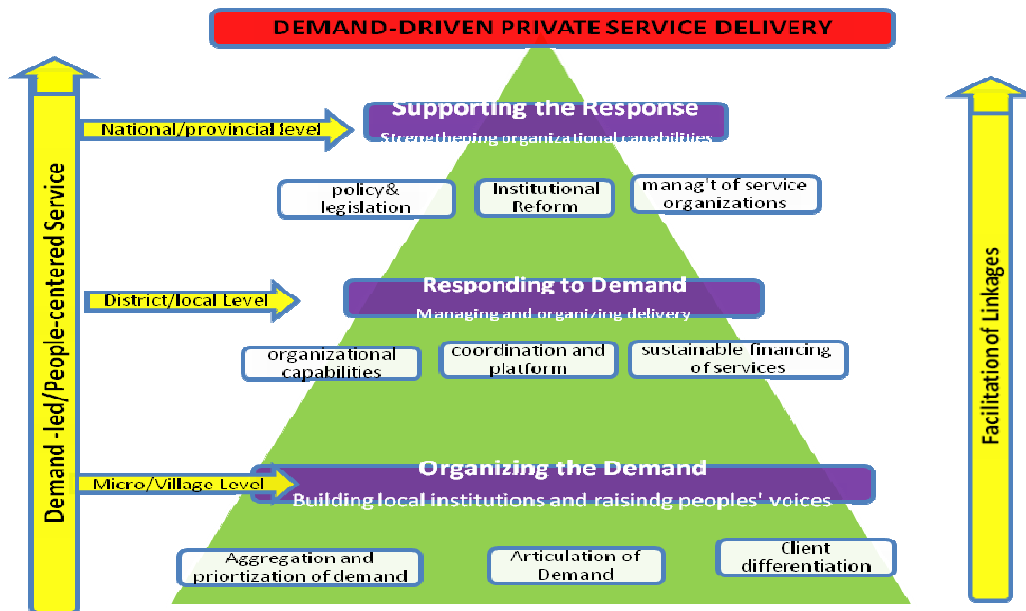


Figure 1. Conceptual Framework to analyze Private Service Delivery System:

Adapted from: Ehret *et al.*, 2005.

3. METHODOLOGY

This section describes the approaches and methods employed for data collection and analysis. The first sub-section of this chapter presents the description of the study area. Then the details of methodology used to conduct the overall study were discussed in subsequent sub-sections.

3.1 Description of the Study Area

Alaba district is one of the 13 zones and 8 special districts in SNNPR and located 315km south of Addis Ababa and 85km southwest of the regional state capital, Hawassa (Figure 2). The woreda is geographically located 7^o17'N latitude and 38^o06'E longitude and is part of the Southern Rift Valley of Ethiopia. It is located west of Oromiya region, north of Hadiya (Sike), east of Kembata Tembaro, south east of Silte and Hadiya zones. It is a special woreda in the region and has a special status where the administration directly accountable to the regional state. There are 79 PAs and 2 sub cities and Alaba Kulito is the capital of the district (IPMS, 2005; WoARD, 2008).

The total population of woreda is 232,241, of which 117,236 are male and 115,005 are female, with area coverage 91,230ha and density 277.5 person/km² (CSA, 2008). The total number of rural HHs is 42,000. Of these, 75% are men and 25% are female-headed. Agriculture is the mainstay of the district with two types of farming Systems: teff-haricot bean and pepper-livestock farming system. Economically active population of the woreda (15-55 years of age) are 44%, of which, 54% are male and 46% are female. Ethnically, there are about 6 major groups in the woreda, but Alaba and Grarage are the dominant constituting about 81 and 10% of the total population, respectively. The altitude in the woreda ranges from 1700 to 2149masl.

Rainfall is a major limiting factor in agricultural production in the area that drought observed recurrently affecting many HHs. The annual rainfall varies from 857 to 1085mm, while the annual mean temperatures also vary from 17 to 25^oC. Agro ecologically, the woreda is dominantly classified as dry weina dega. The area receives a bimodal nature of rainfall where the small raining season is between March and April while the main takes

July to September. As the reliability of the rain is low between March and April, farmers usually raise pepper seedling to be transplanted during the main rainy season. Major crops growing in the area, including maize, *teff*, wheat, pepper, haricot bean, sorghum and finger millet (WoARD, 2008). Alaba is situated close to the four big market cities of Wolaita, Hoseana, Shashemene and Hawassa at a distance of, respectively, 70, 64, 62 and 85km.

3.2 Research Design

This is a descriptive study of private service delivery in the Alaba special woreda of Sothern Ethiopia. Group discussion with government experts and service providers and HH survey with service users and non-users were used to determine the research design. Qualitative methodology was the major tool to achieve the objectives with the advantage of enhancing the quality of social assessment and contributes to a deeper insight of the situation being studied. The interest of the respondents in survey work was an issue given top priority. Farmers show little cooperation unless their concerns are taken care very seriously. In this regard, chair-persons of the respective rural PAs were first approached

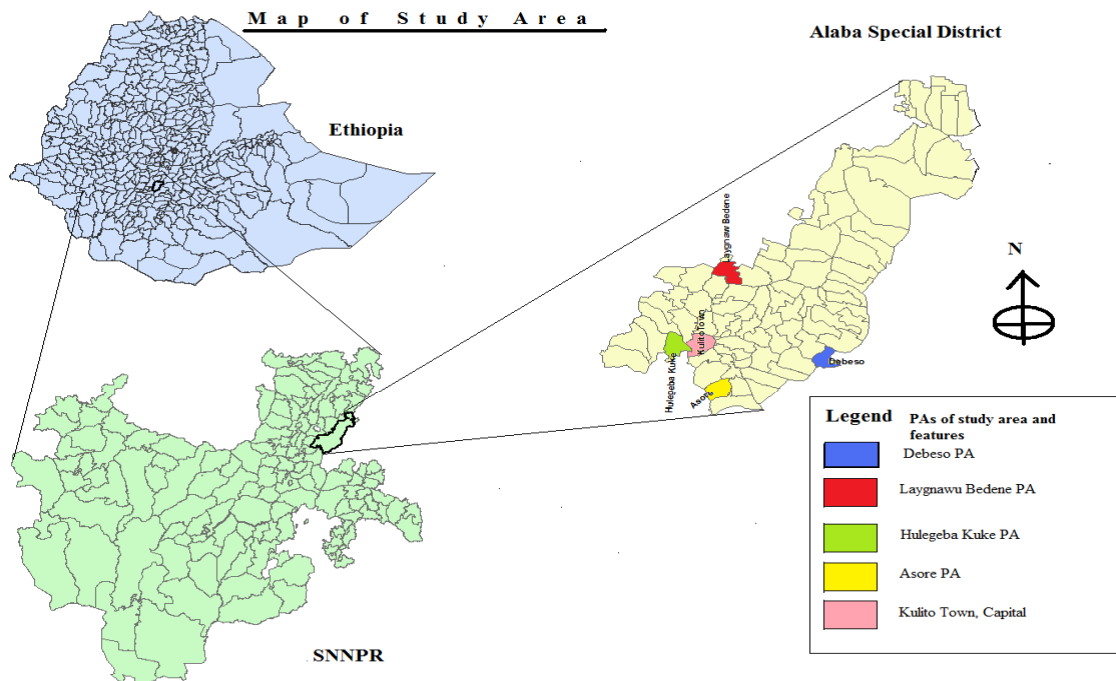


Figure 2. Map of the study area; **Source:** Own Design, 2010

farmers also informed that information related to HH and farm characteristics would be kept confidential. As a result, a thorough identification and definition of the population of the study were an important prerequisite for research sample. Once the target population has defined, the next task were the task of taking in the right representative samples from the population.

3.2.1 Sampling Techniques

Multi-stage sampling procedures were used to select the rural PAs and sample HHs. In the district, the Research and Development Office of IPMS has identified potential PAs where there are 11 spray and 6 animal health services providers. Those HHs who used to visit formal private service providers for purchase of service and those seldom or non-users were chosen to be interviewed from reliable list in each surveyed PAs, with the help of respective service providers and DAs, using systematic random sampling. The farmers were categorized as user and non-user on the basis of frequency of using the intended service. Secondly, since these PAs are large enough in number and different in proximity to Kulito market, they were stratified into two: PAs closer to market (in the range less than 10km) and PAs far from market center (on average 18km). Five PAs where spraying service is being practiced are near and six are far. Likewise 3 PAs where CAHWs service being given are near to Kulito market and 3 are far. Thirdly, four PAs selected based on service type: one closer and one distant PA for each services. This is because two private services (spraying and CAHWs) do not exist in the same PA. Fourthly, the list of HHs growing a particular crop for which spraying service is available and those HHs who own cattle has compiled and then these HHs were classified into the service user and non user. This classification further disaggregated of the beneficiaries into male and female headed HHs of each service. Finally, the sample size of 120 farm HH heads were selected based on the researcher time and resource availability by taking into account Probability Proportional to Size (PPS) of the HHs in each of four selected PAs. As a result, the survey administered and data were collected and analyzed on 120 respondents as the sample of the study including 25 or 20.8% of female HHs.

3.2.2 Survey Instrument and Administration

Ten interviewers were trained to administer the interview instrument. Training for the enumerators included a detailed explanation of the objective of the study, concept of interview instrument and guidelines to be followed during the interviewing. Pre-testing was done in Wanja PA on 10 HHs after which two questions were dropped for being short of clarity. The interview schedule had 44 questions (15 close-ended with some being likert-scale type, and 29 open-ended). The questions covered various relevant topics (Appendix 12, 13 & 14). The questionnaires were administered in Amharic for those who were literate and in the local language (*Alabigna*) for those with difficulties in the Amharic language. The questionnaires were administered in December 2009 in order to make use of free time of the respondents before congested with and distorting of information for fear of the for-coming Fourth National Election agenda of the country. For the group interview of experts, key informants and providers; the researcher was fully involved in discussion whereas in HH survey the role of the researcher was facilitator and moderator. Two types of group interviews (FGD and KIG) were used in order to grasp information as much as possible. Group interview were developed for each group of participants: government experts, formal and informal service providers. Fourthly, HH structured interview (Appendix 12) were administered for service users and non-users. Finally the data were crosschecked by triangulation of various aforementioned tools. Interview to each HH took on average 2hr to administer. Content validity (appropriateness of instrument for measuring what they are supposed to measure) and reliability of the instruments were important considerations taken in determining the credibility of the study. For this purpose, expert from ILRI-IPMS project and from Haramaya University, Department of Rural Development and Agricultural Extension and the researcher were reviewed the instrument.

3.3 Data Sources and Data Types

The study consumed both primary and secondary data. The primary qualitative data were gathered from focused group discussion, key informant's interviews, informal discussions with individuals, case studies and personal observations. The primary quantitative data were also generated through interviews with the sample HHs. In addition, relevant secondary data were collected from available reports from Union, woreda Knowledge Center and NGOs; records from providers, government polices and strategies documents

from WoARD, IPMS Alaba Pilot Learning Site survey, and internet websites. More emphasis was given to the qualitative data to capture all relevant information required and to have an in-depth insight of the problem under analysis and have the potential to cover wide aspects of service delivery and are easy to use in questionnaires for farmers.

3.4 Method of Data Collection

A review of the instrument by the expertise preceded the data collection for ethical soundness. Then each PA contacted with a translated version of the informed consent letter prior to interview which describes the approximate amount of time that participation in the study would require and no compensation for their participation. Of the total population targeted for the study, 96% of the original population was interviewed due to the fact that it was not possible to interview sick, displaced HHs. The primary data collection were started through KIG discussion including Participatory Rural Appraisal (PRA), HH survey by using pre-tested interview schedule, focus group discussion (FGD) with checklists and finally case studies.

3.5 Methods of Data Analysis

Quantitative data collected from the HHs survey were analyzed using descriptive statistics with the use of Statistical Package for Social Science (SPSS). The responses to the raw quantitative data were coded and stored using Microsoft Excel spreadsheet in order to avoid respondent anonymity. These were imported into SPSS (version 13.0, Analytical Software Inc., St. Paul, MN, USA) and summarized while qualitative responses were tallied and finally prioritized in order to determine trends and patterns in the data and draw conclusions. It were also described, analyzed and interpreted on the spot during data collection to avoid missing of relevant information.

4. RESULTS AND DISCUSSION

In this chapter, the results of qualitative and quantitative analysis that was conducted to address specific objectives of the thesis are presented and discussed. The chapter has been organized into five sections. Section 4.1 provides background information on demographic, personal and socio-economic characteristics of the different wealth categories of sampled HHs while sections 4.2 and 4.3 discuss, respectively, crop production system of study PAs with special attention to challenges and opportunities related to crop protection services, and providers' capacity and use of private crop protection services and its willingness to pay. Sections 4.4 and 4.5 deal with, respectively, livestock production systems while focusing on the challenges and opportunities related to livestock health services, and CAHWs' capacity, use and coverage of services and respective willingness to pay.

4.1. Characteristics of Sampled HHs

4.1.1 Local Wealth indicators and wealth categories

Farmers' Perception to wealth category

First of all, key informant farmers group have tried to identify the terminologies for three local level wealth categories and accordingly *kabatamo*, *mererancha* and *butichoo* are terms for such category. The group suppose that the highest socio-economic class locally called *kabatamo* which is equivalent as better-off; the next class termed as *mererancha* and equivalent as middle economic class and finally the least economic class termed as *butichoo* and equated as poor. Following the identification of socio-economic category, the group moved to set local wealth ranking criteria. Accordingly, the local proxy indicators of wealth are elaborated upon the agreed sound of the group.

Livestock ownership

Livestock is an important indicator of household's wealth position and is the farmers' important source of food, draught power and more importantly a cash income for crop cultivation for which the spray service is available. For example, a HH who own pair of oxen have comparative advantage for timely preparation of crop land, hire labor for exchange of oxen service, rent-in more land or enter in to sharecropping arrangement with poor. Given the flat topography and cash crop dominated production in all study PAs,

horses for cart and donkeys for transportation play an important role for a HH to engage in petty trade thus to build better livelihood. According to the group, the livestock products such as butter, milk, calf, shoats and poultry selling is an important income source to livestock owners to cover the health cost of large animal assets such as oxen and cows. Hence, a household with large livestock holding can have good access for more income and it is one of the main cash sources to purchase private services.

Land holding

Land with its all dimensions (size and fertility) is the single most important resource and a base for any economic activity especially for rural HHs. For example, farm size influences households' decision to cultivate cash, subsistence crops or rear animals for which there is improved private service. Hence, land holding was hypothesized to have positive and significant relationship with use rate of private services.

Housing, children Educated and Employed

The type of house with all its facet (type of roof and construction material) was a proxy indicator for socio-economic status of a HH. The number of children who are educating or employed was another indicator for wealth position and benefits from it like remittance is considered as non-stopping income for the parents. In addition, the HH asset indices of land holding and livestock ownership were used (Table 5 & 6) to strengthen the analysis done by KIGs of farmers which is more of subjective. Debeso PA is with least value of these both assets and which is further confirmed when the majority (80%) were categorized as medium or less (Table 3a). Whereas, Lay Bedene PA is relatively richer with 70% of its population were categorized as medium or better-off in contrast to Debeso PA where the majority (53%) are poor. Having identified the three wealth classes, the key informant farmers groups in each four study PAs sorted out the sample HHs list into three wealth categories.

Table 3a. Wealth Category of sample HHs, by PAs

Wealth Category	Equivalent Local term, (Alabigna)	% of HHs by study PAs				Overall
		Asore	L. Bedene	H. Kuke	Debeso	
Better-off	<i>Kabatamu,</i>	23.3 (7)	33.3 (10)	26.7 (8)	20 (6)	25.8
Medium	<i>Mereranchu</i>	33.3 (10)	36.7 (11)	30 (9)	26.7 (8)	31.7
Poor	<i>Butichu</i>	43.3 (13)	30 (9)	43.3 (13)	53.3 (16)	42.5

Source: KIGs Discussion Result, 2010; Numbers in parenthesis are frequencies

4.1.2 Demographic characteristics

As a good indicator of labor force endowment, family size (Table 3b) and age structure are important parameters in differentiating rural HHs. The average family size of the sample households was 6.1 persons with standard deviation of 2.4. The average family size of the study area is relatively higher as compared to that of the district which is 6 persons per HH. Interesting observation from Table 3b is the average adult family size shows that better-offs and medium HHs have more adults than the poor.

Table 3b. Demographic Characteristics of sample HHs

Description of variables	Better-off		Medium		Poor		Overall	
	mean	SD	mean	SD	mean	SD	mean	SD
Average family size	6.81	2.4	6.5	2.6	5.39	2.0	6.12	2.4
Average number of adults	2.58	.7	2.27	.88	1.94	.5	2.23	.7
Average No of children	4.65	2.1	4.53	2.2	3.67	1.9	4.2	2.1

Source: Own Computational Result, 2010; SD means Standard Deviations

4.1.3 Characteristics of HH Heads

Sex Differentiation of HH Head

Further, the survey data set was disaggregated by sex of heads of the HHs to scrutinize whether the observed wealth differentiation follows sex line i.e. if there is any association between wealth class and being female-headed or male-headed HH. The study was conducted on 25 and 95 female and male-headed HHs, respectively. From 25 FHHs in the sample 56, 24 and 20% were, respectively, categorized as poor, medium and better-off HHs (Figure 3). In contrast, 38.9, 33.7 and 27.4% of male-headed HHs were categorized as poor, medium and better-off HHs respectively. This clearly depicts that FHHs are over represented in the lowest socio-economic stratum in terms of access and ownership of human and non-human (land, water, farm implements and livestock) assets, however, the latter is more constraining than the former in context of current population pressure. Sex of sample HHs has important dimension as agricultural activities intensively use male labor. Labor was considered a critical factor in rural differentiation, as particularly expressed by the FHHs. Most of the time, the poor in study PAs are the elderly, the sick or the FHH. Because of labor shortage, they usually rent-out their land or give to sharecropping.

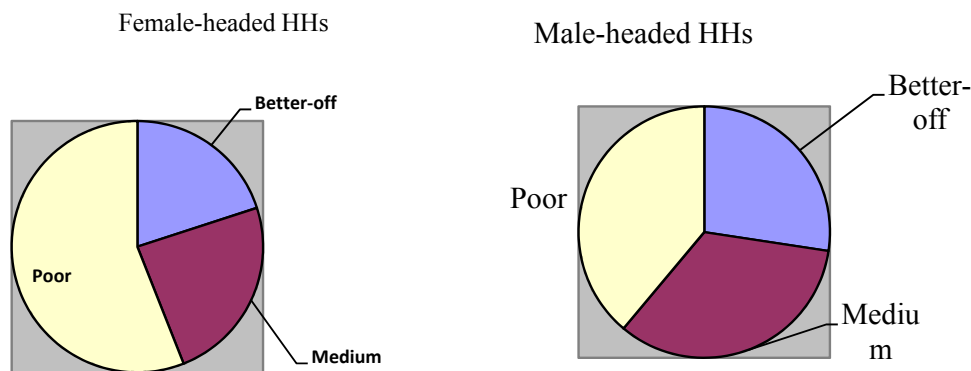


Figure 3. Wealth Categories by gender of HH Head; **Source:** Own Design, 2010

Education of HH Head

The educational status of HH head is key as it influencing ability to access and use information to make informal decision in crop and livestock production and marketing. The highest illiteracy rate (60%) was reported in one of far PA, Lay Bedene than Debeso due to the fact that the latter is easily accessible to education on account of proximity to main road to Addis. In addition, the education level of head revealed interesting information that in near PAs (Asore and Hulegeba Kuke) where the majority, 60 and 56.7%, respectively, HHs have got at least non formal education perhaps on account of their proximity to service center, Kulito and this clearly bolds how rural differentiation based on distance affects access to education hence decision to or not to use private services. Furthermore, own observation during data collection revealed that some sampled HHs in study PAs face difficulties to express their service demands in a clear and structured manner. This is specifically true for the underprivileged, the poor, the women and the minorities. Under these conditions it is very difficult to come up with a service delivery concept that takes only demand and can still be managed economically and sustainably. The chi-square test of education shows significant variation among HHs at less than 10% (Table 4). Hence, in order to develop demand-side of service market, rural education for all subgroups of the clientele has to be promoted.

Farm Experience of the household Head

Farmers with higher experience in livestock and crop production appear to have often full information and better knowledge and supposed to use private services (Rahmeto, 2007). With respect to the respondents' farming experience, the most experienced farmer in the sample had 45 years whereas the least experienced farmer had four years of experience in

farming. As expected, farming experience for medium and better-off classes were laying above the mean years of sampled respondents, 20.3 years, where poor are with lower years of experience in crop and livestock production.

Table 4.Characteristics of HH Heads

Attributes	Better-off	Medium	Poor	Overall	t/ χ^2 - significance test#
Mean Age [@]	38.2(11.4)	37.7(10.9)	36.7(9.4)	37.4(10.4)	t=0.57(0.207) ns
Mean Experience in crop production (year) [@]	21.3(9.2)	22 (10.2)	18.51(8.4)	20.3(9.3)	t=2.5(0.436) ns
Sex, <i>female</i>	16.1	15.8	27.5	20.8	$\chi^2 = 2.3(0.308)$ ns
Education, <i>literate</i>	67.7	50	53	55.8	$\chi^2 = 11.4(0.076)$ *
Participation in crop extension, <i>yes</i>	25.8	36.8	23.5	28.3	$\chi^2 = 2(0.36)$ ns
Has been model farmer, <i>yes</i>	25.8	26.3	0	15	$\chi^2 = 15.69(0.000)$ ***
Cooperative member, <i>yes</i>	32.3	10.5	11.8	16.7	$\chi^2 = 7.3(0.025)$ **
Food security task force member, <i>yes</i>	9.7	5.3	7.8	7.5	$\chi^2 = 0.49(0.78)$ ns
PA development group, <i>yes</i>	54.8	57.9	51	54.2	$\chi^2 = 0.43(0.81)$ ns

Remark: ***, **, and * statistically significant at 1%, 5%, and 10% probability level, respectively; ns- statistically not significant NB: @=Numbers in parenthesis are standard deviations; #= Numbers in parenthesis are *p*-values

Source: Own analysis, 2010

Farmer Associations

There is one farmer union in the district, Mencheno, which is supplying various agricultural inputs and purchasing agricultural produces from members when the price of commodities falls in market. Even though there are 129 cooperatives (Appendix 3) in the district, none is of private in nature and only 16.7% of sampled HHs are members of cooperatives. Table 4 shows that cooperative membership for better-off is higher (32.3%) than either of medium or poor classes. The chi-square test for cooperative membership shows significant variation among HHs at less than 5%. In addition, the farmers associations in every PA are not well organized to prioritize their needs. Whereas the public sector is characterized by division due to political affiliations and favoritism and bureaucratise are the major inhibitors for vibrant private sector development. There are only 15% of sampled HHs were model farmers for demonstration with significant variation at less than 1%.

4.1.4 Crop land holding and use

Crop land holding and Access

The better-off class own comparatively bigger, fertile and irrigated land with mean holding of 1.6ha, though land in all PAs is flat (Table 5). These HHs are the one who rent-in from or enter share cropping with poor who have no oxen or cash access.

Table 5. Crop land holding and access

Attributes	Better-off	Medium	Poor	Overall sig.
Average own land holding	1.6(.76)	1.3(.62)	1.23(.72)	1.39(.71)
Average rented-in land holding	.21(.27)	.23(.30)	.20(.31)	.21(.30)
% considering their cropland fertile	83.3	79	82	81.7
% of HHs having access to irrigation	3	2.6	2	2.5

Source: Own Survey Result, 2010; Numbers in parenthesis are Standard Deviations

4.1.5 Livestock Ownership

Livestock holding and oxen ownership

To assess the livestock ownership, TLU per HH was calculated and the sampled household had an average of more than 3 TLU. Lay Bedene PA is endowed with mean TLU of 4.6 (Table 23a). The majority (97%) of better-offs were having at least one ox while the same holds third for the poor (Table 6). Thus, difference in the livestock ownership between PAs had an important implication in the decision to use the private services.

Table 6. Livestock holding and oxen ownership

Attributes	Better-off	Medium	Poor	Overall
Average cattle owned by HHs (Heads)	6.3	3.5	1.51	3.7
% of HH owning at least an ox/bull	97	84	33	71
Average shoats owned by HHs (Heads)	4.8	2.4	1.2	2.8
HHs owning at least a donkey, %	90	53	16	53
HHs average total TLU ownership	6.1	3.3	1.3	3.6

Source: Own survey result, 2010

In all account, better-offs were owned the largest share. For example, livestock ownership of better-offs in TLU is almost five and two times higher than that of poor and medium groups, respectively. Donkey ownership have greater importance among the community particularly for transportation of water from distant and farm produce from crop field. In line with this a 41-year-old- model farmer, Ato Rufael, from Asore PA, said that *my two donkeys are not less than my boys because they are always at my side in every plots of my farm, in every market center, in every water points, in every woodlots and every distribution sites*. Moreover, shortage of grazing land may be forcing farmers to keep donkeys rather than other pack animals as donkeys withstand hardship better such as shortage of water in Debeso PA.

