ANALYSIS OF QUALITY AND ECONOMIC PERFORMANCE OF EXTENSION SERVICES IN THE SOUTH CENTRAL REGION OF BURKINA FASO: A PUBLIC PRIVATE COMPARISON

BY

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DECLARATION

I do hereby declare that except for references to other people’s works which have been duly cited, the study presented in this thesis, ‘Analysis of quality and economic performance of extension services in the south central region of Burkina Faso: A public private comparison’, is the result of my original work. This work has never been presented either in whole or in part for any other degree of this University or elsewhere.

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DEDICATION

To my Parents:

My mother Sangamité Marceline Dayo and my late father Sékou Sylla.
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I would like to express my profound gratitude to Prof. Ramatu Al-Hassan, Dr. (Mrs.) Irene S. Egyir, Dr. Henry Anim-Somuah and Prof. Taladidia Thiombiano, my supervisors; their criticisms and suggestions have contributed to improve this work and complete it. I also wish to thank all the lecturers in the Department of Agricultural Economics and Agribusiness who helped me to acquire better research skills and raised my interest for research.

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Ahmed Yves Sylla
ABSTRACT

In the context of privatisation of agricultural extension services as recommended by the Government of Burkina Faso, there was a need for empirical research to inform policy makers about the opportunity of such privatisation. Therefore, this study aimed at assessing the perception of farmers under private and public systems about the quality of extension services, estimating their willingness to pay for better and sustainable extension services, assessing their farm technical efficiency levels and analysing the profitability of a private organisation delivering extension services. Four services were selected in this study. These services were: Facilitation of access to credit, facilitation of input provision, technical support and facilitation of access to market. The private sector was represented by a Catholic non-governmental organisation called Organisation Catholique pour le Développement et la Solidarité (OCADES-CARITAS) and the public sector was represented by three provincial Departments of the Ministry of Agriculture. Two groups of farmers were selected from six localities in the South Central Region of Burkina Faso. The first group, selected from three localities, included 136 farmers under public extension system. The second group included 135 farmers selected from three localities covered by private extension services. Using Likert scale measurement techniques, descriptive statistics and econometrics methods (Probit and Tobit), it was found that both farmers who access public and private extension services were satisfied with the quality of facilitation of access to credit, facilitation of input provision, technical support, and facilitation of access to market. However, it was observed that farmers under private extension system had better appreciation of the quality of services they received than farmers under public extension. Farmers under public extension services (who currently receive fee free services) were willing to pay to receive better quality services. The average amounts they were willing to pay were 300 FCFA/month for facilitation of access to credit, 455 FCFA/month for facilitation of input provision, 400 FCFA/month for technical support and 450 FCFA/month for facilitation of access to market. Farmers under private extension were ready to pay 245 FCFA/month more for facilitation of access to credit, 855 FCFA/month more for facilitation of input provision, 825 FCFA/month for technical support and 900 FCFA/month more for facilitation of access to market. In terms of efficiency of food crop farms, it was found that farmers under public extension system were on average 54% technically efficient, while the score was estimated at 46% for those under private extension system. All food crop farmers irrespective of service provider are inefficient. The public receivers are cotton farmers, who could use information received from cotton extension companies for their food crop, hence, the higher inefficiency. The estimated extension costs (376,642,125 FCFA) make the delivery of the services not profitable for the private organisation which supplies them (the Benefit-Cost ratio calculated was less than one). External support of farmers should continue; for farmer to benefit from extension information (whether they pay or not) training on effective application of extension information is key.
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ACRONYMS

ADRA : Adventist Development and Relief Agency

AEAs : Agricultural Extension Activities

AGRA : Alliance for Green Revolution in Africa

ANOVA : Analysis of Variance

ASAWA : International Association for the Advancement of Women in Africa

BCEAO : Banque Centrale des Etats de l’Afrique de l’Ouest

DEA : Data Envelope Analysis

DGPV : Direction Générale des Productions Végétales

DP : Demonstration Plot

DPSAA : Direction de la Prospective et des Statistiques Agricoles et Alimentaires