4.1.6 Access to Agricultural Knowledge and Information

The PA level DA and farmer-to-farmers discussion and observation, respectively 82.8 and 100%, are the two top most important sources of knowledge and information on agricultural services to farmers in study PAs (Table 7). When there is frequent contact with extension agent, the greater is the possibilities of HH head being influenced to use quality private services. Whilst extension is supposed to have a direct influence on service use rate, weak extension visit by DAs for diffusion of information and technology further exacerbated the marginalization of female in private sector development. This clearly holds the existence of weak public extension system in the district that uses direct contact only with a relatively small group of well-to-do model farmers. In a nutshell, the critical observation of Table 7 reflects that the better-off class have by far more participation in farmers' field day and experience sharing visit to other areas.

Table 7. Main sources for improved agricultural knowledge and technology, % of HHs

Knowledge information sources	Better-off	Medium	Poor	Overall
Training	29	31.6	19.6	26.7
Farmer field day	38.7	15.8	5.9	20
Experience sharing visit	32	15.8	7.8	18.5
Farmer-to-Farmer knowledge sharing	100	100	100	100
Discussion with model farmer	61	50	23.5	44.8
On-farm trail	16	13.2	5.9	11.7
TV/Radio	83.9	55.3	41	60
Development Agents (DA)	96.8	94.7	57	82.8

Private input suppliers	29	26	13.7	22.9
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Source: Field Survey Result, 2010

4.1.7 Access to credit

Where livestock, rather than cash, is preferred form of saving, access to credit from formal financial institution, can make difference to sample HHs. The three wealth categories of HHs differentiated in the purpose for which credit is needed, ability to access credit and frequency of application to loan. The major purpose for need of loan among better-offs who borrowed (32%) was to purchase draught oxen, livestock for fattening, improved seed, fertilizer, rent-in more land and to open rural shops, which are more of an investment (Table 8) whereas the poor use the small amount they borrow (4%) for consumption purpose. Unlike for crop inputs where credit is relatively available for fertilizer and seed, the use of credit for animal health were not observed for all sampled HHs. Most of those HHs who did not show an interest in taking credit lacked awareness about the availability of credit services and fear of risk of not being able to repay the credit. Lack of credit supply and knowledge on credit management together with poorly developed retail markets and so limited market access to retail outlet for service providers in far PAs, Lay Bedene and Debeso, seemed to discourage competition and resulting in uncertainty and risk to new entrants. Overall, the efficiency of credit service is weak as both CAHWs and PCPS providers didn't made any repayment of their loan from Mencheno Union (Appendix 2).

Table 8. Access to credit, Proportion of responding HHs (%)

Attributes	Better-off	Medium	Poor	Overall
Needed loan	71	84	84	79.7
Borrowed from formal sources	32	15.8	3.9	17.2
Application for loan turned down	35.5	21	11.8	22.8

Source: HH Survey Result, 2010

4.2 Crop Production and Marketing Systems of the study PAs

This second section presents an overview of crop production system of the research PAs. It explores whether there is any difference across the PAs with regard to land use patterns, key challenges in crop production, access to inputs, services and market, and the degree of participation in crop production for the market. These features are important as they may influence the demand for and use of services, particularly private crop protection services.

Cereals are the most widely grown crop in all study PAs and produced by almost all HHs and shares 62.3% of the total cropped land area (Figure 4), followed by pulses and spices which together account for about 25% of the total cropped land area in study PAs and elsewhere in the district. Table 9a shows the spatial variation of crop production pattern across study PAs. Vegetables such as chat and potato are mainly produced in PAs near to Kulito market, Hulegeba Kukie 14 and Asore 13.3%, and accounts 12.5% of total cropped land area whereas cereals are dominantly produced in PAs far from Kulito, Debeso 66 and Lay Bedene 65%. Hot pepper and chat (*Catha edulis*) are the major cash crops both in terms of area covered and revenue generated in four PAs covered by the study. Producing chat has thus become a viable and important alternative to ensure continued cash income. Chat production has another advantage: it can be harvested at least twice a year under rainfed agriculture and five times per year under irrigation. This implies that HHs have a well-distributed flow of income. This improved income, in turn, maintains the effective demand for private spray service to produce these cash crops. Chat is a perennial tree crop mainly grown in Alaba thus majority of people chew young fresh leaves of chat as a stimulant. However, chat is blamed for decreased productivity, as people wastes valuable working time sitting and chewing it for hours.

HHs in the study PAs produce crops for different purposes, such as for food, feed, seed or sale. Although, crop production for feed and seed is not common in the study area, about 70% of the cereal produced was used for direct HH food consumption and 25% is for generating HH cash income. For example, maize being the major cereal produced in the study area with mean area coverage of 0.5ha, accounting for 37.5% of total area allocated to cereal, is the major crop for both HH consumption and cash generation. It is produced by almost all households (99%), followed by teff, with 81.7% of teff grower. Haricot bean is produced by 51.6% of sampled farmers and stands the first among the pulses and the

community call it “*the poor man’s meat*” due to its high protein content, which compensates for the protein deficiency that could have occurred with low income HHs.

Table 9a. Crop Land Use Pattern of 2008/9, by PAs (Ha)

Crop coverage	Asore	L.Bedene	H.Kuke	Debeso	Overall
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Maize	.57(.29)	.58(.33)	.44(.24)	.57(.23)	.54(.28)
Sorghum	.30(.11)	.29(.10)	.21(.06)	.31(.24)	.28(.16)
Teff	.33(.17)	.36(.15)	.28(.10)	.37(.19)	.34(.16)
Wheat	.30(.12)	.26(.06)	.30(.11)	.26(.10)	.28(.10)
Cereal total coverage (%)	60	65	57.5	66	62.3
Haricot bean	.23(.09)	.21(.05)	.26(.10)	.22(.06)	.23(.08)
Faya bean	.17(.06)	.25(0)	.12(0)	.12(00)	.17(.06)
Finger millet	.19(.06)	.19(.06)	.20(.06)	.21(.05)	.20(.06)
Hot pepper	.27(.15)	.19(.09)	.26(.15)	.26(.13)	.25(.13)
Pulse/spices total (%)	26	23.6	28	22.5	25
Chat	.17(.06)	.15(.05)	.16(.05)	.16(.06)	.16(.05)
Potato	.23(.12)	.20(.06)	.21(.10)	.34(.38)	.24(.13)
Vegetable total (%)	13.3	11	14	11.3	12.5
Total cropped area (ha)	55.2	49.1	41.8	47	193.1
Distance from Kulito, km	7	15	5	14	

Source: Own Survey Result, 2010; NB: numbers in parentheses are standard deviations

Teff is another important cash crop in the study area mainly produced for sale for 91% of sampled HHs and is the primary crop for which modern crop protection service, particularly herbicide, is available. However, maize is increasingly becoming the leading staple crop for consumption of sample HHs. Both teff and maize are the leading cereal crops but maize preferred to teff for its lower price of food for poor and feed, for instance, higher nutrient value of stover for animal feed among the sample HHs either as dry or green stover.

Own observation indicated an interesting crop sowing pattern in Debeso PA which is mid crossed by main road to Addis, farmers deliberately sow some plot of maize land lately than normal cropping season in order to fill the feed shortage gap for fattening oxen for *meskel* holidays with young nutritive maize green stover. Due to the fact that sorghum is a drought resistant crop, it is mainly produced in Debeso PA with mean area coverage of 0.31ha and its stover is an important feed in dry months as it is annual crop and crosses all months of the year.

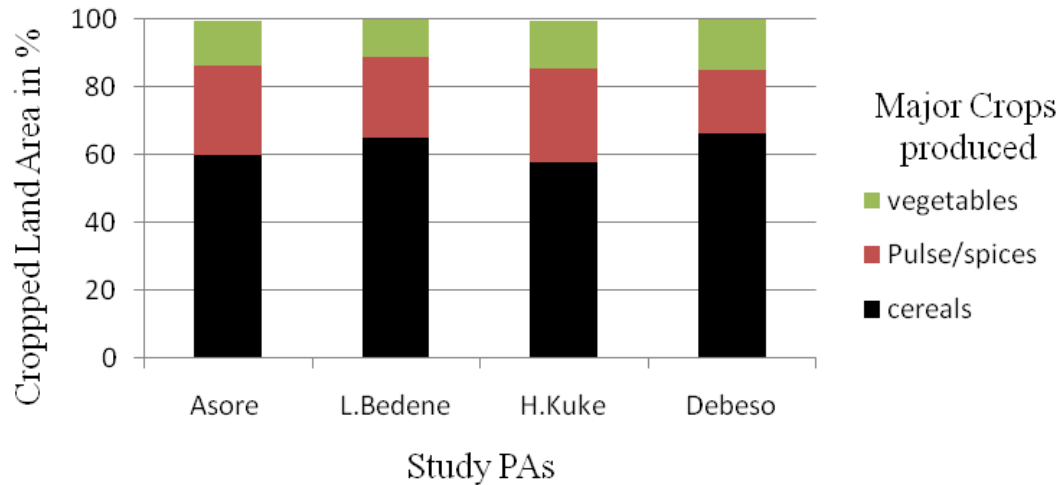


Figure 4. Proportion of Cropped land area allocated to different crop categories;

Source: Own Design, 2010

HHs in the study PAs traditionally practice crop rotation and inter-cropping in research PAs for different purposes including soil fertility management, diversification, moisture conservation and crop pest and disease control. For example, the growing of sunflower with teff, haricot bean with finger millet, chat with local cabbage, teff with linseed, haricot bean with maize is practiced as indigenous strategies to manage risks associated with drought, disease and pests and efficient use of nutrient niches so that minimize crop failure and is a crop protection practice. Chat is less affected by these risks and perfectly suited for intercropping unlike, potato. Moreover, in PAs particularly those near to market center, H.Kuke, homesteads tend to cover significant proportion of land relative to other PAs and mainly covered with garden crops including chat and local cabbage and rarely with enset/false banana.

4.2.1 Input use and management

Input use exhibits great variation over study PAs and crops produced. Despite its far location from Kulito town, HHs in Debeso PA dominantly use inputs for subsistence crops perhaps due to lack of irrigation access, farmers in Debeso opted to use all inputs for subsistence than cash crops. While other near PAs substantially used improved inputs for cash crops production. More than 39% of HHs in 2008/9 used inorganic fertilizer for any type of crop in any one season (Table 9b). But the use of DAP is more common than urea

in Asore and Hulegeba Kuke PAs where 23% of HHs in each reported their land is poorly fertile. Despite the extension efforts to increase fertilizer use in the district there is still a considerable proportion of farmers who are not using it. Part of the reasons for less likely use of fertilizer is its sky rocketed price, risk of drought as the response to fertilizer is very much related to the amount of moisture in the soil, especially for urea, and it is usually delivered late and in short supply. As the study PAs are in the Rift Valley of the country, they receive low amount of rain affecting the use of fertilizer besides other factors.

Table 9b. Input use and overall yield trends for subsistence and cash crop (% responding)

Improved inputs use	Asore	L.Bedene	H.Kuke	Debeso	Overall
Subsistence Crops					
Improved seed	36.7	20	33	53	35.6
Inorganic fertilizer	26.7	30	33	66.7	39
Irrigation	0	0	0	0	0
Hired labor	73.7	81.8	80	81	79
Overall yield trend increasing	73	66.7	60	70	67.5
Cash Crops					
Improved seed	63.7	80	66.7	46.7	64
Inorganic fertilizer	60	63	60	26.7	52.5
Irrigation	13	0	10	0	5.8
Hired labor	15.8	9	20	9.5	13
Overall yield trend increasing	93	100	73	70	84

Source: Own Survey Result, 2010

The heavy dependency of agriculture on rainfall and lack of labor saving technologies forces female-headed HHs (20.8%) to put more labor in specific period to complete a given agricultural activity. For example, transplanting and harvesting of pepper against unusual rain in harvesting season needs to be conducted at one time with sufficient labor. Due to this reason, they used to rent-out their land to those HHs who have more labor or able to hire labor or have oxen. They make such linkage mechanism because majority of farm activities such as hoeing and threshing of cereals need oxen. Another arrangement is they opt to cultivate those crops which cannot be hoed but threshing performed in exchange of threshed crop yield to labor. The survey clearly revealed the role of women in performing most of the farm tasks ranging from weeding crop field to harvesting. It was noted that if only weed infestation is high or a wife is pregnant or not physically strong, HHs may participate in free reciprocal or hired labor exchange to complete the task more

quickly. Free labor exchange is hardly possible to FHHs from the fact that they do not have labor to reimburse for used. Women are usually growing horticultural crops such as chat and local cabbage on small plots of land close to their home. In richer households, farming activities may be performed wholly or partly (80%) by hired labour. However, in the study area, only 8% of FHHs were able to hire labor which were only for threshing while their male headed counterparts hired for range of activities such as land preparation, weeding and livestock husbandry. According to farmers FGD, most of the laborers come from neighboring districts of Wolaita and Hadya.

As the main road to Addis crosses the district and its proximity and fortunately mid-situated to main big cities of Wolaita Sodo (70km), Hossaena (64km), Shashemene (62km) and Hawassa (85km), most of HHs are cosmopolite, agricultural productivity depends by large on agricultural information and input utilization. Cash crop production is intensive type in all accounts, for example, improved seed (64%) is basically used for cash crop production than subsistence crops. In contrast, majority (79%) of labor hired by sample HHs is allocated for subsistence than cash crops (Table 9b), while irrigation is totally said to have not been practiced in study PAs except for Asore and Hulegeba Kuke PAs which border *Bilate* River for short distance.

However, more than 67% of the respondents reported the increase in yield trend of either crop. A lot of things are also contributing to this. Soil erosion, the main factor for nutrient depletion, is not an issue of all HHs in study area as their land is fairly flat hence about 81.7% HHs considering their land is fertile (Table 5) and the inherent soil fertility and moisture is maintained. For long period of time HHs in study PAs were known for and content with exchange of local seed each other which is resistance to pests and disease and yield is relatively better. The inter-cropping of legume with cereal crops and agro forestry practices such as planting trees in the farm field for efficient utilization of nutrient niche is mainly practiced by sample HHs. Use of crop residue and animal dung while animals are kept on crop field after harvesting is also another on-farm input contributing soil fertility thus improved crop yield. Another important input for subsistence crop yield increment is having more than 66% HHs at least an ox. The price of cash crops has also been rising, for example, chat enjoys a relatively stable domestic price, while cereals suffer from fluctuating price. In the domestic market it is quite evident that chat chewing has become

a recreational activity in all study PAs and now also forms part of the culture of the urban youth in Kulito.

4.2.2 Crop Production Opportunities and Challenges

For many HHs in the study PAs, crop yield signifies storing wealth, a cushion for food shortages, and a source of fertilizer, fuel and cash. Despite the existence of possible opportunities, the sector has not yet attained its full productive potential. The HH survey summarized the top three opportunities with varying degree of importance for subsistence and cash crops. These opportunities include the availability private crop protection services, market demand and land, in order of importance, for subsistence crops, and the availability of market demand, input and land for cash crops. The presence of formal and informal crop protection service comes first because crop pests and disease are in all study PAs. Market demand stands the second as the district is mid situated from big markets in vicinity, and on account of topography every PAs are accessible, crop yields even bought from field.

The major constraint for crop production in study PAs is environmental factor among which drought, without spatial variation over PAs and type of crops, is the most important and ranked the first though some crops such as sorghum is tolerant to drought. Rainfall has been a major limiting factor in agricultural production in the area. Even worse, according to key informant farmers, the district has experienced recurrent droughts every ten years, while nationally every three to five years, probably attributed to uneven distribution and erratic rainfall. Despite the recurrent drought, flood has also been a major problem in Debeso PA where the latter induced as a result of dominantly flat topography in Debeso. The second important challenge is pests and disease, while the third important constraint, in order of importance, is lack of draught power as more than 43% of HHs in Hulegeba Kuke and Debeso PAs have own no ox.

Due to the presence of private input shops, culture of local seed exchange mechanism and seed multiplication trail, next to market demand, input availability is an opportunity to cash crop producers in the study PAs. As a result of distance from service market and relatively higher land size, land is comparatively better advantaged than input availability for Lay Bedene PA. Likewise, drought, pests and disease and cost of inputs, in order of

importance, are the major challenges for cash crops. More than 20% of HHs (Table 9c) in each PA reported the importance of pests and disease for cash crops such as hot pepper, chat, potato and teff. Crop yield loss associated with pests and diseases is one of the major constraints in all study PAs where the hot humid weather aggravates the growth and propagation of these pests than elsewhere. An interesting observation is that input cost is a problem for cash than subsistence crops. As HHs mainly used fertilizer for cash crops (Table 9b), the high input cost and its short supply is ranked as the third major challenge to cash crops highlighted in HH survey.

Table 9c. Opportunities and Challenges rankings, % of respondent

Asore	L. Bedene	H. Kuke	Debeso	Opportunities overall the study PAs	Ranking in overall study PAs
Opportunities for Subsistence crops					
Market demand (43.3)	Land availability(50)	Private Service existence(33.3)	Private Service existence (46.7)	Private Service existence (30.8)	1 st
Private service existence (30)	Market demand (23.3)	Market demand (30)	Market demand (20)	Market demand (29.2)	2 nd
Land availability(26.7)	Private Service existence(13.3)	Land availability(20)	Land availability(16.7)	Land availability (28.3)	3 rd
Challenges for Subsistence Crops				Challenges overall study PAs	
Drought (40)	Drought (40)	Drought (36.7)	Drought (33.3)	Drought (37.5)	1 st
Shortage of land (30)	Pests and Disease (20)	Pests and Disease (26.7)	Pests and Disease (23.3)	Pests and Disease (24.2)	2 nd
Pests and Disease (16.7)	Shortage of land (16.7)	Lack of draught power (23.3)	Lack of draught power (16.7)	Lack of drought power (15.8)	3 rd
Opportunities for Cash Crops					
Market demand (40)	Availability of land (30)	Market demand (40)	Market demand (56.7)	Market demand (40)	1 st
Availability of land (30)	Input availability(30)	Input availability(33.3)	Input availability (23.3)	Input availability (25.8)	2 nd
Input availability (16.7)	Market demand (26.7)	Availability of land (16.7)	Availability of land (16.7)	Availability of Land (23.3)	3 rd
Challenges for Cash crops					
Drought (36.7)	Drought (56.7)	Drought (60)	Drought (46.7)	Drought(50)	1 st
Pests and disease (30)	Pests and disease (23.3)	Cost of input (23.3)	Pests and disease (20)	Pest and disease (18.3)	2 nd
cost of inputs (20)	Cost of inputs (23.3)	Lack of improved inputs (13.3)	Cost of inputs (16.7)	Cost of inputs (18.3)	3 rd

Source: Own computation, 2010 NB: numbers in parentheses are % of HHs

In general, Table 9c has tried to describe the salient opportunities and challenges to crop production with the intention to facilitate the detail examination of private service development in the subsequent analysis. Among the constraints crop pests and disease have been ranked the second and perceived as the major problem for both subsistence and cash crops across study PAs.

The HH survey has identified the major pests and diseases with varying level of importance over study PAs and crop type as weed, stock borer and wollo cricket to cereals and early and late blight to vegetables and spices are the major pests among the group and others are listed in Table 9d. This is more justified when the importance of herbicide ranked the first in response to first ranked weed infestation. In addition to modern crop protection, majority of HHs who could not afford the cost of chemicals are still preferred to use mechanical hand weeding and land management.

Table 9d. Major Pests and Disease problems & protection measures (% of reporting HHs)

Crops affected	Study PAs				Pests & diseases overall study PAs	Ranking in overall study PAs
	Asore	L.Bedene	H.Kuke	Debeso		
Cereal / Pulses crops						
Maize, teff, wheat, finger millet	Weed (26.7)	Weed (26.7)	Weed (26.7)	Wollo bush cricket(26.7)	Weed (25.8)	1 st
	Stem borer (23.3)	Stem bore (23.3)	Armyworm (23.3)	Weed (23.3)	Stem borer(20)	2 nd
	Army worm (20)	Wollo bush cricket (16.7)	Wollo bush cricket(16.7)	Stem borer (20)	Wollo cricket(17.5)	3 rd
Spices / vegetable crops						
Chat , Potato, Onion, carrot	Late blight (33.3)	Late blight (26.7)	Late blight (30)	Early blight (26.7)	Late blight (29)	1 st
pepper, tomato, sweet potato,	Early blight (33.3)	E. blight (26.7)	E.blight/23.3/	L.blight (26.7)	E.blight (27.5)	2 nd
Cabbage	Downy mildew(23.3)	Downy mildew (16.7)	Aphid (20)	Downy mildew(23.7)	Downy mildew (20)	3 rd
Traditional Crop Protection Measures						
All crops	Mechanical (43.3)	Land mgt (46.7)	Mechanical (53.3)	Mechanical (46.7)	Mechanical (43.3)	1 st
	Land management (33.3)	Mechanical / hand weeding (30)	Land mgt (20)	Herbal solution (23.3)	Land mgt (30)	2 nd
	Herbal solution (16.7)	Herbal solution (20)	Herbal sol. (13.3)	Land mgt (20)	Herbal solution (18)	3 rd
Modern Protection Measure						
Cereals/pulses vegetative	Herbicide (56.7)	Herbicide (43.3)	Herbicide (46.7)	Herbicide (46.7)	Herbicide (48.3)	1 st
Vegetables/ spices	Pesticide (33.3)	Pesticide (36.7)	Pesticide (36.7)	Pesticide (33.3)	Pesticide (35)	2 nd
grain (maize & sorghum)	Post Harvest Service, PHS/10	PHS (20)	PHS (16.7)	PHS (20)	PHS (16)	3 rd

Source: Field survey result, 2010; NB: numbers in parentheses are % of HHs

In general, from pests of subsistence crops, army worm was reported only from Asore while wollo cricket not reported from Asore only. Similarly for cash crops, aphid was only mentioned in Hulegeba Kuke. The existence of higher family size and oxen ownership (Table 23a) in Lay Bedene PA is further justified when land preparation comes the first traditional crop protection practice.

4.3. Private Crop Protection Services and Uses

As the preceding section shows (Section 4.2.2), crop pests and diseases are among the major production constraints in the study area. In the study PAs and elsewhere in the country, the public sector is the main source of inputs and technical assistance for crop pests and diseases control, especially when epidemic large outbreak would occur. In addition, the farmers have their own indigenous crop protection measure and there are also some farmers in the community who informally provide crop protection service using purchased modern agro-chemicals. At one hand, traditional and informal crop protection measure may not always effective, on the other hand the use of chemical inputs raises issues relating to effectiveness, human health and its impact on the environment.

In response to this, Improving Productivity and Market Success (IPMS) project together with Alaba WoARD has initiated the concept of community-based crop protection service in workshop organized for input delivery and accepted in Alaba as one alternative of providing spray service since three years and pilot-tested in the study area to assess its feasibility for scaling. Hence, this section deals with both the supply and demand sides of the private formal crop protection service. Qualitative and quantitative empirical evidence are presented and discussed on both the supply capacity of the formal private providers and the demand for the service, including the levels of satisfaction with the performance of the service by farmers who are users or potential users^{††} and by other stakeholders like the WoARD, IPMS and research centers. Therefore, in the context of private service delivery, the current private spray providers are the role model to scrutinize their human, material, technical and financial capacity and learn lessons.

4.3.1 Capacity of Crop Protection Service Providers

To provide private crop protection service which is effective, safe, environmentally sound and financial profitable and sustainable, the providers need various capacity. The capacities need for such service provision comprise of human, financial, and

^{††}The word ‘potential users’ here to cover cases where currently they are not using the service (e.g., because they do not perceive the quality of services to justify using the service), but where reasonable analysis suggests that they able to use at a price that would cover the providers’ full costs of supply yet still be low enough to permit profitable delivery by providers.

social/networking capacity of the providers for accessing knowledge/information, finance/credit and inputs/material resources.

4.3.1.1 Human Capacity

The first, perhaps most important, component of capacity required for the service delivery is human capacity, i.e., staffing, technical competence, practical and entrepreneurial skills of each service providers. Personal capability of each of the service providers is, in turn, a function of their sex, levels of education, prior relevant experience in the practice, service-relevant formal skill-oriented training, and their extent of access and use for technical backstopping and other relevant knowledge and information sources. Whilst skilled staffing is one of the most important ingredients of human capacity, currently there are 11 formal providers who are all males and more than 36 years old.

The education levels of the service providers ranges from grade 1 to 10 and the average level of education is grade six. Of the eleven service providers, 5, 3 and 3 have formal education levels of, respectively, 1-4, 5-8 and 9-10 grades. Unlike CAHWs, the spray service providers have ventured into formal service with relatively better prior experience as informal crop protection service providers ranging from 2- 12 years; and 5, 3 and 3 of the service providers had an average year of experience 7.2, 5.7 and 4, respectively. This reflects the two study PAs under investigation, Debeso and Hulegeba Kuke, were categorized into the first and second intervals, respectively. Table 10 reports that the providers who have less education tend to have more experience which helped them to compensate their lower education status.

Table 10. Educational Profile and Practical Experience of providers

Education level (Grade)	Average (Grade)	Education	Average Experience (yr)	Frequency	%
1-4	2.4		7.2	5	45.4
5-8	7		5.7	3	27.3
9-10	9.7		4	3	27.3
Overall	6		6	11	100

Source: Own Computation, 2010

In addition to staffing, education and practical experiences of providers, an acquisition of knowledge through formal training is an important dimension of capacity. Since the inception of the service provision, at least four formal trainings were organized for the

service providers: two weeks training on agronomy and crop protection principles (organized by Melkassa Research center, WoARD and IPMS), one week training on operation and maintenance of spraying equipment and proper handling and use of agro-chemicals (delivered by WoARD and Adami Tulu Pesticide company), and refreshment trainings on bio-pesticides and integrated pest management (organized by pesticide company and IPMS), and pepper diseases control (organized by research center and IPMS) were offered for 5 and 2 days, respectively. The training on basic agronomic and crop protection principles was an inception training and attended by all providers while others were delivered to the current 9 active providers.

The issue of environmental quality, crop disease calendar, traditional protection methods and integrated pest management (IPM) were the central topics of training among many. Particularly the training on bio-pesticide (Appendix 7) and IPM was undertaken with the intension to introduce and capitalizing the habit of using of low cost and environmentally friendly disease control practice among the communities. To this end, IPMS and WoARD have shouldered the lion share to offer these trainings. According to the discussion made with providers, however, the DAs based at FTCs in which this study was carried out were not yet geared to perform any training to providers. The countable impact of the training to providers was towards their competence and perception towards service delivery. For example, so far they used to spray while chewing chat, but now they wear their safety measures properly.

Further assessment of the perception providers about the skill-orientation and practical usefulness of trainings revealed all providers (100%) have perceived the training on operation and maintenance of knapsack sprayer and handling of agro-chemicals as the most skill-oriented and practically very useful (Table 11). On the other hand, the training on crop protection principles and agronomy practices was perceived as the most theoretical-oriented.

However, according to discussion with providers, the selection process of training topics didn't include the providers, too short training duration and contents usually do not align with the need for ever-changing and contextual skills. Moreover, there are missing wings that the training program did not addressed, yet vital to better capacitate the providers include post harvest, coffee berry disease and extension education services. Hence, it is important to provide full package trainings to providers which also contests with the

finding of Ashworth (2005) who indicated that another area likely to emerge in the future is a revolution of business entrepreneurship and professional training for private sector development.

Table 11. Perception to practical skill-orientation of various trainings

Types of Trainings	Rated value	Max Freq.	%
Basic training on crop protection principles and agronomy practices	2	4	44
On-job training on operation and maintenance of knapsack sprayer and handling of agro-chemicals	5	9	100
Refreshment trainings on Bio-pesticide and IPM methods	4	7	78
Refreshment training on pepper disease	3	5	55.5

*1=highly theoretical, 2=slightly theoretical, 3=marginally practical, 4=practical, 5=highly practical oriented.

Source: Discussion with Spray Providers, 2010; N=9,

The result of an investigation about the major roots of knowledge and information about sources of agrochemicals inputs revealed formal trainings, private input shops, providers-to-providers information sharing network (market days and various public gatherings such as safety net public works) as the main sources. Likewise, additional sources of knowledge/information regarding handling and storage, application, disposal of containers were prescription from input shops, directions and labeling on the containers and their life time experiences from formal and informal practices. To this end, Adami Tulu Pesticide Company and Melkassa Research Center are highly appreciated by providers for their provision of user manuals which helped them to update their knowledge timely.

Another important issue with regard to quality and safety assurance is the technical assistance, monitoring and supervision of the actual service delivery system. The supervision and monitoring role is primarily the responsibility of the Alaba WoARD, particularly, Crop Production and Protection Work Process. In addition, other organizations such as IPMS and research centers provide technical backstopping. In regard to this, the discussions held with the individual service providers, relevant experts of the Alaba WoARD as well as organizations spearheading the initiative such as IPMS revealed the absence of both professional and trade licenses for providers and weak enforcement capacity of regulations which in turn affected their competition with informal providers and limited their access and networking to reliable sources to chemical inputs and equipment.

4.3.1.2 Storage and Handling of equipment/materials and chemicals

The availability of store and essential basic equipment and materials is another important constituent of the capacity needed for safe and environmentally sound yet effective crop protection service delivery. During bringing the spray providers into being, equipment kits and chemicals were given on credit base through Menchon union, which had received funds from the IPMS Credit Innovation fund. Unlike the CAHWs, the spray providers were supplied with equipments and essential protective measures for appropriate handling and application of chemicals (Appendix 8). This sounds good because it had impacted positively. At one hand, it has absorbed start up shocks, on the other hand, it helped the providers better perceived and trusted by the community for their safe and low risk of service compared with informal providers' service. This ignited the other informal providers to follow the same path and make necessary care for their health and environment.

The providers' access to materials and other utilities assessment reported that they frequently mentioned the difficulties they went through during launching the process of accessing agrochemicals, equipments and technical supports. They frequently face the shortage and even absence of chemical inputs in their vicinity. For example, the provider in far PA, Debeso, was frequently reported the incidence of regular and sporadic coffee disease and bring the diseased coffee sample to the WoARD crop protection desk (now work process) but the response to respective chemical was none except dreary walk to WoARD. On the other hand, the terms of access to chemicals varies following the pattern of demand for various services (Figure 6). Providers do not store chemicals at their stock due to lack of separate storage room and sufficient capital. Although the providers were attached to Union and WoARD Input and Marketing Work Process, the supply of chemicals is usually ad hoc and come very late after the disease or pest had caused sizeable damage. Moreover, there is no retailer channel in rural far PAs where majority of providers and users reside, disease incidence is more prevalent and outbreak report is delaying. Yet, interviews with private input providers suggest that cash constraints, which limit most traders' ability to stock sufficient amount, would need to be addressed to maintain supply.

The assessment of perception of providers regarding the timely availability, quality and costliness of the chemical inputs is summarized in Table 12. The survey has identified the

three major sources of agrochemicals in the study area. Accordingly, the private input shops (Appendix 1) ranked the first for their timely availability followed by the Mencheno Union shop. This is because private shops are always open and chemicals available in kind and quantity. Hence, the providers have reported their strong linkage with them to maintain supply of chemicals. For quality of chemicals, providers selected Union shop as the best of all because in public store chemicals usually stay more than two and three months before dispatch but is not the case for the Union. The overall assessment of chemical price also indicated that WoARD is preferred to others because the WoARD absorbs all its transportation and personnel expenses and sells chemicals at reasonable price unlike the private dealers where price is too costly as they transfer all costs to buyers. This calls for trade and professionally licensing and ensuring regular renewal of license for providers so that they can access chemicals and necessary equipment at reasonable price from wholesalers and hence, maximize profit margins from their practice. The experts' group also perceives the importance of licensing as the regulatory bodies have the power to remove licenses from providers who contravene regulations and perform poor. Nonetheless, the issue of certification and licensing has revealed a weak linkage and did not get any attention.

Table 12. Providers' Perception about supply of chemical inputs

Agro-chemicals Providers	Spray service Providers Rating, %					Score	Rank
	Excellent	Very good	Good	Poor	Very Poor		
Timely availability							
WoARD Agr. Ext. Work Process	.00	.00	22	67	11	211	3
Private input shops	56	22	11	11	0.00	423	1
Mencheno Union input shop	33.3	44.4	22.2	.00	.00	410.7	2
Quality of chemicals							
WoARD Agr. Ext. Work Process	44.4	33.3	11	11	.00	410.2	2
Private input shops	.00	22	78	.00	.00	322	3
Mencheno Union input shop	56	22	22	.00	.00	434	1
Price of chemical inputs							
WoARD Agr. Ext. Work Process	78	22	.00	.00	.00	478	1
Private input shops	.00	33	11	56	.00	277	3
Mencheno Union input shop	56	33	11	0.00	.00	445	2

NB: Score is calculated by assigning 5 for excellent, 4 for very good, 3 for good, 2 for poor and 1 for very poor. Then multiply % of observation by the score and finally adding the total observation; N=9

Source: Own Computation from providers survey, 2010

The availability of means of transport is important to facilitate mobility and timely response to the users' demand and for easy access to reliable sources of chemical inputs. As a result, all providers were supplied with bicycle for transport purpose which helped the providers to cover wider area and timely respond to demand given the plain topography of study PAs.

Finally, the survey as well as own observation about the disposal of used container and expired chemicals were revealed an important finding. Although the sprayers were offered professional training for proper handling of chemicals, it was observed while they are selling and reusing containers for various purposes such as carrying gas/oil and water for 'selat'. Further critical examination of the case also indicated the optimal ignorance of some providers to store in separate shelf and wear safety measures properly. However, all the providers responded that they do not have separate room for chemicals as 67% of providers are living in grass thatched house which is not partitioned into classes. Apart from use and handling of chemicals, the providers' reflected their fear for the potential health hazards as result of the cumulative effect of consuming chemically treated food as time goes the risk it takes. Ato Asemo, a 39-year-old PCPS provider from Choroko PA, reflected his worry as *'how much it affects our health if it let the seed dormant for such long time'*. Nonetheless, still yet no rigorous environmental and health impact were recorded except some light symptoms such as reduced appetite for food and skin irritation on joints.

4.3.1.3 Finance or credit linkages

Finance and access to credit are also important to cover costs of initial investment on fixed assets and to overcome liquidity constraints for acquired agro-chemical inputs. The survey has revealed a vacuum of financial service market in Alaba. Though structures exist at regional, zonal and district levels, it is functioning sub-optimally due to weak institutionalization. The privatization agency in the region has a structure up to district level and various financial institutions (Agricultural Rural Fund, MFI, Unions) are operating in the sector. However, except Mencheno Union, others have not yet delivered any financial and business management services to providers neither in the training nor in practice.

Based on the typology of linkage, the providers made four types of linkage such as linkage for input and material, regulation and certification, knowledge and information and linkage for finance and credit (Figure 5). The first two were already discussed in section 4.3.1.1 and 4.3.1.2. The actors' linkage analysis has revealed the very limited and ad hoc knowledge linkage, usually a resource person for training. For example, research centers were training on principles of crop protection and demonstrating crop protection practices on farmers plot. However, the linkage for research and extension is missing. Despite the existence of many NGOs actors, their interaction with private spray providers was often absent. They interact occasionally with providers and their engagement in systematic and continuous experimental social learning and scaling up/out successful experience is often debatable. One exception is the partnership between IPMS in facilitating and latter attaching the providers to unions and private input shops to sustain the access to knowledge, credit and input services.

Credit and finance linkage also mainly focus on production inputs such as fertilizer and improved seeds rather than on equipments, chemicals inputs and operating capital. According to providers' survey, they started business as formal private entity with credit

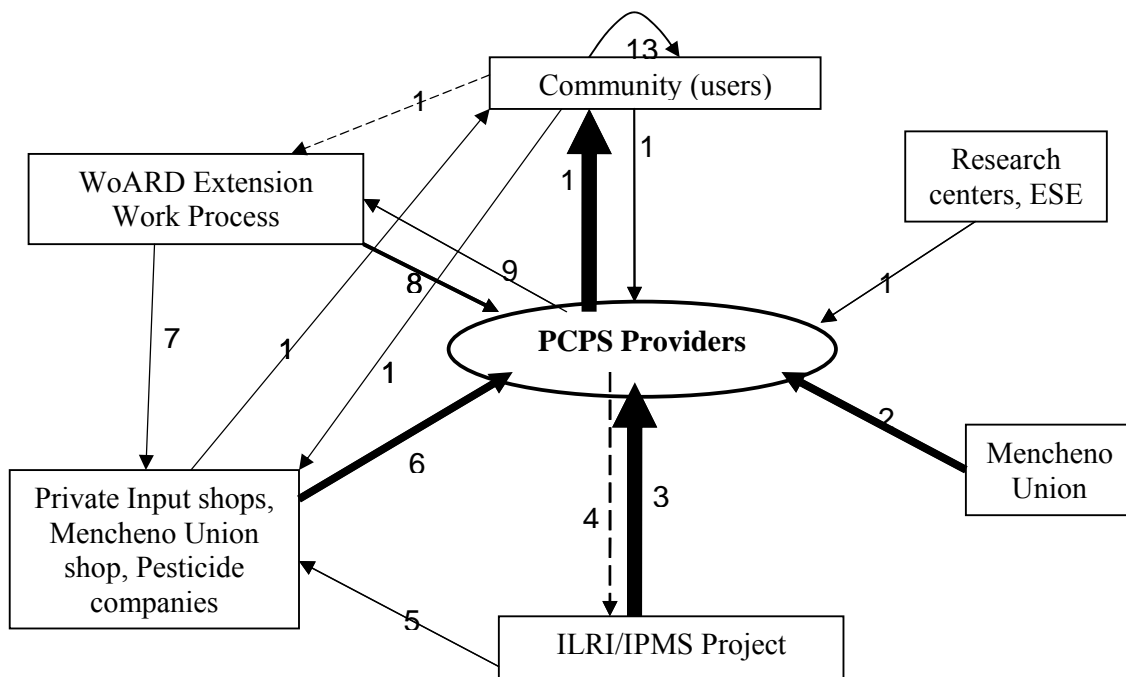


Figure 5. Actors Linkage Map showing access to Knowledge, Inputs and Finance to PCPS Providers; **Source:** Own Design, 2010

Linkage Descriptions

K		e		y			
1 st Most important linkage		2 nd most important		3 rd most important		4 th most important	
1	Linkage for Knowledge and information i.e. training on bio-pesticide and modern protection spraying, demonstrate on-farm trail	8	Linkage for Regulation/certification: train, monitor, supply chemicals, facilitate linkage	9	Report disease outbreak to process owner	10	Report disease/pest outbreak
2	Linkage for finance and credit: supply formal credit, agro-chemicals and equipment	11	Deliver various crop protection services	12	Request services, report pest outbreak	13	Service linkage within poor and rich, male and female-headed HHs
3	Organize training, facilitating linkage with unions and research centers, promotion of service	14	Supply chemicals	15	Pest/disease outbreak, request chemical		
4	Provide report of work, report disease outbreak						
5	Training and facilitate technical support						
6	Provide chemicals & equipment, promote of new chemical						
7	Regulate and monitor						

from Mencheno Union. The Union has also made strong linkage for finance and mobilized a total credit of birr 39,050 in kind. IPMS has been admired for its strong linkage in facilitating to access to formal credit and knowledge sources. However, the effectiveness of these linkages have been limited due to the neglect in addressing non-technical hurdles related to institutions and market for improving service delivery.

Own attempt to observe and review the providers' record keeping & its nature has revealed how different the providers are. IPMS together with WoARD had developed recording formats of achievements. Accordingly, the provider in Hulegeba Kuke who has relatively better recording system and separate format for revenue and expenditure for most of specific services may be due to his better education level than the provider in Debeso PA who had very low education has revealed poor recording system of cases even not differentiated into type and amount of users and extent of hectare covered has created difficulties to trace its success rate. This is also coupled with the very weak follow up of focal persons to handle the system informative. Hence, the information is not often timely reported to decision makers and shared with the end users and lacks backward and forward linkage.

Since launching the service, the providers have accumulated various assets in the form of fixed and working capital. The current asset value has increased for majority of the providers (Table 13). Having cell phone (56%), purchase of additional knapsack sprayer (44%) and outstanding loan are particularly intended to expand service delivery.

Table 13. Current Assets and Capital of the PCPS providers, (% of yes)

Indicators	Frequency (N=9)	%
Owned cell phone	5	55.5
Bought additional knapsack	4	44
Money in cash at hand	8	89
Outstanding loan	4	44

Source: Spray Service Providers survey, 2010

Overall, PCPS providers are relatively better capacitated for most of the indicators assessed, despite the weak supply-side to chemical inputs and enforcement capacity of regulations.

4.3.1.4 Perception of Providers' about Opportunities & Challenges to their Capacity

Understanding the perception of providers, with respect to challenges and opportunities they currently possess to perform their role help learn their capacity to deliver full and effective services. In line with this, the following favorable motivating conditions (opportunities) about their capacity were summarized.

- Technical and material assistance and the devotion of some NGOs to support providers are highly motivating conditions.
- They perceive themselves as a physician to crop as veterinarians to animals that they are proud of their profession when they put on all their safety measures.
- The benefit (in form of profit & work experience) from practice further strengthening their capacity.
- Existence of private input shops for chemical inputs and unions for credit access and mediating role of IPMS is also an important opportunity.
- While delivering the service meanwhile they are developing social capital within the society.

It is also imperative to assess the potential supply constraints of providers. Based on discussion with providers on the constraints facing their day-to-day practice, the top 3 constraints with regard to their capacity were discussed as follows.

Table 1. Constraints Perceived by PCPS Providers: rank order (1=first most important)

Providers Perceived Constraints	Freq.	%	Ranking
Lack of incentives from the government	5	55.5	4 th
Lack of commercial production to support private practice	4	44	5 th
Lack of training in practice management	6	66.7	3 rd
Competition with informals who are likely to undercut price	9	100	1 st
Weak enforcement mechanism to deal with informals	7	78	2 nd

Source: Service Providers Survey, 2010, (N=9)

All providers (100%) perceived the competition with informal providers is discouraging their morale and ranked it as the most important constraint (Table 14). Informal providers are local elites who have better financial capacity to supply service on long credit base and cover a significant number of poor clients in remote areas thus eventually may drain all the users as their customer. This is basically attributed to absence of license to control the strategic behavior and interest-of-conflict with informal providers. Their strategic behavior can be expressed by adulteration and undercutting prices. The very reason forwarded for adulteration, in FGD with informal providers, was because the public has absorbed a large proportion of the delivery cost (including equipment and loans) for formal providers; this resulted in unfair competition in price between formal and informal providers working in private capacity. This overlap of roles between the formal & informal providers breeding unfair competition and ineffectiveness or if the roles are clear then there is a weak implementation of the laid down regulatory rules & legislation regarding licensing and policing. Unlike CAHWs services, PCPS is quite new, lacks service standards and guidelines. Lack of appropriate capacity building and timely updating of acquired knowledge leading to inefficiency at work. About 66.7% of providers' reported inadequacy of regular refresher trainings.

Weak enforcement of regulatory framework had exerted significant negative impact on the system. The providers were reported as many of the chemicals supplied never had labels other than the name of the product and its manufacturer. Own observation and informal discussion with district experts indicated that products that are supplied without enough information about their intended use. These have brought various localized impact on the environment. The providers also recounted the most resistant to herbicide and

aggressive weed, parthenium, which was supposed to be introduced as result of weakly quarantined improved seed.

4.3.2 Crop Protection Service Coverage and Use

4.3.2.1 Crop Protection Methods and Services

Modern crop spray service in the district is delivered by different partners including public, formal and informal private providers while traditional service provided by individual farmer on his own farm. Currently, formal and informal private spray services are dominant among them. However, the public takes the part only when there is a significant witness for crop loss. For example, epidemic army worm infestation (Table 15), which has the potential to threat food security at HH and district level.

In addition to modern crop protection measures, the sample HHs also use various indigenous crop protection measures. The use of bio-pesticide and cultural agronomic practices are the dominant methods among the HHs for termite pest (Table 15). In post-harvest services, on account of its availability and affordability, the use of traditional methods overweighs the others. However, these practices lack formal and regular documentation for promotion and scaling while in the meantime strengthening and integrating with modern methods.

Table 2. Major Crop protection methods and services

Services Category	Crops affected	Common Pests & Diseases	Specific control methods by source			
			Traditional	Public	Private informal	Private formal
Pre-harvest	Cereal & pulses	Weed	Mechanical weeding	-	Herbicide	Herbicide
		Termite	Bio-pesticides, cultural	-	-	-
		Army worm	Bio-pesticides	Pesticide	Pesticide	Pesticide
		Stem-borer	crop sowing calendar	-	Pesticide	Pesticide
	Wallo bush cricket	Bio-pesticides, sowing calendar, cultural	-	Pesticide	Pesticide	
	Vegetable and spies	Early & late blight, down mildew, aphid	Bio-pesticides, cultural practices	-	Pesticide	Pesticide
Post-harvest	Cereal & pulses	Rodents, Fungi Weevils	Bio-pesticides, capturing rodents mechanically, harvesting calendar	-	Fungicide, rodenticide	Fungicide, rodenticide

Source: Survey Result , 2010

Another important observation is that the community are using pre-harvest services both for subsistence and cash crops whereas post-harvest services only for subsistence cereal crops indicating lack of post harvest service for cash crops despite the latter is easily perishable than the former.

Service charge

The charging rate for crop protection services shows variation within and between services. Within the service, the charging of both pesticide and herbicide now frequently fluctuating in response to price of chemical inputs (i.e. responding to market forces). Viability is a function of charging and demand for services. Between the services, charging for pesticide is higher than that of herbicide. As cereal crops are the major crops in study area, the demand for herbicide is also higher than that of pesticide. As a result, the viability of pesticide is governed by charging rate whereas that of herbicide governed by demand for service. This tells us where the balance is to maintain the service delivery within poor society. For a given service, the charging rate of formal providers is incomparable as this service is not common by the public sector but higher than that of informal providers. Because services for latter have the characteristics of low dose, ineffective, poor quality usually expired and adulterated with excess water, pepsi and coffee which also creating a problem of adverse of selection to users.

Seasonality of service demand

Because of the seasonal nature of disease incidence, the service demand also follows the same pattern (Figure 6). Post Harvesting Service (PHT) mostly demanded in months February to May because Alaba falls in Rift Valley and these are months of hot humid weather inducing high weevil infestation. Herbicide is highly demanded from mid-April to mid-September where most crops are at vegetative growth. The seasonality nature of

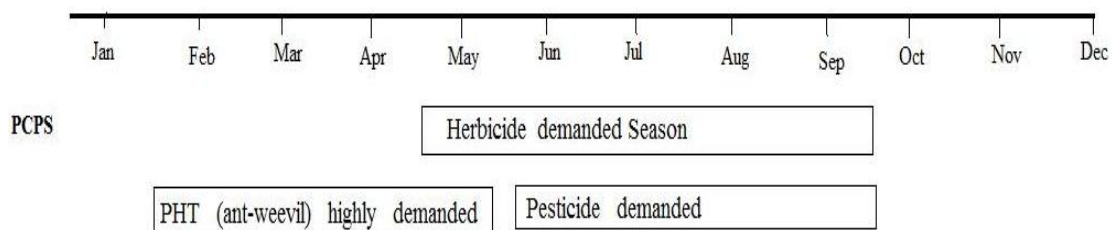


Figure 6. Seasonal Calendar for demand of crop protection service;

Source: Own Design, 2010

demand for services has its own impact on delivery efficiency. As a result, some providers switch on-and-off to other options of businesses like cattle and/or pepper trading leading to difficulty in maintaining the service in remote PAs.

4.3.2.2 Service Coverage and Uses

The herbicide coverage (110ha) with its focus to cereals and pulses is wider than that of pesticide (35ha) which is more confined to cash crops (spices, vegetables and chat) and rarely to others (Table 16). Based on service category, pre harvest service coverage which encompasses herbicide and pesticide is wider than that of post harvest services which only takes fungicide for weevil. This locates where the gap is in order to strengthen both supply and demand-side. Regarding to provider, the service provider in H.Kuke has covered wider area perhaps due to relatively better education level (Appendix 9), own mobile cell phone to serve on call basis whenever there is peak demand particularly for herbicide and physically young strong to travel by bicycle than that of Debeso PA who lacks these qualities.

Table 3. Crop Spray Service coverage in Hectare, by Provider

Specific Services	Commonly used chemical	Average coverage in Ha, by Provider		Overall
		H.Kuke	Debeso	
Herbicide	2-4-D, gran star	124	96	110
Pesticide	Malathine, Redomill, Mancozeb, Diazol	46	24	35
Fungicide / Rodenticide	Rodenticides (DDT phosfide), Fungicide	12.3 [@]	na	na

Source: Recordings of Providers, 2010; na=data not available; @ is % of HHs from H.Kuke PA using service

Out of the total 23 PAs covered by the providers, the coverage of extended PAs accounts for 52.2% (beyond the PAs they were originally assigned). In the district, the total PAs covered by formal providers is only 29% (Appendix 9) despite the presence of informal providers in every PA (Figure 7).

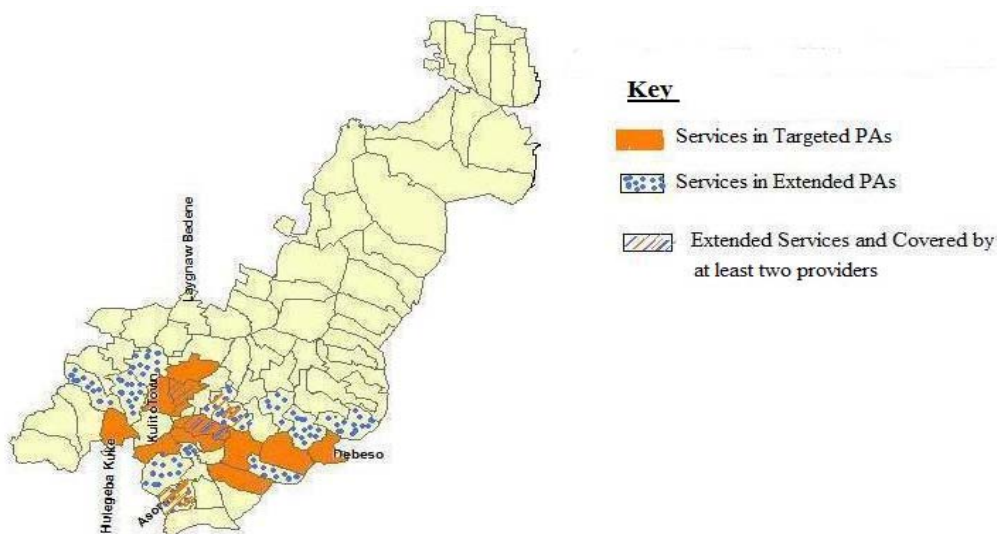


Figure 7. Private Crop Protection Service Coverage in PAs; **Source:** Own Design, 2010

The use rate of spray service shows certain variation over PAs and wealth categories (Table 17). In both PAs the better-off HHs rarely use spray services (at most 37.5%) than poor and medium classes due to the fact that majority of better-offs having their own knapsack sprayer. This is because the equipment is available in Union and shops and the cost is affordable to them. Regarding to service category, the use rate of herbicide is more than that of pesticide, which is also more than fungicide use thus confirming similar finding of providers recording in Table 17. This herbicide dominance than pesticide further contests with where lack of commercialized production to support private practice mentioned as important constraint in Table 14 and indicating staple crops dominated production than cash crops which need pesticide. The poor in both PAs are not using fungicide because they do not have grain stock.

Table 17. Service Use rate by different wealth categories, by PA (% of user HHs)

PA	HHs Category	Specific services			Overall
		Herbicide	Pesticide	Fungicide / Rodenticide	
Debeso	Better-off	50	37.5	25	37.5
	Middle	77.8	66.7	66.7	70.4
	Poor	61.5	46	0	53.8
	Total user				53.3
H.Kuke	Better-off	33.3	33.3	33.3	33.3
	Middle	100	87.5	75	87.5
	Poor	56.2	43.7	0	50
	Total user				56.7

Source: Survey Result, 2010

4.3.3 Financial viability of Spray Service

Among the various crop protection services being delivered, only herbicide is analyzed as a showcase of commercial viability on account of its demand by majority of HHs. The data that was subjected to Cost Benefit Analysis (CBA) include cash inflows, outflows, area covered and treatment and labor charging. The cash benefits and the costs of the business were obtained from the providers' cash flow reports for the year 2008/9 for which relatively sufficient data was found and the analysis for possible financial relationship between income and expenditure is summarized in Box 2.

Box 2. Cost Benefit Analysis for PCPS

CBA was based on information that the service provided on seasonal base and the number of service days are limited, the data is actual and obtained from providers recording.

Given Data: Chemical cost is to be covered by user; business started with formal credit of 400Br at 7% interest rate, the chemical used is herbicide (2-4-D); average service days =110days/year i.e. 5 peak months with average of 22 working days per month; depreciation cost of equips is ignored; Take 1 Ha=4timad.

Charging: 1 knapsack (15 L or 1container) = 5Br/Timad (includes labor & chemical cost).....1

Case 1==Field with low weed density needs = 2 container/timad.

Case 2==Field with high weed density needs = 4 container/timad.

Thus, on average one timad consumes= 3 containers of herbicide..... 2

On average a given service provider serves 1ha/day. Labor cost = 2Br/container..... 3

Given these information: Thus, for a hectare = 4timad * 3 (from 2 above) = 12 containers required. The user customer pays 12*5Br (from 1 above) = 60 Br.

Gross income: 1) The provider gains 60Br/ha/day and, annual income is 110*60=6,600Br
2) credit from union=400Br, 3) overall= 6600+400=7000Br

Expenditure: There are 20 knapsack containers can be prepared from 1L of 2-4-D chemical. In 110 days in a year, 110ha require 66L of 2-4-D.

- 1) On average 1L of 2-4-D costs 30Br. Total cost is 66L*30Br = 1,980Br.
- 2) Maintenance cost for knapsack sprayer and nozzle (accessories)=1000Br
- 3) Labor cost of 2Br per container gives= 2640Br per year (from 3 above).
- 4) Loan pay to loaning institution=400+(400*0.07)*12=400+336=736Br

$$5) \text{ Overall} = 1980 + 1000 + 2640 + 736 = 6356 \text{ Br}$$

Average net income from the service per year for individual provider = 7,000 - 6,356 = 644 Br/year or the B/C = $7000/6356 = 1.10$ i.e. $B/C \geq 1$. This indicates that, if the current service delivery trend continues, the spray service would remain financially viable even if the current costs of chemical inputs increased by 10%.

Source: Own Computation, 2010

4.3.4 Perception of User and Potential user Farmers

Table 18 shows the variation of perception of HHs within and between PAs. HHs in H.Kuke PA (71%) were better satisfied with the service due to better performance of the provider than HHs in Debeso PA (63%) where HHs feel some shading of dissatisfaction. In both H.Kuke and Debeso PAs better-offs were better perceived an increase in crop yield, 87.5 and 83.3%, respectively, than middle and poor classes because they had comparative advantage to use service from different sources (from private and their own spray services with normal dosage and recommended frequency). The same reason holds true for effectiveness. In general, the better-off and middle class HHs in both PAs were better perceived for all indicators under investigation than the poor who mostly use the service with poor quality and lower frequency from informal providers.

Table 4. Perception about the use of spray service, by user/potential user farmers

Perception about spray services	Service users, %			Overall
	Better-off	Middle	Poor	
H.Kuke PA				
Service effective, yes	87.5	88.9	42.8	73
Overall crop yield, increased	87.5	66.7	57	70.4
Satisfaction to service, satisfied	87.5	83.3	42.8	71
Debeso PA				
Service effective, yes	83.3	75.7	50	69.7
Overall crop yield, increased	83.3	71	62.5	72
Satisfaction to service, satisfied	66.7	71	50	62.6

Source: Own Survey Result, 2010

Overall, the coverage of PCPS is herbicide dominated, sufficiently satisfied the nearby PAs particularly the better-offs and middle class users.

4.3.4.1 Comparison of Crop Protection Methods as Perceived by Farmers

The service users more positively perceived traditional practice for its availability, timeliness and environmental safety and used by majority of poor but criticized for its affordability as it consumes more labor than others (Table 19). Nonetheless, in the worst scenario when pest and diseases have the potential to threaten food security, it is advisable to use chemicals in economic way (Save the children, 2001). On account of their quantity and access to chemicals from black market, private informal are better perceived for timeliness, affordability and availability than formal providers. However, as an output of formal trainings and presence of safety measures, in contrast, private formal are better perceived for environmental and human health than informal providers. In general, the service is better for its accessibility for all providers. However, improvement in other indicators and progress monitoring that involves users in defining the performance criteria to be monitored would contribute more positively.

Table 19. Ranking of different providers for various indicators, by user/potential user farmers

Indicators	HHs ranking of Spray service providers		
	Traditional	Private informal	Private formal
Accessible /available	5	4	4
Cost affordable	2	5	4
Timeliness/responsive to demand	5	5	3
Human health, safe	3	2	5
Environmentally, safe	5	2	5

Source: HH Survey Result, 2010; *Rating: 1=very poor, 2=poor, 3=moderate, 4=very good, 5=excellent

4.3.4.2 SWOT Analysis for Private Crop Protection Service

When services are delivered in remote rural PAs, it is notoriously difficult to evaluate. Because they take place within challenging and rapidly changing milieu, where information is usually scarce, unreliable and difficult to collect. The priorities of providers, understandably, are often been output rather than impact and learning. Thus, thorough and valid assessment is usually impractical. However, without credible evaluation it's difficult to show that services delivered in remote PAs met objectives or made a worthwhile

impact. Recognizing the importance, hence, the SWOT analysis for private crop protection service (Table 20) conducted jointly by WoARD experts and key informants from IPMS.

Table 20. SWOT analysis of PCPS

Strengths and benefits of delivery system	Weaknesses of delivery system
<ul style="list-style-type: none"> • Provision of quality service to users in short and long term credit modality • High ability to identify localized pests, diseases and respective chemicals for protection • Recording of achievements • An endeavors to promote bio-pesticides use • Provision of startup materials & later attachment of providers to unions to sustain the system; • Market promotions on market day to inform the existence of service and its providers 	<ul style="list-style-type: none"> • Limited availability of services and insufficient integration of indigenous with modern practices • Providers are highly profit-oriented than client-orientation • The system didn't include women as provider; • Lack of practical oriented capacity building program to providers • Weak coordination and information exchange between service providers and WoARD • Weak public regulation and supervision
Opportunities for sustainability & expansion	Threats for expansion and sustainability
<ul style="list-style-type: none"> • Presence of the district existing extension service • Existence of private input shops address constraints to availability of agrochemicals • The existence of Mencheno union and MFI for credit service delivery • Close cooperation between community and providers while living with & to-community help internalize the problem as if their own • An increasing demand for services • Direct charges provides the right incentives for the providers to deliver the 	<ul style="list-style-type: none"> • Ever increasing cost of chemicals and equipments may reduce WTP of poor farmers in remote PAs • Due to under dose use of chemicals by informal providers, minor pests becoming resistant and major pest this eventually might increase pests community in the environment • Farmers may be reluctance to use private services due to both production and price risks. • Poor economic status of HHs in remote areas might hinder users' ability to pay

<p>services</p> <ul style="list-style-type: none"> • Mutual benefit for providers (gain from service fee) & users (reduction in yield loss) • given the existing market-led policy, the public sector initiative to support private sector • The existence of providers help as a real model for others to enter • Existence of various NGOs & 46 DAs in the field based in FTCs witnesses strong support 	<ul style="list-style-type: none"> • Seasonal nature of demand for service may dissolve sustainability of service • Lack of both professional and trade licenses • Incomplete or partial implementation and the near-reversal of policy reforms • Institutional instability expressed by frequent restructuring and high staff turnover and low commitment and motivation of staff in public sector
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Source: WoARD Experts and Key informants Discussion, 2010

For the future expansion and sustainability of service delivery, it is important that the system should focus on these strengths. The provision of startup kits & later attachment of providers to unions and introduction of bio-pesticides use showed up as an important strength of the system. So, the system has to keep on it and build at their good reputation in the community. Especially linkages with private input shops, Union and WoARD and IPMS are important, as these maintain supply of essential resources and need to be cultivated. Absence of female providers perhaps due to cultural barrier was highlighted as an important weakness. But they are more efficient even more than the professional provider if given adequate and relevant trainings. This will increase their knowledge on farming activities, give them an opportunity to income, and enhance their status within the HH and the community as a whole. On the other hand, the seasonal nature of demand for service and lack of both professional and trade licenses for providers are important threats that may dissolve the sustainability of the system. Hence, this finding has significant implications for determining where the crop protection service delivery system in study PAs and elsewhere in the district and should focus its effort.

Lessons learnt

In general the following lessons were learnt from the existing PCPS practices:

- PCP service can easily be affected by any shocks because they directly deal with the most vulnerable group in the communities whose livelihoods are purely smallholder subsistence farming.
- The crop sprayer operated single person enterprises have been expanding to hire two or more labor to share load during peak time while the CAHWs have remained single person enterprises.
- The farmers are willing to pay for various crop protection services if the services would improve their income as farmers and empower them financially.

4.3.5 Willingness and Ability to Pay for Private Crop Protection Services

Crop protection services in the study area are already being paid for by the users. Payment has been started for the services that bring an immediate benefit to the users and substantial profit for providers, such as pesticide and herbicide services. As far as output of the service is considered, reports from providers were encouraging as it reduced yield loss (Section 4.2.1). However, private service delivery has the potential to exclude poor and marginalized groups who are unable to pay. Thus, alongside the potential merits of privatization, it is imperative to recognize the perceptions of the affected groups, the poor, while the extenuating factors peculiar to crop protection service users and non-users may be critical and will be discussed in this section.

Willingness to pay for the service was gauged on the basis of the assessment of service fee and perceptions of users/potential users on the prevailing charging rates for specific services. Majority (51.7%) of the current herbicide users and non-users perceive the prevailing charge is reasonable though the users outweigh the proportion (Table 21). On the other hand, about 63.3% of pesticide users perceive the current charging is higher to them in fact non-users outweigh in contrast. Majority of non-users perceive the current charge is higher (45% for herbicide and 77% for pesticide) and are not using the service. In both services very few proportion of HHs (13% for herbicide and 11.7% for pesticide) perceived the current fee is lower and prepared to pay a little higher fee for quality services i.e. 6.25 and 11.86 Br for herbicide and pesticide respectively (Table 22).

Table 5. Perception to crop protection services Charging

Crop protection Services	Lower	Reasonable	Higher
Perception to the current prevailing charge rate for herbicide, %			
User	12.5	62.5	25
Non-user	14.3	40.6	45.1
Overall	13.3	51.7	35
Perception to the current prevailing charge rate for pesticide, %			
User	12.5	37.5	50
Non-user	10.7	12.5	76.8
Overall	11.7	25	63.3

Source: HH Survey Result, 2010

Data presented in Table 22 presents descriptive results related to mean willingness to pay. The survey revealed that the respondents are willing to pay for quality services despite the difference in amount of fee for various services. The reason pointed out by HHs (35% for herbicide and 63.3% for pesticide) were they couldn't afford the current charge but could pay if the service charges could be reduced. This group of respondents is willing to pay for herbicide 2.99 and for pesticide 5.00Br, with standard deviation 1.1 and 1.49, respectively, due to the reason that they can't afford more than the stated fee.

Table 22. Proportion of HHs willing to pay (WTP) for different spray service chargings

Service type	Perception to current prevailing charging	Mean WTP (Br)	% of willing respondents
Herbicide	Current charging is higher	2.99 (1.10)	35
	Current charging is Reasonable	5.00 (.00)	51.7
	Current charging is lower	6.25 (0.50)	13.3
Pesticide	Current charging is higher	5.01(1.49)	63.3
	Current charging is Reasonable	10 (.00)	25
	Current charging is lower	11.86 (0.56)	11.7

Source: HH Survey Result, 2010; *NB:* Numbers in parenthesis are standard deviations

4.4 Livestock Production and Marketing Systems in study area

Cattle are the dominant livestock type in the study area accounting for about 87% of TLU^{**} (Appendix 11) and owned by about 92% of the households. The average number of cattle owned by households is 2.8 TLU ranging from 2.1 in Debeso to 3.8 in Lay Bedene PA. About 66% of the households have at least one ox and similarly about 80% of the households have at least one cow/heifer, pointing to the importance of both oxen and cows in the household economy (Table 23a). The average number of oxen and cows owned by households is 1.13 and 1.52, with standard deviation 1 and 1.3, respectively.

Table 23a. Livestock ownership pattern, % of owners

Livestock species	Asore	L.Bedene	H.Kuke	Debeso	Overall
Proportion owning at least an ox/bull	60	90	56.7	56.7	65.8
Proportion owning at least a cow/heifer	80	90	76.7	73.3	80
Goats or sheep ownership	66.7	93.3	76.7	46.7	70.8
Donkey ownership	36.7	70	43.3	36.7	46.7
Mean TLU	3	4.6	2.6	2.4	3.17
HHs selling butter, >55%	80	83.3	90	76.7	85
HHs engaged in cattle fattening	16.7	16.7	23.3	40	24.2

Source: Own Survey Result, 2010

On account of proximity to main road to Addis and big market cities, livestock fattening and marketing in Debeso and Hulegeba Kuke PAs is important source of cash income. This is more envisaged when low proportion of HHs, nearly 57% in each PA, own draught oxen. The low TLU in these PAs further justifies that these HHs have opted to marketing of livestock than storing as wealth. Due to nearness to Kulito market and having more improved breeds (Table 23b), about 90% of HHs in Hulegeba Kuke PA sale more than 55% of butter while consuming the remaining proportion in house. As a rule of culture, milk is not sold at all in any interviewed HHs in any PAs. Population of equines is very low particularly those used for transportation of human such as horses and none of the HHs owned mule. This is because all study PAs are topographically fairly flat thus 56.7% of HHs own bicycle for transportation perhaps due to lack of feed and high cost to purchase mule. From 48.3% of HHs who owned equines, in 46.7% HHs, the equines reported are only donkeys pointing the dominance of donkeys as pack animals.

^{**} 1 Tropical Livestock Units (TLU)= 250 kg live weight

4.4.1 Livestock Input use and yield trends

As farming in all study PAs is mainly subsistence oriented and mixed crop–livestock production system and open grazing is more common and stall feeding is almost non-existent, HH survey was attempted to consider only some inputs as real inputs. Crop protection like weeding of crop fields also yields feed. As discussion to key informant farmers, use of communal grazing was common usually right after collection of crops from the field and the average grazing hours in the study PAs is 7 hours/day during harvesting, and in dry season when there is no pasture, the time of grazing on communal fields is increased to 10hours/day. On-farm improved fodder production is not common, only 7.5% of sampled HHs, except for Asore and Lay Bedene PAs where the IPMS introduced male goat breeds for mating. For part of this reason and where 23 and 17% of model farmers were found in Asore and Lay Bedene respectively, in general, these PAs are more intensive in livestock input use. These PAs are also with relatively better access to animal health service when Asore on its proximity to public health center and presence of CAHW, and Lay Bedene with an active and competent CAHW. This finding further confirms the impact of CAHWs service on animal husbandry in changing farmers’ attitude to use more livestock input than other PAs. In sum, more than 86% of HHs in these PAs reported that overall cattle yield is increasing for which improved livestock health services had positive contribution.

Table 23b. Livestock input use and over all yield trends, % of respondents

Improved inputs	Study PAs				Overall
	Asore	L.Bedene	H.Kuke	Debeso	
For cattle					
Improved breed	16.7	16.7	20	6.7	15
AI service	13.3	16.7	20	6.7	14.2
On-farm improved fodder production	10	6.7	10	3.3	7.5
Purchase feed	13.3	16.7	6.7	6.7	10.8
Hired labor	10.5	9.1	0	9.5	7.3
Overall yields trend increasing	86.7	93.3	86.7	86.7	88.3
Small ruminants					
Improved breed	13.3	6.7	0	0	5
On-farm improved fodder production	6.7	3.3	0	0	2.5
Overall yields trend increasing	60	76.7	66.7	70	68.4

Source: Own Survey, 2010

Most farmers use crop residues as stubble as they do not collect and feed their animals in the field. Collected crop residues are usually used when there is shortage of natural pasture

and stubble. Purchased feed is not common for rural HHs. With the expansion of cropland, which has reduced the availability of natural pasture, crop residues are becoming increasingly important in all study PAs. In each PAs only few (14%) model farmers who are using AI service on their account of targeting improved breeds by WoARD (Table 23b). Only in few PAs farmers were using watering trough for livestock, otherwise, livestock are mainly watered in community ponds and few use Bilate River. Herding and watering are the major activities that require labor in livestock management. Out of 64.2% HHs hired labor for various agricultural activities, only 7.8% goes to livestock management while the rest allocated to other agricultural activities. FHHHs rely heavily on family labor for milking and barn cleaning than hired labor. In general, improved input use trend shows relatively greater amount allocated to large cattle than small ruminant animals.

4.4.2 Opportunities and Challenges for Livestock production

Among opportunities to the development of livestock sector, sampled HHs put animal health care and its coverage at the top of the list and they were listened recommending the necessity of improving its delivery. Nearly 41% of livestock owners reported the availability of livestock market as the second most important opportunity, ranging from 7% of farmers in Asore to 17% in Debeso PA.

Table 23c. Livestock production Opportunities and Challenges ranking, (% of respondents)

Ranking in every study PAs				Opportunities & challenges overall study PAs	Ranking overall study PAs
Asore	L.Bedene	H.Kuke	Debeso		
Opportunities					
CAHWs presence(86.7)	CAHWs presence (83.3)	Market availability (66.7)	Market availability(76.7)	CAHWs presence(50.8)	1 st
Market availability (6.7)	Market availability(13.3)	Public Health Service presence/16	Public Health Service presence/17	Market availability(41)	2 nd
Constraints					
Feed shortage (66.7)	Feed shortage (53.3)	Feed shortage (56.7)	Feed shortage (66.7)	Feed shortage (60.8)	1 st
Disease (20)	Disease (20)	Disease (13.3)	Water shortage (16.7)	Disease (16.7)	2 nd
Water shortage (6.7)	Water shortage (13.3)	Water shortage (10)	Disease (13.3)	Water shortage (11.7)	3 rd

Source: Survey Result, 2010

Lack of feed has been considered the most important challenge to all livestock owners in every study PAs. The second important constraint is disease, which on average was reported by about 17% of the households (Table 23c).

Table 23d. Major livestock parasites & diseases & treatment measures

Asore	Study PAs (% of responding HHs)			Parasites & Diseases overall study PAs	Ranking overall study PAs
	L.Bedene	H.Kuke	Debeso		
For cattle					
Anthrax (40)	Anthrax (40)	Anthrax (36.7)	Anthrax (56.7)	Anthrax (43.3)	1 st
Internal parasite (23)	Internal parasite (33.3)	Internal parasite (30)	Internal parasite (16.7)	Internal parasite (25.8)	2 nd
Bottle-jaw (16.7)	Bottle-jaw (13.3)	Bottle-jaw (20)	Bottle-jaw/13.3	Bottle-jaw/15.8	3 rd
Small ruminants					
Pasteurolosi (30)	Fassiolllosis (40)	Fassiolllosis (56)	Fassiolllosis/40/	Fassiolllosis/40/	1 st
Fassiolllosis (Liver fluke) (26.7)	Lung worm (internal parasite)(16.7)	Pasteurolosi (23.3)	Pasteurolosi (33.3)	Pasteurolosi (25.8)	2 nd
Lung worm/ parasite (26.7)	Pasteurolosi (16.7)	Lung worm / parasite (10)	Lung worm/ parasite (20)	Lung worm/ parasite (18.3)	3 rd
Improved treatment measures				Treatment measures over study PAs	Ranking overall study PAs
Oxy treatment (63.3)	Oxy treatment (46.7)	Oxy treatment (46.7)	Oxy treatment (56.7)	Oxy treatment (53.3)	1 st
Tablet service (26.7)	Tablet service (43.3)	Tablet service(33.3)	Tablet service (23.3)	Tablet service (31.7)	2 nd
Castration service (10)	Castration service (6.7)	Tick control (10)	Tick control (20)	Tick control (8.3)	3 rd

Source: Own Computational Result, 2010

However, the problem is more serious in Asore and Lay Bedene where many farmers, 20% in each, reported the problem and specific diseases are summarized in Table 23d. Due to the risk associated with livestock production as result of recurrent drought and disease outbreaks that incur high social and economic disasters in study area, communities in Asore and Debeso PAs have established coping mechanisms for HHs through traditional livestock insurance mechanisms by raising money to affected HHs. Own observation and historical analysis of HH profile in study PAs shows where crop loss due to diseases, pests and natural calamities have been compensated through food and cash aid indicating support to agrarian communities seldom considered feed aid and compensation to losses of livestock in all sampled HHs. The next problem, in order of importance, is

serious shortage of water where majority of HHs watering in ponds of poor quality water and which is further justified by the communities ranking of internal parasite as the second most important animal health problem. The temporary indigenous response to shortage of water is to move their animals to the neighboring PAs where there is perennial river and to highland PAs within and outside the district. The second option is to sell animals to decreasing their animal population. Sale of animals is starting from the gestate cows with the intension to make easy transport of animals for long distance in search for water and feed and to minimize the competitions for feed among animals.

Despite the seasonal pattern of improved animal health service delivery, 53% of HHs perceived antibiotic oxytetracycline treatment as the first among improved animal health care measures in response to the first ranked anthrax animal disease.

4.5 Community Animal Health Workers' (CAHWs) Services and Uses

As reported in the previous section (Section 4.4.2), disease is one of the major constraints of livestock production in the study area. The public sector is the main provider of animal health diagnostic and treatment service and periodic vaccination against large scale outbreak of animal diseases. The livestock keepers also have their own indigenous knowledge of dealing with animal health problems and can access service from private sources, particularly veterinary drugs. However, publicly provide animal health service are not easily accessible on time, its coverage is limited and often the essential vet drugs are not sufficiently available, On the other hand, traditional methods of treating animal disease may not always effective, and the purchase and use of vet drugs from market, often from informal suppliers raises concerns relating to effectiveness, human health safety and environmental impact.

The Improving Productivity and Market Success (IPMS) project had conducted participatory assessment on the challenges and potential for improving animal health service in selected PAs. Subsequently, IPMS in collaboration with an Italian NGO (LVIA) and Alaba WoARD initiated the concept of community-based primary animal health service delivery through trained Community Animal Health Workers' (CAHWs) and at experimental level in selected PAs including the study area. This section deals with both the supply and demand sides of the service that has been provided by the CAHWs since three years or so ago. Qualitative and quantitative evidence are presented and discussed on both the capacity of CAHWs for primary animal health service delivery and the demand of users for the service. The results of the assessment are scrutinized on the levels of satisfaction with the performance of the service by farmers who are users or potential users as well as by the other key stakeholders such as Alaba WoARD, IPMS and LVIA.

4.5.1 Capacity of CAHWs

Like crop protection service, the provision of primary animal health service by CAHWs, which is effective, safe, environmentally sound and financial profitable and sustainable, requires capacity. The capacity need for such service provision comprise human or personal capacity of the service providers, financial capacity, and network and linkage of CAHWs for accessing essential knowledge/information, finance/credit, material/inputs.

4.5.1.1 Human Capacity

Like the case of private delivery of formal crop protection service discussed in the preceding section (Section 4.3), the capacity, i.e., technical, practical and entrepreneurial skills of each of the CAHWs is crucial. Personal capabilities of the service providers is, in turn, a function of their levels of education, prior relevant experience, relevant formal skill-oriented training, and their extent of access to technical backstopping and other relevant knowledge/information sources.

There are only four CAHWs in the study area, who are over 40 years old and all males. The age and sex composition of the CAHWs in the PAs are different from the experiences of many developed countries where females and relatively younger (between 30 and 40 years) reported to serve as CAHWs in countries like South Africa (Odendaal, 1994 as cited in Sen and Chander, 2003). Currently the CAHWs are engaged in the service on part-time base as a non-farm activity.

The education levels of the CAHWs ranges from grade 1 to 8 and the average level of education is grade six (Table 24). Of the 4 CAHWs, 1 (CAHW operating in Asore) and 3 (CAHWs operating in the remaining PAs) have formal education levels of, respectively, 1-4 and 5-8 grades. The education levels of all the four CAHWs is less than 8th grade and none of them reported prior experience relevant to the service. In contrast, in countries with well-established similar service provision, CAHWs were reported to have several years of experience as informal service provider. According to Sen and Chander (2003), in the USA CAHWs had 13 years of prior experience although their education level was also less than 8th grade.

Table 6. Educational Profile and Practical Experience of CAHWs

Education interval (Grade)	Average Education (Grade)	Frequency	%
1-4	3	1	25
5-8	7	3	75
Overall	6	4	100

Source: Own Computation, 2010

In addition to experience and formal education, access to relevant trainings by CAHWs is important. The ever changing environment and emerging animal diseases call for

continuous upgrading of capacity and skills of the CAHWs, which go beyond the technical training. Table 25 provides the summary of different formal trainings conducted to build the capacities of the CAHWs. Since the initiation of the service three years ago, at least 7 formal trainings were organized and conducted to build the capacities of the CAHWs: basics of animal health service (organized by LVIA for 3 weeks); practical demonstration of animal anatomy (organized by IPMS and WoARD for 3 weeks); the role of CAHWs (organized by Alaba WoARD for 1 week); pregnancy diagnosis (conducted by Southern Region Agricultural Research Institute for a week); and 3 refreshment trainings (conducted by WoARD and IPMs). LVIA took the first initiative and contributed a lion's share in offering inception trainings. Training on basics of animal health service was attended by all CAHWs while others were delivered to the current 4 active CAHWs.

Table 25. Perception to practical skill-orientation of various trainings

Types of Trainings	<i>Rated value</i>	frequency	%
Basic technical training on Animal Health service delivery	3	4	100
On-the-job training on role of CAHWs	3	3	75
Practical training on pregnancy diagnosis in cattle	5	3	75
Demonstration of animal Anatomy and field trip	5	4	100
Refreshment trainings	3	4	100

*1=highly theoretical, 2=slightly theoretical, 3=marginally practical, 4=practical, 5=highly practical oriented.

Source: Discussion with CAHWs, 2010: N=4

The specific topics covered by the trainings include topics such as use and handling of drugs including issue of environmental and human health, operation and maintenance of equipments, disease calendars and ethno-veterinary practices both on practical and theoretical sessions. Unlike crop spray providers, CAHWs have been provided with certificates that enable them to formally provide the service, though not licensed. The result of the assessment on the perceptions of the CAHWs about the skill-orientation of the trainings they attended revealed that only two of seven trainings were rated 5 (highly skill-oriented) and found practically useful. The CAHWs also felt that there were important gaps still needed to be addressed such as skill for the provision of animal vaccination and extension education related to animal health.

An investigation result about the major sources of knowledge and information regarding recommended drugs and equipment shows, in order of importance, formal training,

CAHWs-to-CAHWs knowledge sharing and information from animal health assistances (AHAs) based at FTC as the main sources. In similar fashion, the sources for knowledge and information regarding drugs handling and storage and use, disposal of unutilized/expired drugs and container were found formal trainings organized by LVIA, IPMS, regional BoARD, research institutions, labeling by drug suppliers on the containers and advice by drug vendors.

Regarding quality and safety assurance, supervision and monitoring is done primarily by the WoARD, Animal Health and Production Work Process. Other institutions such as IPMS and Farm Africa are providing technical backstopping. However, the discussion with CAHWs and other key informants revealed lack of professional license from WoARD and trade licenses from trade and industry office and weak recognition and supervision of public sector to ensure quality CAHWs service. The weak attention given by process owner to supervise CAHWs in this case was reported to be due to a combination of low motivation and transport constraint in public sector which is further manifested when CAHWs lack clear professional and geographic delineation about their roles and responsibilities. For example, the CAHW in Gerema PA conducting minor operations, while that of Rokenen PA is not reporting at all.

4.5.1.2 Storage and Handling of equipment/materials and drugs

Material and equipment capacity in terms of store and essential basic facilities for transportation and communication is another component to capacity of CAHWs. During inception, LVIA has provided various materials and equipments, and start up drugs channeling through WoARD. However, the provision was not complete and lacking appropriate safety measures, shelves and separate rooms for safe storage of drugs which was clearly manifested when CAHWs using plastic sheet as a hood for abdominal examination, and storing drugs in boxes of clothes. A CAHW from Asore PA also reported lack of cattle crush and the injure from cattle and equines in the course of castration and examination. Whilst this is the fact, yet, CAHWs are delivering substantial services closer to the rural community with missing safety facilities and equipment.

The assessment on CAHWs access to materials and other utilities reported the difficulties they went to access and use adequate and reliable sources of drugs, equipments and technical supports. They frequently face the shortage and even absence of drugs in near

reach. The terms of access to drugs varies following the pattern of disease incidence and respective demand for services (Figure 9). All CAHWs do not have a habit of storing drugs at their stock for time of short supply perhaps in fear of expiration, lack of separate storage room and sufficient capital. The access to drug from WoARD is occasional and usually come very late after the disease caused significant damage. Moreover, there is no drug retailer channel in rural far PAs to maintain reliable supply where majority of livestock keepers reside and disease incidence is more prevalent.

It is also imperative to assess the perception of CAHWs with regard to the timely availability, quality and costliness of the drugs purchased from different sources and the comparison is presented in Table 26. Currently there are three potential sources of drugs in the study area. Accordingly, CAHWs ranked the private vet drug vendors first for its timely availability followed by the Mencheno Union input shop. This is because private vet drug vendors are always open and drugs are available in kind and quantity. For case of quality of drugs considering expiry date, chemical composition and prescription and direction for use CAHWs selected WoARD as the best than others because public sector purchase drugs from well known source and supply with careful handling and perfect direction to use. The CAHWs discussion further evaluated the costliness of drugs and preferred WoARD to others because drugs purchased at reasonable price since it absorbed all its transportation and personnel expenses unlike the private vendors where they transfer all costs to buyers. But in all cases CAHWs are taking the third and fourth prices and cannot purchase from wholesalers at factory gate price due to lack of trade license.

Table 26. CAHWs Perception about supply of drugs

Drug sources	CAHWs Rating, %					Score	Rank
	Excellent	Very good	Good	Poor	Very Poor		
Timely availability							
Mencheno input shop	.00	50	50	.00	.00	350	2
Private vet drug vendors	50	25	25	.00	.00	425	1
WoARD	.00	25	50	25	.00	300	3
Quality of chemicals							
Mencheno input shop	50	25	25	.00	.00	425	2
Private vet drug vendor	.00	25	50	25	.00	300	3
WoARD	50	50	.00	.00	.00	450	1
Costliness							
Mencheno input shop	25	50	25	.00	.00	400	2
Private vet drug vendor	.00	.00	75	25	.00	275	3
WoARD	75	25	.00	.00	.00	475	1

NB: Score is calculated by assigning 5 for excellent, 4 for very good, 3 for good, 2 for poor and 1 for very poor. Then multiply % of observation by the score and finally adding the total observation; N=4

Source: Own Computation, 2010

Thus, CAHWs require being trade and professionally licensed in order to access drugs and necessary equipments at reasonable price from reliable sources so that maximize their profit margins from their practice.

The availability of means of transport is important to facilitate mobility and timely response to acute animal disease and for easy access to reliable sources of drugs. CAHWs in their discussion also pointed the problem with having mule for transport as its cost of purchase is very high and supply of feed is difficult, hence, all CAHWs, except the one in Gerema PA who has bicycle, render the service on foot. The discussion has also proven the importance of communication facility, however, only the CAHW in Asore PA having cell phone and serving on call basis. As a result, advice or help often arrived too late for CAHWs in far PAs. Overall, lack of transportation and communication capacity has exerted particular impact on reporting and referring system.

Own personal observation and informal discussion with experts about the use of drug containers and expired drugs disposal indicated that all CAHWs are either reusing (syringes and needles) or selling the containers for handling water and oil/gas for local *kuraz*. The CAHWs did not report the availability of expired drugs as they do not store drugs for long period. But some of the effects pointed out in the discussion were the death of bees and poultry as they drunk the washed out water of containers, morbidity to other animals when calcite (tick control) contact with grass if applied while the animal is in the grazing field.

4.5.1.3 Finance or credit linkages

Access to credit and soft loans defined as low-interest loans with less-stringent conditions, plus supplementing income from horn and hoof trimming service (Appendix 10), were perceived as paramount important for CAHWs. One plausible explanation for this is that CAHWs perceived access to credit and soft loans as critical because of the high start-up costs, which according to Talib (CAHWs focal person in WoARD) were as high as 740 USD (in December 2009) for CAHWs service delivery in study PAs. However, the current agricultural credit service in the study PAs and elsewhere in the district is promising in promoting access to private sources of credit through farmer unions such as Mencheno. This was reduced the transaction costs for CAHWs at start up of the service.

Based on the typology, the CAHWs made four types of linkage viz-a-viz linkage for knowledge and information, input and material, regulation and certification, and linkage for finance and credit were presented in generic linkage map (Figure 8). During inception CAHWs were made strong linkage for knowledge and information with LVIA (now phased out). But IPMS soon take over the responsibility and supporting with the relevant information. Other organizations in this regard include Mencheno Union and retailers in vendor shop providing knowledge on use and handling of drugs; WoARD, Farm Africa and Awassa/Melkassa research centers on training and demonstrations. The networking of CAHWs for input and material is also another wing need due attention. In this regard LVIA has shouldered a lot of share with provision of startup kits and equipment and later IPMS and WoARD were continued in facilitating and supporting the necessary materials. Though CAHWs are professionally certified the linkage for regulation and licensing also weak. Linkage for finance and credit is the central issue to cover initial investment and operating costs. Even though CAHWs do have a reasonable knowledge and resource linkages with actors they are rarely seen as important clients by rural financial institutions, Omo microfinance and agricultural rural fund, except Mencheno Union which has played substantial role as the sole source of formal credit for startup of service.

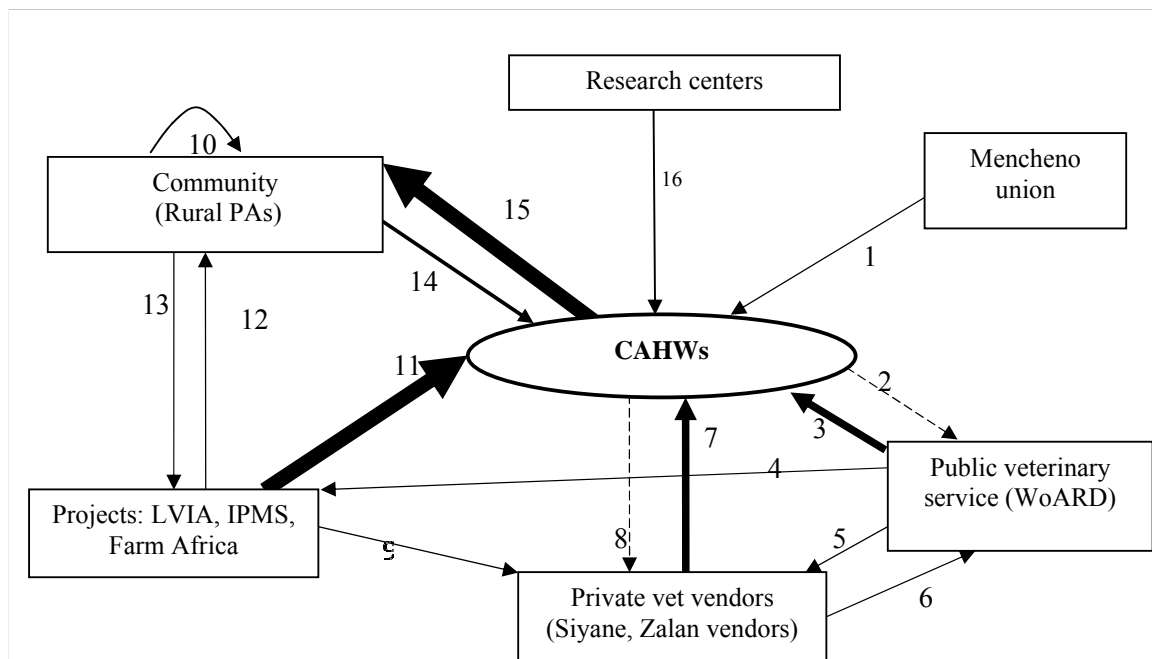


Figure 8. Actors Linkage Map showing access to knowledge, inputs and finance to CAHWs; **Source:** Own Design, 2010

Linkage Descriptions

Key	1 st Most important linkage	2 nd most important	3 rd most important	4 th most important
1	Supply drugs, equipments		9	Facilitate links with stakeholders
2	Report disease outbreak, report monthly work		10	Farmers-to-farmers input & knowledge linkage
3	Supply drugs, facilitate & monitor, technical support		11	Provision of startup kits, train, facilitate
4	Authorize and regulate		12	Assist in M&E
5	Authorize and regulate		13	Provide information
6	Report disease outbreak, submit monthly report		14	Select trainees, report disease outbreak
7	Supply drugs		15	Treat important animal diseases
8	Report disease outbreak		16	Training, knowledge & information linkage

But the linkage for research and extension is particularly weak. Hence, recognizing the gap, IPMS project in the district has been facilitating relevant credit support and also conducting research on ways of strengthening the CAHWs role in services provision. In addition, CAHWs had reported having discussion with each other to share experiences, and reciprocated and borrowed drugs and equipment in some cases. Furthermore, they are seeking new linkage with CAHWs in neighboring Shashigo district to share knowledge and information on financial management, and with newly phased-in NGOs like Farm Africa for technical support, and WoARD for promotion and regulation of service since still informal providers are jeopardizing the service delivery market. Hence, this study stresses a better definition of linkage strategies as a fundamental approach in improving the performance of interaction among these actors.

An assessment conducted to look at record keeping of treatment, achievements, revenues and expenditures and reporting and referral of cases has revealed various features on progress of the service delivery system. The CAHW in Lay Bedene PA who is relatively better educated has adopted better record keeping practice, recording events in separate formats given by WoARD than CAHW in Asore although latter reported to have a good practice of referring animal disease cases when he felt difficult to treat. However, the latter is facing a lot of complains from his customers about his competence and untimely response to demand may be due to his lower education level and tightened with a lot of political affairs and having better capital. Overall, observation regarding the record keeping system indicates a lot remains to be improved, for example, even quantitative such as types of service users, animal treated, cases referred, response to treatment, etc. However, in nearby PAs, Asore where the public supports the development of basic

infrastructure influence interaction with experts, the speed of advice from experts and referring of serious cases was enhanced.

As far as the current asset value accumulated is considered, since the inception of the service, CAHWs have accumulated various assets for service delivery in form of fixed and working capital. The survey showed an increase in current asset for some of CAHWs (Table 27). Purchase of additional equipment, construction of separate house for drugs (most recent) and outstanding loan are rather an investment asset for service delivery system. Whereas bicycle and cell phone are part of operating capital help further expand the service territory.

Table 7. Current Assets and Capital of CAHWs for Service Delivery, (% of yes)

Indicators	Frequency (N=4)	%
Construction of separate house for drugs storage	1	25
Transport facility, bicycle	1	25
Owned cell phone	1	25
Bought additional equipment	1	25
Outstanding loan	3	75

Source: CAHWs survey, 2010

4.5.1.4 Perception of CAHWs about Opportunities and Challenges to their Capacity

The perceptions of CAHWs regarding their motivating factors to continue and expand the delivery scope were assessed and hence all CAHWs share similar perceptions on course of service delivery. Here, the following perceived opportunities of CAHWs regarding their capacity were summarized.

- The existence of private sector and the district existing extension service is an opportunity to support the service delivery
- Existence of private input shops address constraints to availability of drugs to some extent
- Existence of Mencheno Union for credit service delivery is an opportunity to be exploited.
- The IPMS and WoARD effort for facilitation and training
- Huge public investment in deploying 48DAs, 13AHAs and 5vets in animal health field, judicious use of 30 FTCs in the district are another niche to be utilized.

- The emerging NGOs such as Farm Africa supporting animal health service delivery system
- The current government investment in public goods (roads, telex and rural electrification) has numerous opportunities for communication and transportation facility.

Based on CAHWs group discussion on supply constraints (Table 28) facing the delivery practice, the following constraints were identified, ranked and the top 3 were discussed in detail.

Table 8. Constraints Perceived by CAHWs: rank order (1=first most important)

Constraints	Freq.	%	Ranking
High operating costs (drugs, equipments, etc.)	2	50	4 th
Lack of capital, input or credit services	3	75	3 rd
Too few providers in private practice to show its viability	2	50	4 th
Lack of training in practice management	4	100	1 st
Weak enforcement mechanism to deal with competition from illegal's	4	100	1 st

Source: CAHWs Discussion, 2010, (N=4)

Lack of a clear mandate for process owner in the district associated with lack of resource to supervise the work of CAHWs in the field and weak enforcement capacity was considered as a major constraint needing due attention. CAHWs usually lack supervision, monitoring and evaluation services from the public sector to control strategic behavior of individuals. On account of nature of service complexity, CAHWs are the one who usually face lack of technical knowledge and resource. However, others such as drug suppliers were not immune to this. CAHWs in near PAs, on the other hand, were the ones who felt the importance of lack of training in CAHWs practice management probably due to the clients' ability to differentiate specific quality services in vicinity of Kulito. Thus, effective training including business management skill is another dimension to build capacity of CAHWs as a result some two CAHWs quite dropped-out the system. Capital limitation was identified by the CAHWs discussion as an important challenge for the viability and expansion of services. Another important challenge that CAHWs faced was shortage and even absence of drugs in near reach. Moreover, when the CAHWs come to public clinic to buy drugs, the staffs are often absent, on meeting, or no drug at all thus

forced to buy from retailers at exorbitant price thereby extra costs are passed to the users. Except some treatment equipment and castration tool for cattle, CAHWs lack equipment for horn and hoof trimming services. One of the major roles of CAHWs is referring difficult cases needing specialized diagnostic and treatment service a public attention. However, this is quite limited, due to communication problems and high operating (transport and communication capacity) costs for CAHWs bordering Shashigo and Shone districts. These hinder reporting of cases and timely information (backward and forward) flow. Too few CAHWs could not witness the profitability in order the others to venture the system, and unable to follow-up of distant cases.

In a nutshell, in all indicators assessed for capacity of CAHWs, they are lacking the minimum critical facilities and inputs for proper primary animal health care service provision.

4.5.2 CAHW Service Coverage and Uses

4.5.2.1 CAHWs Service Type and Coverage

Animal health service in the study PAs delivered by public, formal CAHWs and informal CAHWs while traditional service provided by individual livestock keepers on his own animal. However, the first two take the lion share in animal health service delivery. Unlike the spray service, the role of public sector (39%) is very visible (Tables 29&30). This indicates the right positive alignment of public sector to animal health care where there are only few CAHWs than crop protection service sector where the suppliers are relatively saturated. Large share of traditional service coverage (12.5%) is additional witness for shortage of CAHWs (Tables 29&30, Appendix 6).

Table 9. Sources of Animal Health diagnostic and treatment Services of sample HHs

Sources	% of responding HHs
Public	39.2
Formal CAHWs	43.3
Informal CAHWs	5.0
Traditional	12.5

Source: HH Survey, 2010

Table 30 displays types of specific animal health treatment services which are in the study PAs by various providers. It shows the service delivery is cattle dominated than other animal species such as equines and poultry. According to the respondents, tick control service is not given to equines because anatomical nature of their skin is very hard to attach ticks (capitulum/gnathosoma). In addition, CAHWs delivering services like cutting/trimming horns and hoofs by using local materials (e.g. sickle) showing us CAHWs are lacking the necessary equipment for this service which need special attention. The horn and hoof trimming service might have considered important avenues for supplementing income for CAHWs since as these services do not incur any cost though it is constrained by lack of relevant equipment. This may be instead of accepted practice of marking up drug prices to earn extra income necessary to augment low income from few service users. Even though CAHWs are not giving vaccination service, HHs seemed to have developed a good knowledge on the importance of disease prevention through immunization. Another observation from Table 30 is that both drug dealers (*forest doctors*) and CAHWs are delivering the same type of service except in their dosage and quality (Informal Discussion with WoARD Expert). Private drug dealers are only selling tablets and potential sources for both the communities and CAHWs.

Table 30. Major types of Animal Health services delivered

Specific Services	Livestock spp. affected	Common Diseases	Specific treatment methods, by source				
			Public	Drug dealers (black market)	CAHWs	Private drug vendors	Traditional methods
Antibiotic treatments	Cattle, equines, shoats	Anthrax, Pasteurellosis, wound infection	Oxy short 10% and oxy long 20%, penstrep, multivitamin, ivermectine	Oxy short 10% and oxy long 20%-all for cattle	Oxy short 10% and oxy long 20%, penstrep-all for cattle	-	Herbal sol ^l of roots, leaves and salt. Pepper is crushed and dissolved in water and given per nostrils; sol ^l from rotten egg for equines
Tablet selling	Shoats, equines, cattle	Internal parasite, Fassiollosis/ liver fluke	Fenbendazol 20% for equine, bollus & tetraclozan for cattle	Fenbendazol 20% for equine, bollus for cattle	Fenbendazol 20% for equine, bollus for cattle	Fenbendazol 20% for equine, bollus for cattle	drinking local <i>areke</i> to de-worm internal parasite for cattle
Tick control	Cattle	External parasite	calcite	malathion	malathion	Selling malathion	Painting tobacco solution on external skin of cattle
Castration	Cattle, shoats, equines	-	tool	-	castration tool	-	Using local material

Source: Survey Result , 2010

Service charge

Initially in 2007, the team stemmed from WoARD, IPMS, PA leaders, CAHWs and users made discussion to set charge of the CAHWs service (Appendix 4), to delineate their mandate, ethics and their roles in order to control their strategic behavior. Only for a few months, CAHWs started selling services in stated prices; however, prices for CAHWs delivered with various modes of payment depending on type of service and distance from the CAHW and fluctuating in response to market forces. For example, in 2007, prices for 20cc oxytetracycline ranged from birr 7.60 to 15 birr (Appendix 5). As CAHWs are not yet licensed to purchase drugs from wholesalers, tablet selling is the most easily jeopardized service by informal dealers. Overall, the demand trend for CAHWs services has increased substantially despite poor response of the supply-side.

Seasonality of service demand

Like PCPS, the demand for CAHWs service follows a seasonal pattern (Figure 9). In line with this, March, April and May are months in which disease outbreaks are more observed and characterized by serious scarcity of animal feeds thus animals lose their immunity. These are followed by June to August where the summer moisture becomes dominant over the dry months which are suitable for microbial growth and risk of contamination of the pastureland and water points with high effluents of micro organisms. Following this, services are delivered in off-farm base where some CAHWs are switch on-and-off to other businesses like cattle and pepper trading indicating the difficulty in maintaining the service in study PAs and elsewhere in the district. The CAHWs discussion has identified the seasons why castration service is highly demanded in September to October because these are off-seasons for plowing bulls and a season of sufficient feed.

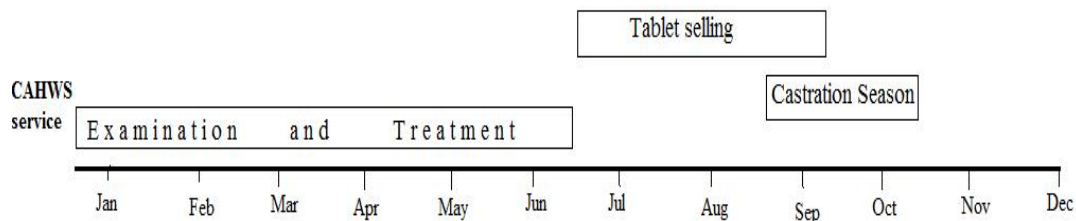


Figure 9. Seasonal Calendar of CAHWs service demand; **Source:** Own Design, 2010

Similarly, tablet selling for de-worming is highly demanded by the users through July to September as it is the period for fattening oxen for Meskel holiday sell (date of true Cross

found). Antibiotic treatment service is highly demanded from January to June because it is onset of *belg* rain which gives rise to the emergence of soil born disease and pathogens are being active.

4.5.2.2 CAHWs Service coverage and Use

CAHWs covering on average radius of 13km (in case of Asore PA for which public clinic is near covered 7PAs in 2 districts) on foot from their homes, with exception of one CAHW of *Gerema* PA who had his own bicycle covered up to 23km and 17PAs in 3 bordering districts (Appendix 10). In contrast, public vet coverage depending on means of transport or not; they cover a radius of 40 km on daily basis on motorbikes compared to when they are on foot (in wet season) they could cover only a radius of 6km. Table 31 shows CAHW in far PA, Lay Bedene, is covering large livestock indicating increased use of community due to lack of other animal health service option than community in Asore who has public clinic in a very near reach. In all listed services, cattle are the dominant users of the service indicating strengthening the missing services to other species such as poultry and equines. In general, the service area coverage of the CAHWs depends on their mode of transport, the demand to the service, health condition of CAHW, and levels of practice diversification.

Table 31. CAHWs livestock and Service specific coverage, by PAs

PA	Specific services	Drug used	Livestock, head/month			Overall
			Cattle	Equines*	Shoats	
Asore	Treatment	Penstrep, oxy, procaine penicillin	25	6	17	48
	Tablet Selling	Bollus/Albendazol	50	0	56	106
	Castration	Only equipment	12	0	10	22
	Cutting of hoof/horn	Only equipment	2	1	0	3
	External parasite	Malathion	10	0	0	10
Lay Bedene	Treatment	Penstrep, oxy, procaine penicillin	36	10	20	66
	Tablet Selling	Bollus/Albendazol	92	18	30	140
	Castration	Only equipment	10	0	22	32
	Cutting of hoof/horn	Only equipment	6	1	0	7
	External parasite	Malathion	16	3	0	19
Average			130	20	78	

NA= Not Applicable; *Equines are usually the donkeys and horses for cart

Source: Computation of CAHWs Recordings, 2010

Currently, existing CAHWs covering both targeted and extended PAs of a total of 36 PAs in 5 districts (27 from Alaba, 4 from Shashigo, 3 from Damboya, 1 from Shone, 1 from Silte) where Alaba takes the lion share (Appendix 10). Figure 10 shows that CAHWs are covering the extended PAs in Alaba and neighboring districts accounting 71.2% and PAs where they originally assigned. This indicates the demand of the service beyond the intended district and stimulating new entrants to join the service delivery system. But this requires regularly licensing and policing the CAHWs to serve their assigned and extended PAs.

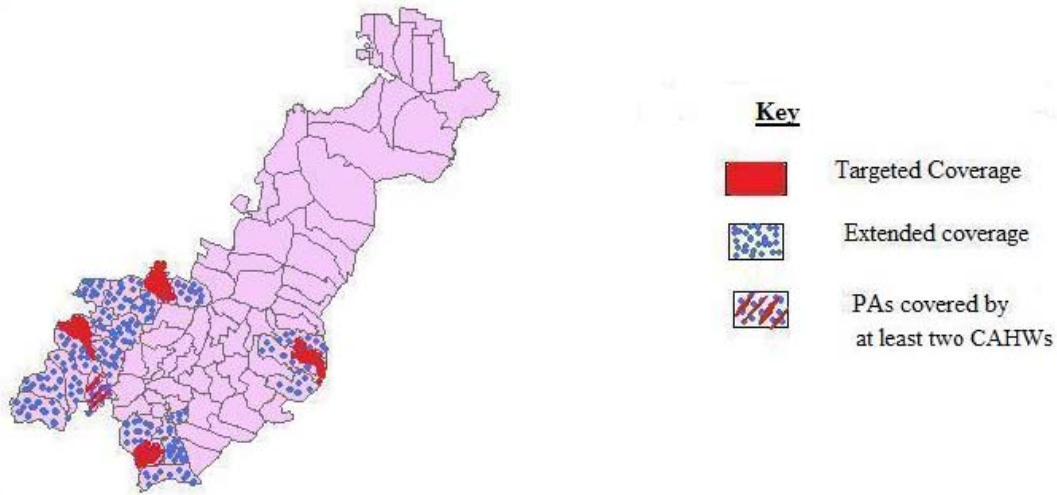


Figure 10. CAHWs Service Coverage; **Source:** Own Design, 2010

Moreover, most animal diseases are transboundary in nature, it needs an integrated effort in all these adjacent districts if the objective is to deliver improved animal health services. One of the plausible solutions to this is for public to encourage and support the participation of more service users / livestock keepers themselves and promoting existing informal providers in the delivery of the service

The service use rate based on HHs wealth group shows certain variation over PAs (Table 32), HHs and specific types of services. All the better-off class in Lay Bedene PA was service users of any type at anyone season where it is only 85.7% for Asore due to the nearness to public animal health service with better quality and their ability to cover the transaction costs to use public service. Even though tablet purchase is requested by all users, it is the only service dominantly used by poor in both PAs as due to its lower price of charging than other services. In case of other services which have higher charging, they opted to use traditional castration and local medicines instead.

Table 32. CAHWs Service Use rate by different wealth groups, % user HHs

Sample HHs category	Type of animal health specific services				Overall
Asore PA	Antibiotics	Tablet selling	Tick control	Castration	
Better-off	85.7	85.7	100	71.5	85.7
Middle	90	80	70	80	80
Poor	0	15.4	0	0	15.4
Total user					53.3
L.Bedene PA					
Better-off	100	100	100	100	100
Middle	91	81.8	72.8	81.8	81.8
Poor	0	22.2	0	0	22.2
Total user					70

Source: Own Survey Result , 2010

Overall, the CAHWs service covered relatively wider PAs and cattle dominated than other animal species such as equines and poultry and different across PAs depending on their mode of transport and seasonal pattern of demand for service.

4.5.3 Financial Viability of CAHWs Service

In conventional service delivery system, many attempts have failed to address important technical, social and financial sustainability. Financial viability refers to the degree in which CAHWs manage to minimize the costs of service delivery and maximize revenue from the practice and the better for CAHWs (Kaberia, 2002) and presented in Box 3. Varieties of service are currently delivered by formal CAHWs in study PAs. However, only antibiotic treatment selling was used to analyze CBA for commercial viability of the service. This is because both demand and supply of this service is relatively better than others and used as a showcase to see financial viability of services being delivered. The data were obtained from CAHWs recording of the year 2008/9 for which relatively sufficient data was found.

Box 3. Cost Benefit Analysis of CAHWs service

CBA was based on information that the service is being delivered in off-farm base and the number of service days and hours are limited, the data is actual and obtained from CAHWs recording.

Given the following data: Service charge is to be covered by user; business started with

formal credit of 300Br at 7% interest rate and this is revolving capital over months, Service being delivered = Antibiotic i.e. oxytetracycline 20% (long acting) selling; average service required =20 head/month i.e. 240head/year; depreciation cost of equip and labor cost ignored; personal and transaction expenses were also ignored.

1 bottle of antibiotic contains = 100cc and dosage is 20cc/Cow, thus 1 bottle can treat= 5 Cows, average antibiotic service charge=15 Br/20cc/cow

Total Expenditure: 1 bottle antibiotic purchase = 60Br, total number of bottles required per month for average of 20 head is 4, this gives $4*60\text{Br}=240\text{Br/month}$ i.e. $12\text{mon}*240\text{Br}=2880\text{Br/yr}$; Credit is 300Br, interest at 7% = 21br/month, thus Total = $300+(21*12) = 552\text{Br/yr}$

Gross Income: Credit=300Br, income from a sell of antibiotics= $5*15=75\text{Br/Bottle}$, Sell of 4 bottles in a month= $4*75=300\text{Br}$, in a year= $12*300=3600\text{Br}$

Gross Profit: Gross income - Gross expenditure = $(300+3600) - (2880+552) = 3900-3432= 468 \text{ Br/yr}$, or $B/C = 3900/3432= 1.14$ i.e. $B/C \geq 1$, indicating, if the current profit trend continues, CAHWs service would be financially viable or would remain financially viable even if the current costs of drugs increased by 14%.

Source: Own Computations , 2010

The service fulfill the condition that the BCR must be equal to or greater than one, however, it looks for that financing of the practices and revision of their profit margins needs to be done to maximize the profit. Because CAHWs service is risky and susceptible as detrimental external factors such as drought and financial crises are likely to shake it easily.

4.5.4 Perception of User and Potential-user Farmers

Currently, little is formally documented as to the perceptions of service users towards the quality, satisfaction and effectiveness of CAHWs services and about the implications of envisioned service delivery market in the study PAs. Table 33 shows the variation of HH perceptions across HHs and between PAs categories. The better-off HHs in Asore PA were not satisfied with the effectiveness of service which may be due to poor competence of the CAHW for which users' ability to differentiate the quality of specific services and use of public service in near reach contributed a lot. On contrast, the majority of better-off HHs (92%) in Lay Bedene PA reported the satisfaction with effectiveness with the service.

This confirms with Table 32 where only 85.7% of better-offs were users in Asore where it accounts 100% for Lay Bedene. Majority (86.3%) were satisfied with CAHWs service in Lay Bedene than Asore (67%) where there is some shading of dissatisfaction particularly for better-offs perhaps due to untimely response to acute cases which need immediate response.

Table 33. Perception about CAHWs services by different categories of HHs (%), by PAs

PAs	Perception about CAHWs services	Service users			Overall
		Better-off	Middle	Poor	
Asore	Service effective, yes	66	91	93	83
	CAHWs service quality, improved	57	80	85	74
	Satisfaction to service, satisfied	57	80	64	67
Lay Bedene	Service effective	92	90	88	90
	CAHWs service quality, improved	100	100	100	100
	Satisfaction to service, satisfied	90	80	89	86.3

Source: Survey Result, 2010

4.5.4.1 Comparison of Animal Health Service Providers Perceived by Farmers

Performance is one function of service delivery system, and can be expressed in terms of key indicators like accessibility, affordability, timeliness and human health safety and soundness to environmental aspects (Table 34). Since perception of the respondents to various providers assessed with regard to its performance, it could be used as a fair assessment of the state of services delivery system in rural remote areas. Service users were better satisfied and assessed the performance of CAHWs more positively for availability, timeliness and quality of services next to traditional methods. In addition to this, traditional method was also selected by majority of HH for its affordability indicating the HHs inability to access modern animal health inputs but strongly blamed for its quality and damage to human health. Overall, in the indicators assessed for performance, the public service and the traditional methods have got extreme position (when one stands first, the other takes last) by respondents.

Table 34. Ranking of various animal health service providers, by user/potential user farmers

Animal health service Providers	HHs Rating, %					Score	Rank
	Excellent	Very good	Good	Poor	Very Poor		
<i>Service Accessible /available</i>							
Public	22	38	23	10	8	354	5
Drug dealers (informal)	48	9	17	17	10	368	3
CAHWs	50	28	13	.00	8	412	2
Private drug vendors	33	25	19	13	9	360	4
Traditional methods	58	22	3	8	8	413	1
<i>Cost affordable</i>							
Public	30	34	23	12	1	381	5
Drug dealers (informal)	53	17	22	8	.00	415	2
CAHWs	45	28	22	5	.00	413	3
Private drug vendors	50	18	22	10	.00	408	4
Traditional methods	59	19	13	8	.00	429	1
<i>Timeliness/ responsive to demand</i>							
Public	45	23	10	14	8	382	5
Drug dealers (informal)	54	24	14	8	.00	425	4
CAHWs	65	18	9	6	2	439	2
Private drug vendors	70	15	7	.00	8	438	3
Traditional methods	63	21	14	2	.00	446	1
<i>Quality</i>							
Public	80	18	2	.00	.00	478	1
Drug dealers (informal)	46	39	2	13	.00	418	4
CAHWs	78	22	1	.00	.00	477	2
Private drug vendors	54	30	14	2	.00	437	3
Traditional methods	38	33	22	8	.00	399	5
<i>Human and Environmentally health</i>							
Public	84	8	8	.00	.00	477	1
Drug dealers (informal)	55	31	8	6	.00	435	4
CAHWs	62	23	13	2	.00	445	3
Private drug vendors	73	26	2	.00	.00	471	2
Traditional methods	39	33	21	8	.00	403	5

NB: Score is calculated by assigning 5 for excellent, 4 for very good, 3 for good, 2 for poor and 1 for very poor. Then multiply % of observation by the score and finally adding the total observation; N=120

Source: HH Survey Result , 2010

4.5.4.2 SWOT Analysis for CAHWs service delivery

A very useful tool for evaluating service delivery system which also incorporates district experts and key informants from Farm Africa and IPMS is the SWOT analysis. Accordingly it analyzed the CAHWs service delivery system from the external appraisal of opportunities and threats, and an internal appraisal of strengths and weakness and summarized in Table 35.

Table 35. SWOT Analysis of CAHWs Service

Strengths and benefits of service delivery	Weaknesses of service delivery system
<ul style="list-style-type: none"> • Coverage of vast area with a limited capacity • Recording of achievements • The users endeavors to promote traditional medicines • The CAHWs service started with baseline survey of animal disease in the area (Mulugeta, 2006); • Provision of startup materials/inputs and later attachment to unions to sustain the system; • Market promotions on market day of the week showing the existence of service and CAHWs • Capacity building of CAHWs for diversity and complexity of diseases • Existence of process-owner, • Linking CAHWs with Research centers, Union & WoARD for knowledge sharing 	<ul style="list-style-type: none"> • CAHWs are highly profit-oriented than client-orientation • Poor integration of modern and traditional practices tested on ethno-vet laboratory • The system didn't include women as CAHW • Lack of practical oriented capacity building program to CAHWs • Not harnessing the full potential of CAHWs: like for vaccination and AI services delivery • Weak linkage, regulation, exchange of information between CAHWs and stakeholders • Institutional instability expressed by frequent restructuring and high staff turnover and generally low commitment and motivation of staff in public sector;
Opportunities for expansion & sustainability	Threats for expansion and sustainability
<ul style="list-style-type: none"> • The public existing extension service is an opportunity to promote the service delivery • Close cooperation with community help CAHWs internalize problem as if their own • A good business prospect due to increasing demand for services • The current direct charge provides the right incentives for CAHWs to discharge the services • Mutual benefit for CAHWs and customers 	<ul style="list-style-type: none"> • Ever increasing cost of drugs may reduce ability to pay of poor farmers • Willingness of CAHWs to work in remote situations where private practice is not viable due to rising economies of scale. • The seasonal nature of both supply and demand-side may dissolve sustainability • Animals with different disease come to farm yard of the CAHWs, where wastes are not managed well thus transmission of disease from infected to healthy animal

-
- | | |
|---|--|
| <ul style="list-style-type: none"> • given the existing market-led development policy, the public initiative to support PSD • The existence of CAHWs help as a real model for others to enter • Professional confidence as they perceive themselves as a physician to animal | <ul style="list-style-type: none"> • Lack of licenses (professional and trade), can limit expansion and sustainability • Incomplete or partial implementation of policy reforms, and the near-reversal of policy reforms |
|---|--|
-

Source: Experts and Key informants discussion, 2010

In order CAHWs to remain a viable player in animal health service delivery system, all stakeholders must become increasingly more nimble, more strategic-thinking, and well attuned to changes in their delivery and constantly adapting their institutional structure and culture in order to capitalize and utilize existing opportunities that are a good fit to their strengths, mitigate their weaknesses and reduce their vulnerability to external threats to their continued survival and relevance.

Lessons learnt

In general the following lessons were learnt from the existing CAHWs practices:

- Seasonality of demand to CAHWs services, where the pattern is regular, can be capitalized on by stocking necessary drugs during such periods to maximize the profits.
- Provision of transportation, communication and credit facility is quite important to CAHWs if the objective is to make the system effective.
- Diversification of services to CAHWs reduces vulnerability & spreads overheads over number of services
- Lack of business skills on the part of CAHWs has been the major constraints on maximization of profits.
- Unlike the crop protection service, the role of public in animal health service delivery is very visible indicating us the right positive alignment of public to the segment where the providers are only few than where the suppliers are relatively saturated.

4.5.5 Willingness and Ability to Pay for CAHWs Service

CAHWs services are already being paid for services like antibiotic treatment. All the respondents were subjected to survey of the current service charge and found that the large

proportion of antibiotic service users (46%) perceive the current fee is reasonable, whereas majority (42.5%) of non-users complaining that the prevailing service charge rate was higher (Table 36) perhaps owing to their low economic status. Almost two fold of respondents (i.e. 21%, Table 36) than either of spray services users (at most 13.3%, Table 21) perceived antibiotic service charge is lower. This implies these users might have satisfied based on their understanding of the benefits they derived from. The 39% of non-users still believe that the price is reasonable but cannot afford service charging thus indicating price revision in order to bring them into users group.

Table 10. Perception of community for various CAHWs services charging

Services	Perception to the prevailing charge rate for antibiotics, %			Overall
	Lower	Reasonable	Higher	
User	24.3	45.9	29.7	61.7
Non-user	17.4	39.1	43.5	38.3
Overall	20.9	42.5	36.6	100

Source: HH Survey Result, 2010

Table 37 shows the differently perceived mean willing to pay for antibiotic service. The survey revealed the majority of respondents (37%) perceive current charging is higher and willing to pay the mean amount of 14.15Br. Those also who perceived the current charge is lower willing to pay 16.54Br for antibiotic due to the reason that they can't afford more than the stated fee whereas 42.5% agreed that the current fee is reasonable to continue the service use which particularly outweighs for users (Table 36). This implies the existing CAHWs are few in number and not filling the demand which is clearly inferred when relatively larger proportion of CAHWs service users (21.7%) than either of spray services were still willing to pay a higher fee than the current charge.

Table 11. Proportion of HHs willing to pay (WTP) for different CAHWs service charging

Service type	Perception to current prevailing charging	Mean amount WTP (Br)	% of willing respondents
Antibiotics treatment	Current charging is higher	14.15 (0.64)	35
	Current charging is Reasonable	15.00 (00)	43.3
	Current charging is lower	16.54 (0.70)	21.7

Source: HH Survey Result, 2010; *NB: Numbers in parenthesis are Standard Deviations*

Some authors have recently questioned the use of WTP estimates for policy purposes on the grounds that it is the ability and not willingness which should form the basis of social policy (Ahuja and Redmond, 2001). This is because the principles such as willingness to pay may not take into account the problems connected with the ability to pay. The respondent's assessment of their ability to pay is presented in Table 38. The data show that 74.3% rated themselves as just able to pay, while 17% rated themselves as well able to pay the said price. This is a very important finding because these farmers could be further strengthened to be able to pay for quality services. This opportunity could be used in promoting the interest for participation of farmers in financing the current fiscal constrained public service delivery.

Table 12. Proportion of HHs According to self-description related to payment for services

Variables relating to Ability to pay	% of respondents
Self rating of ability to pay for services	
Not able	8.7
Able	74.3
Well able	17.0
Potential users Preferred mode of payment	
Personally	57.4
in group with other farmers into their respective cooperatives	33.6 10
Conditions that will enhance payment ^a	
Relevance of Spray service delivery	53.9
Effectiveness and efficiency of service providers	42.2
Improvement in production output and market	73.7
Improved income from crop and animal production	82.4

Source: HH Survey Result, 2010, *a= multiple response possible*

Currently the respondents in study PAs have already paying for various private services. Nonetheless, they indicated the preferred modes of payment in response to a question on how they would be willing to pay for future. About 33.6% would like to pay in group with other farmers those willing to pay personally to the service providers constitute 57.4%. This implies the absence of farmer's cooperatives in rural PAs as result majority of the respondents are not members of it and opted to pay personally due to fear of credit at any other time later. But this direct pay in person would expected as important incentive to encourage the providers. The conditions which could make farmers pay without complaint in which the majority (82.4%) agreed was improved income from crop and animal production. This finding corroborates with that of Van den Ban (2000) indicating that

potential users are willing to pay for private services if the various private services would improve their income as farmers and empower them financially. This is because, though currently they are paying for services, their improved income would suggest availability of funds from which they could conveniently pay for the services whenever the fees higher than the current rate may introduced. This needs the service delivery system should go beyond mere increase in yields to include good marketing services for guaranteed income increase to pay for services. This is an important condition attached to WTP for private services by farmers.

Subsidized private services could, therefore, be a viable another option here, which may be explored in the provision of effective and sustainable services particularly to poor HHs. This is because there are cases where subsidized service delivery performs better than public service delivery on the principle of free of charge. This would have has three-fold benefit: at one hand, due to lower services charge the current non-users come to be a user. On the other hand, the service providers maintain the delivery of essential services because it is financially viable as higher demand arise as result of some of the cost is covered by the public. Thirdly, it is advantageous for the public since subsidy is relatively better than free supply of services to resolve the current fiscal constraint. Thus, here it needs the involvement of public sector to support the service delivery by subsidizing the service fee thus the non-users became users when the public share the charge up to the point which is feasible to the service provider, yet affordable to poor. But this should only be considered, according to experts discussants, when service use is economically profitable i.e., when there is a strong crop and livestock response that service use remains profitable. Otherwise the discussants agreed that the correct way to subsidize services under the current strategy of agricultural-led market development of Ethiopia may be indirectly through improvements in institutional setup, infrastructure and marketing rather than directly through price subsidies.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The study was conducted to investigate the opportunities and challenges of existing private crop protection and community animal health workers service development in *Alaba* district with the aim of exploring ways of developing demand-driven service delivery system in the sector to support the envisaged smallholder transformation. The specific objectives of the research were to assess: i) the perceptions of service providers about the opportunities and challenges to enter and expand the service; ii) service coverage and commercial viability; iii) the perceptions and level of satisfaction of service users and potential users; and iv) the farmers' ability and willingness to pay for both private crop protection and CAHWs services. The primary data was collected from 120 randomly selected farm households from four PAs representing the near and far PAs in reference to Kulito market. This was supplemented by information from participatory rapid appraisal and review of government policies and strategy documents. Qualitative and quantitative methods were deployed to analyze the collected data. Descriptive statistics was used to measure the mean willingness to pay in the future.

5.1 Private Crop Protection Service

5.1.1 Summary of key findings and Conclusions

In the study PAs and elsewhere in the country, the public sector was found to be the main source of inputs and technical assistance for crop pests and diseases control. In addition, the farmers have their own traditional methods and there are also formal and informal private providers by using purchased agro-chemicals. Both traditional and informal providers were questioned for issues such as effectiveness, human health and its impact on the environment. Recognizing the issue, since three years ago, the formal providers were introduced as one alternative of providing demand-driven service. In response, the survey has assessed their supply capacity and found that these providers are different in their capacity. Accordingly the survey has revealed that all providers are male over 36 years old where their educational level ranges from grade 1 to 10 with average of grade six. In addition the providers were supplied with various credit, equipment and essential protective measures for appropriate handling and application of chemicals which was further backed by technical assistance, monitoring and supervision services from public and private actors in the system.

Private crop protection service providers in Alaba perceived three major opportunities about their capacity: technical and material assistance and the devotion of some NGOs to support providers in capacity building, the benefit in terms of profit & work experience from the service provision, and the existence of private input shops to acquire the necessary chemicals. The perceived supply-side constraints include: unfair competition with informal providers who are likely to undercut price, the public sector (WoARD) weak chemical use regulation enforcement mechanism to deal with informal providers, and limited access to training in technical and financial business management. Hence, overcoming the perceived constraints and seizing the opportunities call for specific technical, policy and institutional interventions.

The main private formal crop protection service in the research area is herbicide spraying primarily focusing on the major cereal and pulse crops; and pesticide application is limited to cash crops. The pre harvest service coverage encompasses more clients than that of post harvest services. The latter is often requested by better-off households who produce cash crops. Unlike the poor and medium classes, the better-off households rarely use private spray services. This is due to the fact that the majority of better-off housed own knapsack for crop spraying. The service coverage also varies across the PAs. For instance, the coverage of private formal crop protection service in H.Kuke PA is wider than that of Debeso PA. This is attributed to the summative of two factors: performance of provider expressed as better educated and young personality to respond timely and travel by bicycle, and the relatively higher demand from better-off HHs for cash crops in H.Huke than Debeso. In this thesis, among the various crop protection services being delivered, only herbicide is considered in service financial viability analysis as it represents the main service provided privately. The result indicates that private herbicide service provision is financially viable even if the current costs of chemical inputs increased by 10%.

Both service user and potential user farmers have favorable perceptions for traditional crop pests and diseases control methods for its availability, timeliness and environmental safety, and thus currently practiced by the majority of poor. The traditional crop protection methods are often labor-intensive hence poor households with abundant labor and less capital tend to prefer traditional crop protection methods to the modern, chemical options. Private informal providers were perceived better for timeliness, affordability and

availability than formal providers. However, as a result of formal trainings and presence of safety measures, in contrast, private formal providers were perceived better for environmental and human health than informal providers. Regarding individual service users, the HHs in H.Kuke PA were better satisfied with the service due to better performance of the provider than HHs in Debeso PA where they feel some shading of dissatisfaction. Overall, the better-off and middle class HHs in both PAs were better perceived for all indicators under investigation than the poor who mostly use the service with poor quality and lower frequency from informal providers

The assessment of willingness to pay for the service about service fee and perceptions of users/potential users on the prevailing charging rates for specific services has revealed that majority (51.7%) of the current herbicide users/potential users perceived the prevailing charge is reasonable whereas about 63.3% of pesticide users perceived the current charging is higher. The survey regarding mean willingness to pay for quality services has revealed 35 and 63.3% of users/potential users for herbicide and for pesticide, respectively, were willing to pay if the service charges could be reduced.

5.1.2 Recommendations

- It is revealed that the training selection program lack qualities of involving providers in selection of topics, too short/long training duration and contents usually do not align with skill and context dynamism and missing aspects of knowledge domain. Hence, it is important to provide full package trainings to capacitate providers to enable them competitive, vibrant and responsive to demand. This has to be also backed by linking the providers with various actors, while strongly focusing on non-technical hurdles related to institutions and market, so that they can access and use the opportunity that resides in other actors.
- For the future of the providers, it is important that they have to seize the existing opportunities at their hand. In order to avoid unfair competition between the formal & informal providers and the associated ineffectiveness in service delivery, it is imperative to enforce legislation with particular emphasis to licensing. Unlike CAHWs services, PCPS is quite new, needs service standards and guidelines. Establishment of regional chemical input quality control can increase farmers' confidence in providers and protect adulterated service and formal service providers against competitors.

- Systematic monitoring and documenting the existing private crop protection initiatives while paying attention to the effect of these initiatives would increase the role of the private sector in supply of services as well as reducing the role of public in the delivery of services is crucial. This needs scaling best practices, seizing opportunities, and addressing the challenges to financial viability, safety and environmental sustainability of private service delivery in innovative ways. The gradual retreat of public sector in PCPS than CAHWs is an indicator to this while shifting its focus to services which are non-delegable and not viable to private sector. Relieving the public from the service delivery would lessen the burden of woreda expertise to focus more on information and knowledge broker, and in facilitating linkages of providers with institutional services. But the re-treat of the public sector has to be complemented by measures to improve the framework conditions for service markets.
- It is undisputed that the stakeholders should give special consideration to remote and low potential far PAs where the service coverage is low and that are not attractive to the profit oriented providers. The government should clearly define tasks division between the various actors (private formal and informal) in the system bearing in mind that in far remote PAs some flexibility may be required in the privatization exercise such as intervention through price subsidy so that the current non-user poor FHHs and marginalized groups would become user.
- Although the respondents batter perceived all crop pest and disease control methods for their accessibility/availability, the improvement in other indicators and progress monitoring that involves users in defining the performance criteria to be monitored would contribute more positively.
- It is revealed that majority of users in the study PAs were willing to pay for private services if it will improve their income as farmers and empower them financially. This is logical because improved income would suggest availability of capacity to users/potential users from which they could able to pay for the services whenever the fees higher than the current rate may introduced. Therefore, the service delivery should go beyond mere increase in yields to include good marketing facilities and other income generating schemes for sustainable income increase as desired by the users and this is an important condition that should be attached to WTP for private services by users.

5.2 CAHWs Service

5.2.1 Summary of key findings and Conclusions

The key lesson for the study PAs, and indeed the whole of district, from the existing initiative is the fact that CAHWs involvement in primary animal health service provision is encouraged to solve the problem of the current budgetary constraint of public sector. However, the assessment result of their capacity revealed the current CAHWs are lacking the minimum critical facilities and inputs for proper primary animal health care service provision. Although all CAHWs are males, they vary in their age and level of education. Overall, they lack the public supportive services such as technical backstopping and supervision, business training, protective safety measures, transport and communication facilities and trade license despite the presence of professional certificate. Lack of transportation and communication facilities was found to be the major factors hindering reporting of cases and timely information (backward and forward) flow as result some two CAHWs were quite dropped-out of the system. They are also poorly linked with respective actors in the system, except that of linkage with Mencheno Union for financing and IPMS for knowledge and information, other wings reveal weak linkage.

The demand-side is particularly weak where farmers are not well organized to be able to analyze their real needs and demand quality services. From perspective of supply-side, the pluralism aspect is absent that CAHWs interact occasionally with other actors, working as non-farm business and hence prefer profit-orientation to client-orientation, and the process owners are not performing to their effectiveness. CAHWs are also not yet organized into cooperatives to capitalize their experiences and to influence policy at higher level. On the policy-side, it was analyzed that policies are not converging towards a common and shared agenda to enforce regulatory frameworks.

In the study area, numerous opportunities were identified to promote CAHWs services in alternative ways include: the existence of district extension service, existence of private input shops address constraints to availability of drugs, and the current government investment in public goods (roads, telex and rural electrification) has numerous opportunities for communication and transportation facility. Likewise, weak enforcement mechanism to deal with competition from informal providers, lack of training in technical

and business management, and lack of capital and input services were the main constraints faced CAHWs. But many of them were found to be non-technical, but lie in realm of policies and institutional challenges over range of CAHWs services.

The service coverage varies over PAs with the domination of public and formal CAHWs. Unlike the spray service, the role of public sector is very substantial indicating us the right positive alignment of public sector to the sector where there are only few providers than where the suppliers are relatively saturated. Like PCPS, the demand for CAHWs service follows a seasonal pattern and service charging varies overtime in response to price of drugs. Overall, the CAHWs service covered relatively wider PAs and cattle dominated than other animal species. It also varies over PAs depending on their mode of transport, distance from Kulito market, performance of CAHW as function of his formal education and physical strength to travel by bicycle and timely respond to demand. All the better-off class in Lay Bedene PA was service users of any type at anyone season where it is only 85.7% for Asore with comparative advantage of public animal health service in near reach. Among services, tablet selling is mostly requested by poor since its price is lower to them. Among the services, antibiotic treatment selling was subjected to analysis of its commercial viability to CAHWs and revealed it is financially viable even if the current costs of drugs increased by 14%.

The assessment of perception of user and potential user farmers about the service depicted that better-off HHs in Asore PA were perceived the service is ineffective which is attributed to users' ability to differentiate the quality of specific services and compare with public service in near reach than that of Lay Bedene. Service users were perceived the performance of CAHWs more positively for availability, timeliness and quality of services whereas traditional method was also appreciated by majority of HH for its affordability.

The survey of WTP were revealed that large proportion of service users/potential users (46%) perceived the current fee is reasonable, whereas nearly 44% of the current non-users reported that the prevailing service charge rate was higher perhaps owing to their inability to pay. WTP estimates are currently questioned for policy purposes on the grounds that it is the ability and not willingness which should form the basis of social policy. In this regard, the assessment of their ability to pay (ATP) has revealed that 74.3% rated themselves as just able to pay the said price. The conditions which could make these

farmers pay without complaint in which the majority agreed was if the various private services would improve their income as farmers and empower them financially

The recent efforts of Alaba WoARD, LVIA and IPMS to promote private service delivery in study PAs and lessons learned from the existing CAHWs delivery system lead to conclude that government have a very important role to play in promoting the expansion of CAHWs service delivery beyond the current territory. This entails provision of various capacity building services to CAHWs and services that will stimulate users to demand various quality services. This is because until there is serious commitment to provide these basic public services, any public supportive services are unlikely to have any lasting impact on CAHWs service delivery.

5.2.2 Recommendations

- There is room for more direct contribution of communities in building the capacity of CAHWs to ensure that a minimum level of service delivery can be maintained in PAs such as Debeso and HKuke where this service would simply not be available. This is because, if affordable services are accessible and available for individuals, the services of CAHWs contribute to increased income at HH level. In this case, the service delivery would go beyond a pure economic client to customer orientation. The public support that train CAHWs on financial management and to evaluate their profitability over time, taking into account ever increasing drugs price, can improve their decision-making concerning on business management.
- Without a well organized demand-side, service delivery will remain ineffective and depend on the good will of CAHWs losing the quality of being demand-driven. Likewise, without strong supply capacity of CAHWs who are capable of responding effectively to the demand aired by users, the system will be ineffective too. This in turn needs continuous capacity building scheme while analyzing the different levels and developing them together to manage change within these and across.
- It would be good if CAHWs would get involved in new linkages. Examples are linkages with drug wholesalers and factories. Until now, these linkages are missing, but they could form a partly solution for shortage of drugs that CAHWs currently facing.

Hence, a better definition of linkage strategies is a fundamental approach in improving the performance of interaction among these actors.

- It was recommended that the CAHWs service delivery system should control its perceived weaknesses and cultivate the opportunities at hand. On the other hand, it should respond to the threats to get the most out of its strengths and pave the way for new entrants and expansion of services.
- In order to fill the gap of current shortage of CAHWs where service coverage is poor, involving more livestock keepers themselves and informal providers in primary animal health service delivery is another option. But this need to be supported with appropriate legislative and policy frameworks. To this regard, issues as far ranging as standards and certification, policy and institutional issues are increasingly vital.
- As sustainability is linked with commercial viability; financial aspects and income opportunities for CAHWs in study PAs are even more important. Even though the CAHWs service is financial viable it should look that revision of their profit margins needs to be done to maximize the profit. Private businesses are risky and susceptible as detrimental external factors are likely to shake it easily.
- The paper recognized one important issue for consideration when CAHWs service is being initiated - the perceptions of the affected groups. Although respondents may share similar perceptions, extenuating factors peculiar to specific service may be critical and will have to be considered. This is because sustaining a privatized service delivery will depend not on the benefit derived alone, nor on the perception of or ability of the recipient to pay, but also on the cumulative purchasing power of both user and potential user groups. This needs designing the service delivery system which is targeted and context-specific

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7. APPENDICES

Appendix 1. General agrochemical/drugs retailers in and around Alaba

Name	Location/town	Remark
Mencheno Union shop	Kulito	Alaba
Kulito farm inputs shop	Kulito	
Zalan vet drug	Kulito	
Alaba Garden pest control and selected seeds shop	Kulito	
Siyane Vet drug	Kulito	
Adami Tulu Pesticides Processing share Company	Ziway	132km from Alaba

Source: Survey Result, 2010

Appendix 2. Credit Mobilized from Mencheno Union to Private sectors in Alaba

Private sectors	Sex			Down payment	Outstanding credit	Total to be paid
	M	F	T			
Apiculture Wanja Galeto Farmers Union	17	-	17	0	51,170	53,167.73
CAHWs	6	-	6	0	15,000	15,955.5
Forage shop and Private nurseries	1	-	1	0	10,000	10,624.66
Input shops				0	100,000	50,000 paid & 50,000 remaining
PCPS Providers	11	-	11	0	38,500	39,050
Multi-thresher	1	-	1		4,000	6,675
Animal feed supplier	2	-	2	0	6000	6724
Drip Irrigation	10	-	10		3,000	3,350

Source: Mencheno Union, 2010

Appendix 3. Cooperatives in Alaba Special Woreda

Name of the Cooperative	# of Coops in district	Remark
General farmers coops	14	
Farmers saving and credit coops	29	
Youths package	65	
Fruits coops	3	Two are established in 2002
Irrigation users coops	3	One established in 2002
Handcrafts coops	1	
Honey production coops	1	
Crop marketing coops	2	
Weavers coops	2	One in 2000 & one in 2001
Shoats fattening coops	1	Established In 2001
Mines producers coops	3	
Seed multipliers coops	3	All established in 2002
Kulito town general coops	2	One in 1996 & one in 2001
Total	129	

Source: WoARD , 2010

NB: There are total of 10,270 members in all 29 coops and a capital of 669,068.95 ETB. All these cooperatives were borrowed money from Rural Development Fund and didn't take any loan from Omo Microfinance.

Appendix 4. Initial* CAHWs charging rate based on Community Consultation in 6 PAs of Alaba, 2006

Drug name	Unit	Buying price	Serves for	Selling price
Albaendazole	Bollus Bovine (50) 2500gm/bollus	60 Br Cents/tablet	50 cattle	75 Br 1.50 /tablet
	Shoats 300mg		55 shoats	
Tetraclonal	Bollus (40)	85 Br	40 Cattle	100 Br, 2.5Br/cattle
Sheep Tetraclonal	Bollus (55)	30 Br	55 Shoats	45 Br: 0.85 cents/tablet
Antibiotic (Oxy)	Long of 20 % Bottle	23Br	20cc/cow	38 Br: 7.6 Br/cow
	Short of 10 % Bottle	23Br	20cc/cow	38 Br, 7.6 Br/cow
Penstrip	Bottle	40 Br	8/Pack animals	6 Br/pack animal
Castration	Boine			3 br/bull
	Caprine			1.5 br/shoats

Source: WoARD, 2006: * Market governs the service rate

Appendix 5. Treatment charging rate of drugs in Alaba Public Animal Health clinic

Medicine	Unit	Unit selling price (Br)	Remark
Penestrep	ml	7.80/cow	
Oxytetracycline 20%	ml	6.50/cow	
Oxytetracycline 10%	ml	5.30/cow	
Multivitamin	ml	0.32	
Ivermectine	ml	2.70	
Albendazol 2500mg	Tablet for cattle	1.27	
Albendazol 300mg	Tablet for shoats	0.30	
Tetralozan 3400mg	Tablet for cattle	2.44	
Tetralozan 900mg	Tablet for shoats	0.86	
Fenbendazol	sapet	13	For equines
Intramammary infusion		14	Applied on breast
Diminal		2.25	
Calcium borogluconate	ml or cc	60	
Castration	For bulls	3	
	For shoats	2	
	For equines	3	

Source: WoARD, 2010

Appendix 6. Traditional Animal Health Practices in the study area

Local Name	Amharic Name	English Name	Species Affected	Common traditional Practices
<i>Tereje (Arae Tizenat)</i>	<i>Aba senga</i>	Anthrax	Cattle, shoats, equine	Root of <i>Kelalla, Gzawa, Lallo</i> and leaf of <i>Truman</i> , fluid of <i>Embuay</i> and <i>Bisana</i> , salt, Hot peper is crushed and dissolved in water and given per nostrils; solution from rotten egg for equines
<i>Habussa</i>	<i>Aba gorba</i>	Blackleg	Cattle, shoats	Root of <i>Kelalla, Gzawa, Lallo</i> and leaf of <i>Truman</i> , fluid of <i>Embuay</i> and <i>Bisana</i> , salt, Hot peper is crushed and dissolved in water and given per nostrils;
<i>Gororsa</i>	-	Pasteurellosis	Cattle, sheep, and goat	-The fluid content of <i>Embuay</i> + Leaf of <i>Bisana</i> +Root of <i>Lallo</i> + salt+ Hot peper is crush together, dissolve in water and given per os) - Branding of the throat region with hot iron
<i>Losha (Lugo in shoats)</i>	-	Fasciollosis (Liver Fluke)	Cattle, sheep, and goat	Root of <i>Kelalla, Gzawa, Lallo</i> and Leaf of <i>Truman</i> , fluid of <i>Embuay</i> and <i>Bisana</i> , salt, Hot peper is crushed and dissolved in water and given per nostrils
<i>Afte-egir</i>	-	FMD	Cattle, sheep, and goat	Fluid content of <i>Embuay</i> + Leaf of <i>Bisana</i> +Root of <i>Lallo</i> + salt+ Hot peper is crush together, dissolve in water and given per os and nostrils) - Mixture of pepper and garlic is delivered for foot and mouth disease
<i>Koyechu</i>	-	Actinobacillosis	Cattle, and shoats	-Rubbing with maize straw
<i>zeree</i>	<i>Mezger</i>	Tick control	Cattle	Painting with tobacco solution on external skin of cattle for purpose of tick control etc.
<i>azizebuluta</i>	<i>Tilatil</i>	De-worming	Cattle, shoats	drinking local <i>areke</i> to de-worm internal parasite for cattle,

Source: KIG Survey Result, 2010

Appendix 7. Bio-pesticides and Natural Pest Control Methods

Bio-pesticide from	Effective For	Result	Health Hazard	Preparation
Red onion	Aphids, rats and mice, Powdery mildew, Early Blight, Late blight, Downy mildew & Asher: caused by virus, bacteria and fungus	Protects fungi , and insects do not approach to the applied crop	Burning of eyes	Chopped stem of onion stored for 4-7 days before application
Pepper (Capsicum Frotescens and Annum,)	For all insect pests, fungus, bacteria, virus	Mosaic solution from pepper protects and kills insect pests	If highly concentrated, it can affect leaves	From pepper seed and fruit, soap. After 1 day apply on roots of crop
Tea/Camellia Sinesis	Termite, Aphid spp, snail	Kills insect pests	-	Powder of leaves & seed of tea mixed with water and applied in crop roots
Papaya (Carica papaya)	Aphids , Army worm , root rot (Fusarium Oxysporium), termite, coffee leaf burner	Anti-fungus, anti-nematode , kills insect pests	-	Seed and green leaf grinded and filtered, soap, thus the solution kills cutworm and termites
Tomato (Lycopersicon esculentum)	Aphids, Army worm, grasshopper , cut worms, ant-fungus	Kills and makes Insect pests dormant/inactive ; anti bacteria	Leaves are poisonous to human	Grinded leaf applied in solution, soap, applied every 2 days
Melia azadarch prinson lilac	Army worm, stalk borer, grasshopper, weevil, mites, fungus	Kills insect pests, in touch, anti-fungus,		Not commonly practiced
Nicotiana Tabacum, (tobacco)	Aphids, bilharzia, snail, sickle, termite, rusts, spider mites, slugs	Kills pests in touch, anti-fungus, anti-insect pests, makes pests growth dormant	Nicotine affects human for any touch, don't apply tomato, potato	Leaf, soap, or use powder after dry
Black jacks (Bidenspilosa)	Ants, aphids, cut worm termite, rusts, spider mites, slugs	Protects and makes insect pests dormant	If highly concentrated, affects flower	Seed boiled for 10 hrs mixed with soap and filtered solution applied,
Candelabra (Euphojrbia Tirutalli)	Aphids, mosquito fly, termite, mites,	Antifungal, protects insect pests	Milky s/n affects eye, skin	Mulching/ burring grinded leaves around the root of crop
Agave Americana (America aloe)	Kills pests in store, termite and pests in the field	Protects and kills pests	Not known yet	Grinded plant mixed with water and applied
Garlic	All Aphids spp., army worm, rust,	Kills insect pests an protects disease	Should not be applied in fertilized soil	100gm garlic, ½ L water, 10gm soap, 2 spoon oil, pepper
Wood ash	Beetles spp. of pumpkin, fungus, rusts	Antifunfal, kills beetles	--	½ cup ash, ½ cup soil , 4L water, applied twice a week
Cattle urine	Mite, caterpillar, aphids, cut worm, milibag, tripas	Kills flying flies, protects diseases	--	Urine stayed for 2 weeks, boiled by sun heat. Then urine and water mixed ratio of 1:6 applied

Source: Document Review and discussion with Providers, 2010

Appendix 8. Common types of Pesticides used and handling

Type of crop protection chemical	Trade Name	Common Name	Mixture type	Application	WHO class *	Rate per ha		Stays after spray	Effective for
						Liter	Kg		
Pesticide	DDT	Didmack	Solution	Mixed with water	2	2		3 wks	Army worm, Stem borer, Red Teff worm, weevil Aphid, mites grasshopper, Wollo bush cricket
			Powder	Applied as powder	2		8-10	3 wks	
			Powder	Applied as powder	2		15-20	3 wks	
	Malathine	Sitayone / insecticide	Solution	Mixed with water	3	2		10days	Army worm, Stem borer, Red Teff worm, grasshopper, Wollo bush cricket , Aphid, Weevil
			Solution	Applied as it is	3	1		10 days	
Powder			Applied as is	3		15-20	1 week		
Ethiozinon 60%EC	Diazinon	Solution	Mixed with water	2	2		10 days	Termite, Army worm, Stem borer, Red Teff worm, Aphid, grasshopper, Wollo bush cricket	
Carbaryle 85% powder	sivin	both	Mixed with water	3		1.5	1 week	Termite, Army worm, Stem borer, Red Teff worm, Aphid ,grasshopper, Wollo bush cricket	
Herbicide	2-4-D	U-46-D (weed killer)	Solution	Mixed with water	2	1-1.5		3 weeks	weed
Fungicide	Thiram								Fungal diseases on potato
	Mancozeb, delan	Antifungal							
Rodenticide	Zinc phospdide				2	NA	NA	NA	rat
	warfarin				1	NA	NA	NA	rat

Source: The Manual developed by WoARD for PCPS providers

*1= highly hazardous (1-50 LD50mg/kg), 2=moderately hazardous (50-100 LD50mg/kg), 3=slightly hazardous (100-500 LD50mg/kg), 4=no hazard in normal use (500-1000 LD50mg/kg), 5=no effect at all (>1000 LD50mg/kg)

Appendix 9. Private Crop Protection Service Providers

Name	PAs originally assigned	PAs covered	Education Level	Contact Address	Experience (years)	
					informal	formal
Jemal H/Osuman	1 st Choroko	3	3 rd	0916045517	12	2
Aman Mohamed	Alemtena	3	8 th	-	5	2
Kedir Abiye	Debeso	3	1 st		10	2
Abdulaziz Beshir	Gedeba	3	10 th	0916057734	2	2
Abdella Osuman	Galeto	2	10 th	-	5	2
Asemo H/Mohamed	2 nd Choroko	1	3 rd	0916284002	5	2
Nuredin Shifa	Wanja	4	9 th	-	5	2
Muhe Ibrahim	Hulegeba	4	5 th	0916304121	7	2
Mundino Kusamo	1 st Mekala	3	8 th		5	2
Nuriye Hassen	Gubasheroro	3	2 nd	0913173620	3	2
Waou Bamud	Kufe	3	3 rd	-	6	2
Total		23			55	18
Average		2.5			6	2
1. PA covered by Jemal H/Osuman a) 1 st choroko b) Muda Mayafa c) Chambulla		4. PA covered by Abdulaziz Beshir a) Gedeba§§ b) Lay Lenda c) 2 nd choroko*		8. PA covered by Muhe Ibrahim a) Hulegeba Kuke b) Gedeba* c) Asore* d) Hulegeba zato		
2. PA covered by Aman Mohamed a) Alemtena		5. PA covered by Abdella Osuman a) Galeto b) 2 nd Mekala*		9. PA covered by Mundino Kusamo a) 1 st Mekala		
3. PA covered by Kedir Abiye a) Debeso b) Gurara Bucho c) Kunchena Yaye		6. PA covered by Asemo H/mohamed a) 2 nd Choroko*		10. PA covered by Nuriye Hassen a) Guba sherero b) Falka c) Bitena senkele		
		7. PA covered by Nuredin Shifa Shifa a) Sheka tena b) Asore c) Misrak Gortancho d) Wanja		11. PA covered by Waou Bamud a) Kufe b) Tach Lenda c) 2 nd Mekala*		

Source: PCPS providers recording

* PAs covered by more than one sprayer

Appendix 10. CAHWs Service Providers

Name	PAs assigned	Education Level	Service Experience Years		Contact Address	Coverage based on			Specific Services
			In informal service	In formal service		PAs	HHs	Woreda	
Jemal Hussien	Lay Bedene	8 th	0	3	-	7	309	3	Castration, Tablet selling, Advisory service Cutting horn/hoof, External parasite, Infectious disease /anthrax
Hussien Awol	Asore	3 rd	0	3	09 10 115573	7	128	2	>>
Abdella Abire	Gerema	8 th	0	3	-	17	557	3	>>
Bediru Dubela	Rekonen Teffo	5 th	0	3	-	5	119	2	>>
PAs covered by Jemal Hussien			PAs covered by Hussien Awol			PAs covered by Abdella Abire			
1. Lay Bedene ^a = 64HH 2. Tach Bedene ^a =23HH 3. Habibo Forena ^a =5HH 4. Sorge Dorgosa ^a =8HH 5. *Hulegeba Kuke ^a =10HH 6. Regina ^b =8HH 7. Tach Gimbicho ^c =10HH			1. Asore ^a =135HH 2. 1 st Ashoka ^a =56HH 3. 2nd Ashoka ^a =36HH 4. Sheke tena ^a =15HH 5. 1st Mekala ^a =20HH 6. 2nd Mekala ^a =10HH 7. Keranso ^d =37HH			1. Gerema ^a = 87HH 2. Chambulla ^a = 48HH 3. Muda Mayafa ^a = 60HH 4. Illolaka ^a =45HH 5. Wushamo ^a = 67HH 6. Misrak gortancho ^a =30HH 7. Mearab gortancho ^a =10HH 8. *Hulegeba Kuke ^a =29HH 9. Lay Arsho ^a =25HH 10. Tach Arsho ^a =20HH 11. Dinkosa ^a =35HH 12. Shemesina mise ^c =10HH 13. Wayawa ^c =6HH 14. Jamaya ^c =7HH 15. Gindella ^e = 47HH 16. Gotmanea ^e =21HH 17. Megari ^e =10HH			
Where: a=Alaba PAs; b=Silte Woreda PAs; c=Shashigo Woreda PAs; d=Shone Woreda PAs; *PA covered by two Formal CAHWs; e=Damboya Worweda PAs									

Source: CAHWs survey, 2010

Appendix 11. Conversion Factors used for Computation of Tropical Livestock Unit

Animal category	Livestock unit
Calf	0.25
Heifer	0.75
Cow/ox	1
Horse	1.1
Donkey (adult)	0.7
Donkey (young)	0.35
Camel	1.25
Sheep / goat (adult)	0.13
Sheep / goat (young)	0.06
Chicken	0.013

Source: Storck *et al.*, 1991:188

Appendix 12. HH Survey Interview Schedule

General Information: Serial No. of the questionnaire _____

Name of the PA _____

Name of the village _____

Date of interview _____

Interviewee name (include grandfather) _____

Interviewer name _____

A. HOUSEHOLD CHARACTERISTICS

1. Household Demography

Age group	No	Education @	Currently going to school yes/no	Health status healthy/sick*
Male > 50 years old				
Female >50 years old				
Adult female (17 – 50 yrs old)				
Adult male (17 – 50 years old)				
Young male (14 – 16)				
Young female (14 - 16)				
Children < 14 years				

@ Education level: 0 = cannot read and write, 1 = Able to read and write, but no formal Schooling, 2 = Primary school, 3 = Secondary school

2. CHARACTERISTICS OF HOUSEHOLD HEAD

Attributes	Description
Age	
Sex	1.Male 2.Female
Religion	

Marital status (single, married, widow/ widower, divorce)	
Education level (codes the same as above)	
Experience in farming (yrs)	
How long s/he participated in crop extension (yrs)	
How long s/he participated in livestock extension (yrs)	
How long s/he participated in other household package other than crop and livestock such as adult education, health & nutrition, non-farm, etc (specify)	
Have you ever been a model farmer?	

B. FARM RESOURCES AND ACCESS

Access to non-family labour

1. Do you use hired labour (√)? 1.Yes 2.No
2. If your answer is yes, please indicate:
 - 2.1 The number of days hired labour is used in a season -----
 - 2.2 Purpose for which hired labour is used -----
 - 2.3 Cash or/and in kind of payment for a per/day /person -----
3. Do you receive labour assistance from relatives or neighbours when such assistance is needed? 1. Yes 2. No

C. Livestock ownership

Livestock Ownership

Category	Number owned (heads) current	Main purpose of keeping*
Cows/heifer (> 2 yrs)*		
Oxen/bulls (> 2 yrs)		
Calves (< 2 yrs)		
Horse (adult)		
Horse <2yrs		
Donkey (adult)		
Donkey(young)		
Sheep & goat*		
Sheep and goat (young)		
Bee colony		

* 1=breeding stalk, 2=beef/fattening, 3=milk production,4= draft power, 5=renting , 6=transportation,7=others

1. Did you face shortage of oxen during this crop season? 1. Yes 2. No
2. If yes, how did you overcome it?

D. Access to land and land use

1. When did the household acquire the land _____yr

2. How did you acquire the land (encircle)?
1=Land distribution, 2=Inheritance , 3=Purchase, 4=other (specify)
3. What is the current total holding size in *timad* _____
4. What is the current size of irrigated/irrigable land in *timad* _____
5. Please give reasons if there has been change in your land holding size. _____
6. Is your land sufficient to meet your need? 1. Yes 2. No
7. Can you get more land to cultivate if you feel necessary? If yes, how?
8. Land use (past cropping season), quality and tenure status

Description of land use type

	Size in <i>timad</i>	Crop/ tree on the land (Q)	Irrigated (Yes/ No)	Fertility: 1=poor, 2=medium, 3=good	Topography 1=plain, 2=steeply	Tenure: 1=secured, 2=not
Plot one						
Plot two						

E. Participation and position in formal and traditional group/organizations

LIVELIHOOD OPTION AND CHOICES

1. List of the main livelihood options for the household including cereal, vegetables, fruits, *chat*; livestock- dairy, cattle fattening, sheep/goats, beekeeping, poultry, off/non-farm, etc.
2. The three main crop options (in the order of importance), division of labour, and amount sold

Main options	Option 1#	Option 2#	Option 3#
How much is sold commercially@			
Responsibility* (production)			
Responsibility* (post-harvest)			
Responsibility* (marketing)			
Make spending decisions*			

@: 0=no or little amount, 1= if it is ≤ 25%, 2=if it is between 25% & 33%, 3= if it is between 33% & 50%, 4= if it is between 50 % & 75 %, 5= for 75- 100%; *: 1 =mainly husband, 2=mainly wife, 3 =both, 4 =son, 5=daughter

3. Yields and prices trends for the three main cropping option(cereals, vegetables, horticulture)

Options (in the	Yields	Contributing	Price	Contributing	Rank#
-----------------	--------	--------------	-------	--------------	-------

order)	trend\$	factors	trend\$	factors	

\$ rate on scale 1=very reduced, 2=reduced 3=moderately reduced, 4=increased, 5=increased substantially

4. The three main livestock options (dairy, cattle fattening, sheep/goats, beekeeping, poultry) in the order of importance, division of labour, and amount sold

	Option 1#	Option 2#	Option 3#
Main livestock options			
How much is sold commercially@			
Responsibility* (production)			
Responsibility* (post-harvest)			
Responsibility* (marketing)			
Make spending decisions*			

@: 0=no or little amount, 1= if it is ≤ 25%, 2=if it is between 25% & 33%, 3= if it is between 33% & 50%, 4= if it is between 50 % & 75 %, 5= for 75- 100%; *: 1 =mainly husband, 2=mainly wife, 3 =both, 4 =son, 5=daughter

5. Yields and prices trends for the three main livestock options (dairy, cattle fattening, sheep/goats, beekeeping, poultry)

Options in order	yield trend\$	Contributing factors	Price trend\$	Contributing factors	Rank#

\$ rate on scale 1=very reduced, 2=reduced 3=moderately reduced, 4=increased, 5=increased substantially

6. What are your main production constraints in the order of importance:

7.1. in your priority crop options 1. 2. 3.

7.2. in your priority livestock options 1. 2. 3.

F. ACCESS TO CREDIT

1. Access to credit

Items	Yes (√)	Purpose
Do you need loan for your agricultural activities?		
Do you need loan for activities other than agriculture (off/non-farm)		
Did you borrow from formal source in last 12 months?		
Have you ever faced a situation where your application for formal loan turned down?		
Other (specify)		

2. In your view, what are the 3 main constraints in accessing finance/credit for your priority livelihood options? 1. 2. 3.

D. Access to Inputs and Supportive Services for Priority Crop and Livestock Options

I. Access to inputs and services for priority crop options

1. Do you have access to improved seeds for your priority crop option? 1. Yes 2. No

2. What are your main sources (in the order of importance) and constraints (accessibility, utilization) of seeds? 1. 2. 3.
3. Do you have access to inorganic fertilizers for your priority crop option? 1. Yes 2. No
4. What are your main sources (in the order of importance) and constraints (accessibility, utilization) of inorganic fertilizers? 1. 2. 3.
5. Do you have access to irrigation and/or moisture conservation such as rainwater harvesting technology for your priority crop option? 1. Yes 2. No
6. Do you have access to crop protection measures (pesticide, herbicide, PHT) for your priority crops? 1. Yes 2. No
7. What are your main sources (in the order of importance) and constraints (accessibility, utilization) of crop protection measures for your priority crop option? 1. 2. 3.

II. Access to inputs and veterinary service for priority livestock option

1. Do you have access to improved breeds or breeding (AI) service for your priority livestock option (dairy, cattle fattening, shoats, apiculture, and poultry)? 1.yes 2. No
2. What are your main sources (in the order of importance) and constraints (accessibility, utilization) of improved breeds or breeding (AI) service for your priority livestock option? 1. 2. 3.
3. In your view, what are the 3 main accessibility (availability & affordability) and utilization (technical appropriateness) constraints of improved breeds or breeding service for your priority livestock option? 1. 2. 3.
4. Do you have access to improved planting material and/or feeds for your priority livestock option? 1. Yes 2. No
5. What are your main sources (in the order of importance) and constraints (accessibility, utilization) of improved planting material and/or feeds? 1. 2. 3.
6. Do you have access to veterinary service for your priority livestock option? 1.Yes 2. No
7. What are your main sources (in the order of importance) and constraints (accessibility, utilization) of veterinary service? 1. 2. 3.

III. ACCESS TO MARKET

1. Please list where the household members often go to buy & sell things

Markets visited	Distance (km)	Things often bought/sold	Frequency of visit (daily, weekly, monthly, quarterly etc)

2. In your view, what are the 3 main product handling and marketing constraints in your priority crop options? 1. 2. 3.
3. In your view, what are the 3 main product handling and marketing constraints in your priority livestock options? 1. 2. 3.

IV. ACCESS TO EXTENSION /ADVISORY SERVICE

I. Access to and sources of knowledge

1. What are your main sources (in the order of importance) of knowledge & information for your priority livelihood options?

Knowledge & information on:	Access Yes /No
Improved livestock breed & breeding practices, and services	
Improved livestock parasites & disease control measures, and services	
Health & environmental effects of unwise vet drug use, and drug handling & disposal practice	
Improved crop pests & diseases control measure, and services	
Health & environmental effects of unwise pesticide use, and pesticide handling & disposal practice	
Other specify	

2. Participation in other extension activities in the last 12 months

Learning events	Yes (√)	Who took part*	Please specify the subject	Practical** usefulness
Managing demonstration /on-farm trial				
Farmer field day				
Experience sharing visit				
Farmer-to-farmer knowledge sharing				
Discussion with model farmer				
FRG /FFS				
Other (specify)				

** Rate on scale from 1=not useful, 2=slightly useful, 3=moderately useful, 4=useful, 5=highly useful

* 1 =husband, 2=wife, 3=both, 4 =son, 5=daughter

2. Frequency of contact with DAs during last cropping season: _____
 1. None 2. Quarterly 3. Weekly 4. Daily

V. Private crop protection and animal health service use

a. Reason for use/non use

Perception	Yes/no
When and from who did you heard about the service?	specify
Have you ever tried it and/or participate in on-farm demonstration/testing?	1=Yes, =No

Do you think that if you use, it will reduce crop loss and/or increase quality?	1=Yes, =No
Will you purchase through credit if you can't afford the payment?	1=Yes, =No
Have you ever applied pesticides and/or administered drug to your animals?	1=Yes, =No
Do you have training or experience in proper application of pesticides and/or administration of vet drug?	1=Yes, =No
Do you have training or experience in proper storage and disposal of pesticides and/or vet drug?	1=Yes, =No
What other traditional crop protection and/or animal health measures do you often use?	specify
How do you assess the performance of traditional crop protection and/or animal health measures often used relative to the introduced ones (inferior, just the same, superior)?	specify

2. How do you assess alternative sources of crop protection and/or animal health service?

Pair-wise ranking of main service options and eliciting criteria the farmer uses for comparison

	Formal- public	Formal- private	Informal-private
Formal- public			
Formal- private			
Informal-private			

b. Application and effect of formal private crop protection and/or animal health services

1. For how many seasons have you used private crop protection and/or animal health services? PRIVATE CROP PROTECTION PRIVATE ANIMAL HEALTH

1. 2. 3. 1. 2. 3.

2. The use of private crop protection and/or animal health services in the last 12 months

2.1. Crop protection service

	Size in <i>timad</i>	Crop in field (Q)	Pesticide type used	Amount (L)	Source	Service charge, Br
Plot one						
Plot two						
Plot three						

2.2. Animal health service

Type of animal treated	Parasite & disease treated	Charge per service (Br)	Frequency of service use	Service provider	Remark

3. What factors do you consider (in the order of importance) while making decision on the use and extent of use of crop protection service in a given season? 1.-- 2.—3.--

4. What is your level of satisfaction with the performance of the private crop protection and/or animal health service?

Private crop protection service ----- private animal health service -----

Rating: 1=very dissatisfied, 2= dissatisfied, 3= fair, 4=satisfied, 5=very satisfied

5. What are the actual results / your view about the likely results of the use of the service?

5.1. Private crop protection: 1= reduced crop loss-----Q, 2=increased product quality.

Please get the farmer’s estimate of incremental benefit as a result of reduced crop loss and/or improved grain quality.

5.2. Private animal health service- 1. Reduced mortality, 2. Improved productivity (e.g. weight gain, milk production, etc). Please get the farmer’s estimate of incremental benefit as a result of private animal health service availability & use.

VI. Sustainability of the private crop protection and/or animal health service use

Description	Reasons
Which element of the private protection service do you wish to continue with?	
Which specific private protection service do you not wish to continue with?	
Which specific private animal health service do you wish to continue with?	
Which specific private animal health service do you not wish to continue with?	

7) Have you ever encountered any symptom(s) of health impairments resulting from pesticide application? 1. Yes 2. No: 1. eye irritation 2= skin irritation, 3= nausea, 4= headache, 5= vomiting

8) Have you observed any change in biodiversity such as decrease/increase in weeds/invasive plant species, insect pests, mosquitoes, beneficial insects, mammals and birds, etc)? Please provide details.

VII. Willingness to pay for private crop protection and veterinary services delivery

Description: Scenario 1 or 2 (which will be randomly administered to 120 HH)

Scenario 1: This is specifically designed to discourse strategic behavior

As you know in your area, the cost of providing crop protection and veterinary service to the farmers has mostly been financed by the government and provided free of charge. However, lack of funds, cost ineffectiveness and lack of impact is now becoming a major obstacle in providing these services. In view of this, private crop spray providers and

CAHWs have initiated to introduce cost recovery mechanism to the farmers through some user charges of birr X to ensure financial sustainability of service delivery and to build genuine quality control mechanism. We want to know your response with the existing payment and your willingness to pay per hectare spray/de-worming (if you are not satisfied with the existing payment) so that high quality services can be provided. Your answer cannot change the plan that the government has to delivery these services in the future.

Scenario 2: This is designed to capture any strategic behavior by the respondent in answering willingness to pay questions.

As you know in your area the cost of providing crop protection and veterinary service to the farmers has mostly been financed by the government and provided free of charge. However, lack of funds, cost ineffectiveness and lack of impact is now becoming a major obstacle in providing these services. In view of this, private crop spray providers and CAHWs have initiated to introduce cost recovery mechanism to the farmers through some user charges of birr X to ensure financial sustainability of service delivery and to build genuine quality control mechanism. Thus, we want to know your response with the existing payment and your willingness to pay per hectare spray/de-worming (if you are not satisfied with the existing payment) so that high quality services can be provided.

- 1 Is the existing actual charge rates (X) for different crop protection /animal health services is reasonable? 1=Yes, 2= No
- 2 If NO for Q1, would you be willing to pay a little different fee than actual for high quality spray/CAHWs service and enhance maximum production from crop/livestock production? 1. Lower and go to Q5 2. Higher and go to Q4
- 3 If the answer for Q1 is Yes, why? 1.I can't afford more than this 2.It is the fee the service deserve 3. I do not believe in improving the service delivery through paying 4. The government has to fund to cover the remaining fee 5.Other (specify) _____
- 4 Would you be willing to pay BX birr per hectare/de-worming? Where $BX > X$.
Yes=1 if yes go to (6), No=2 if no go to
- 5 Would you be willing to CX birr per hectare/de-worming? Where $CX < X$.
- 6 Yes=1 if yes go to (6), No=2 if no go to
- 7 What is the maximum you are willing to pay per visit? -----
- 8 What is the main reason for your maximum willingness to pay the fee stated in number 6 above? 1) I could not afford more 2) I think it worth that amount 3) Other (specify)

- 9 How do you evaluate your ability to pay for spray/CAHWs service?
 10 1. Unable 2. Able 3. Well able
- 11 Preferred mode of payment? 1. Personally 2. With other farmers 3. In cooperative 4. Others(specify)-----
- 12 Preferred payment vehicle (how the WTP amount would be paid)?
- 13 1. Per hectare/de-worming 2. Per month 3. Per bi-annual 4. Per annum
- 14 Conditions that will enhance payment?
 1. Relevance of the spray/CAHWs service
 2. Effectiveness and efficiency of the development agent
 3. Improvement in production output and market
 4. Improved income from crop production/animal husbandry
 5. Others(specify)-----

Appendix 13. Checklist for Group Discussion of KIGs

- 1.Does formal vision / long term plan (national/regional) exist with regard to developing pluralistic service delivery, whereby private and local organization will gradually have more roles than the public sector in production inputs supply and protection/ animal health service delivery? Please provide official document and/ or details.
- 2.If yes, what is (are) the formal/official strategic aim (s) to be achieved through the promotion of pluralistic service delivery? Such aims may include the improvement of service access (coverage, timeliness, effectiveness, accountability for performance, etc) Please provide official document and/ or details.
- 3.What are the (current & future) strategic focuses (key interventions) of public extension (WoARD) to support the development of private service delivery?
- 4.Please provide official document and or details.
- 5.Which department, team or ‘process owner’ at WoARD (if any) has formal responsibility of coordinating activities for supporting and overseeing private production input supply and protection/ animal health service delivery?
- 6.Who else are actually involved in providing support and services to the private crop protection and/or animal health service delivery?

Service	Provider/ supplier	Facilitator/ financer	Capacity (staff No & competence)*
knowledge (technical training,			

information, and backstopping)			
Knowledge (business/entrepreneurship skills)			
Finance/credit			
Material/inputs			
Licensing / certification			
Quality and safety supervision			
Market development/linkages			
Any other (specify)			

* Rate from 1 (very low capacity) to 5 (high capacity)

7. How do you assess the relative performance of the private crop protection/ animal health service delivery? Rate on scale from 1 (poor) to 5 (excellent)

Indicators	Rating	Remark
Timeliness/responsiveness		
Effectiveness		
Affordability		
Commercial viability		
Safety (health & environmental)		

8. SWOT Analysis of private crop protection/ animal health service delivery by expert group at WoARD. Identify and rate on scale from 1 (marginal) to 5 (high) the main SWOTs of the private crop protection/animal health service delivery

Key strengths of private service (internal factor)	Key opportunities for private service expansion and sustainability (external factors)
Key weaknesses of private service (internal factors)	Key threats for private service expansion and sustainability (external factors)

9. Please provide any data available at WoARD on private crop protection and animal health service. a) Service type, Service providers, Service providers' capacity, Farmers access to service / factors constraining access, Service coverage, etc

10. Pesticide/drug sources, use, handling, and health and environmental effects

11. Pesticides and vet drugs sources

Type chemical / vet drug	Trade name	Common name	Source	WHO class@ (can be done after the survey)

@= highly hazardous, moderately hazardous, slightly hazardous, no hazard in normal use, unknown

10.1 Pesticides or/and vet drugs handling practice:

10.1.1 Protective equipment and precaution against exposure?

10.1.2 Storage?

- 10.1.3 Container disposal (reuse/sell/litter in the field/bury)?
- 10.2 Any symptom(s) of health impairments encountered due to pesticide application such as eye irritation, skin irritation, Nausea, headache, vomiting, etc?
- 10.3 Any change in biodiversity due to pesticides use such as decrease/increase in weeds/invasive plant species, insect pests, mosquitoes, beneficial insects, mammals and birds, etc)?

Appendix 14. Checklist for CAHWs or Private Crop Protection Service Providers

Part I. General information

- 1. Contact address of the service provider -----
- 2. Education of the service provider (none/primary/secondary/beyond)
- 3. Type of service s/he provides and for how long s/he has been providing -----
- 4. How did you start the service provision?
 - 4.1 What motivated you to start the business?
 - 4.2 What external support did you get at a start?
 - 4.3 Have you had formal training and/or prior experience in crop protection/animal health service business?

If you have attended any formal training (both technical & non-technical) relevant to the service please provide details:

Title of the Training	duration	Venue	Trainer	Skill- orientation*

*1=highly theoretical, 2=slightly theoretical, 3=moderately practical, 4=practical, 5=highly practical oriented.

- 5.1** License and regulatory requirements
- 5.2** Do you need license/certification to provide the service?
- 5.3** What are the requirements that one should fulfill to provide the service formally?
- 5.4** What is your view about the requirements and ability of the providers to meet it?
- 5.5** What are the regulations currently enforced to ensure service quality and safety?
- 6 What were the main constraints/challenges that you faced during starting up?

A	B	C
---	---	---
- 7 Currently, who are your service users (clients)? Please list them in order of importance, under the following categories:
 - a. Residence (Urban / peri-urban/ rural) 1. ----- 2. ----- 3. -----
 - b. Wealth category (poor/middle/better-off) 1. ----- 2. ----- 3. -----
 - c. Headship (Male-headed/female-headed) 1. ----- 2. -----

8 List in order of importance your current sources of inputs, knowledge and finance for the crop protection and/or animal health service provision:

- a) Inputs/materials 1. ----- --2. ----- 3. -----
- b) Knowledge and information, 1. ----- --2. ----- 3. -----
- c) Finance/credit 1. ----- --2. ----- 3. -----

10. Current external support and linkages (only formal providers)

10.1 What *external supports* are you currently getting from WoARD and others?

- A.
- B.
- C.

10.2 How do you assess the technical back stopping you are being provided with by WoARD? Rate on scale from 1 (poor) to 5 (excellent) in terms of

Relevance/usefulness -----, Timeliness-----, Adequacy-----

11 With whom and for what purpose would you like to establish new linkages to help strengthen your business (service provision)? A ----- B ---- C-----

12 Perception about opportunities and constraints to stay in the business and/or expand the business.

12.1 What are the three things that you consider as opportunities encouraging you to expand your service?

a-----, b-----, c-----

12.2 What are the three things that you consider as constraints or challenges discouraging you to expand your service? a) --- b)---- c)---

13 The demand for and the delivery of crop protection and/or animal health service:

specific services demanded	Season (months) in which service needed	Average service need (ha/cattle head)	Can you meet the demand?*

*Rate on scale 1(rarely) to 5(always)

14 Overall all, how has been the demand for your service in the last 12 months?

Rate on scale from 1(very low) to 5 (very highly). -----

15 Please provide actual data on your crop protection/animal health service coverage (please refer to their record for formal providers) in the last cropping season

16 Service charge (only formal providers)?

16.1 Who set service charge rates and how they are set? -----

16.2 How comparable are your charge rates (low/ the same/ higher) with the rates charged by another private/public provider of similar service (if there is any)? -----

16.3 What is the payment condition (cash/credit)? -----

17 Please provide actual charge rates for different crop protection /animal health services.

Rate on scale from 1 (marginally viable) to 5 (highly viable)

18 Overall, how do you assess the commercial viability of the service you are providing?

Rate on scale from 1 (marginally viable) to 5 (highly viable) -----

Part II. Pesticide and vet drug sources, use, and handling

1. Pesticides and vet drugs sources

chemical/ drug	Trade name	Common name	Source	WHO class @

@ 1= highly hazardous, 2=moderately hazardous, 3=slightly hazardous, 4=no hazard in normal use, 5=unknown

2. Pesticides or/and vet drugs handling practice:

2.1 Protective equipment and precaution against exposure? -----Storage?

-----Container disposal (reuse/sell/litter in the field/bury)? -----

Have you ever encountered any symptom(s) of health impairments resulting from pesticide application? (yes/no)

1. Eye irritation, 2=skin irritation, 3=nausea, 4=headache, 5=vomiting, 6=other (specify)

3. Have you observed any change in biodiversity such as decrease/increase in weeds/invasive plant species, insect pests, mosquitoes, beneficial insects, mammals and birds, etc)? Please provide details.