EW : Extension Worker

FAO : Food and Agriculture Organisation

FCFA : Franc de la Communauté Financière Africaine

FFS : Farmers Field Schools

GFRAS : Global Forum for Rural Advisory Services

INSD : Institut National de la Statistique et de la Démographie

MAAH : Ministère de l’Agriculture et des Aménagements Hydrauliques

NEPAD : New Partnership for Africa’s Development

NGO : Non-Governmental Organisation
OCADES : Organisation Catholique pour le Développement Economique et Social

RGA : Recensement Général Agricole

SAP : Structural Adjustment Programme

SFA : Stochastic Frontier Analysis

SNVACA : Système National de Vulgarisation et d’Appui-Conseil Agricole

SP-SCADD : Secrétariat Permanent de la Stratégie de Croissance Accélérée de Développement Durable

SSA : Sub-Sahara Africa

SVAR : Service de Vulgarisation et d’Animation Rurale

TE : Technical Efficiency

T&V : Training and Visit

WTI : Willingness to be Informed

WTP : Willingness to Pay

WVI : World Vision International
CHAPTER ONE
INTRODUCTION

1.1. Background

For over two decades, how to increase agricultural productivity and farmers’ incomes has been a regular worry of governments across the world and Africa in particular. In African countries, agriculture is the main economic activity involving majority of the population and mostly in rural areas. For instance, 63% of the African population is rural and agriculture employs about 65% of the total work force (Alliance for Green Revolution in Africa (AGRA), 2013). The performance of agricultural sector in Sub-Saharan Africa (SSA) is constrained by governance problems, low soil fertility, poor access to inputs, insufficient storage, transport and marketing infrastructures, limited technical knowledge, lack of information to address knowledge, and weak information dissemination (AGRA, 2014). Agricultural research is therefore a means to generate new knowledge about agricultural techniques and practices or to improve existing knowledge; and extension is the means to disseminate this knowledge and information to farmers in order to improve their farming activities. The system of generating and disseminating new knowledge includes four phases: evolvement phase, linkage phase, delivery phase and adoption phase (Farinde, 1996, cited in Ayansina, 2011). At the evolvement phase, information about new technology, farm organisation and practices is generated by Research Centers and Universities based on farmers’ need and government policy. That information is, at the linkage phase, brought to the extension service providers (public or private) which are the links between farmers and researchers. When the extension providers obtain the information, they start disseminating the new technologies to farmers at the delivery phase. That dissemination
is done through the implementation of various methods such as Farmer Field School (FFS), Training and visit (T&V), mass media, etc. The last phase refers to the adoption of new practices by farmers who are convinced about the importance of these practices in the improvement of their farming activities. That top-down or linear approach was criticised for not promoting farmers’ participation in the information generating process and implying financial constraints for Governments which have the role of coordination of agricultural policy (Swanson, 2008, Taye, 2013).

Although the African agricultural production has increased, the productivity has stagnated compared to Asia or America. The increase in production has been mainly due to the increase of areas cultivated and the increase of labor force rather than the increase in productivity (New Partnership for Africa’s Development (NEPAD), 2013).

In Burkina Faso, agriculture is characterised by a high level of volatility in the sense that it is mainly rain-fed and is therefore very sensitive to climate variations (Food and Agriculture Organisation (FAO), 2013). Agricultural productivity is low, hence the difficulty to meet food security and food self-sufficiency goals. Farmers have low access to input such as fertilizer, improved seed; new agricultural techniques or practices and information for commercialization of their crops. Efforts have been made, but still remain insufficient to change the situation (Direction Générale des Productions Végétales (DGPV), 2010).

The agricultural situation in Africa in general and in Burkina Faso described above, shows that the system of generating and disseminating agricultural information (about new or improved practices, opportunities for credit and marketing) is facing many challenges which need to be addressed in order to make the agricultural sector effective in achieving the food self-sufficiency and food security goals and in promoting
sustainable development. Extension in the context of agricultural activities means mainly education in order to change the behaviour of farmers from some practices to others assumed to be better, more effective and efficient. Agricultural extension was initially related to agricultural research activities from which new farming techniques, better inputs and new social organisations, can be produced in order to help farmers (Kristin, 2008; Swanson, 2008; Swanson & Rajalahti, 2010). The definition includes the function of providing or sharing new knowledge and information to rural communities with the objective of improving their production, their access to market, their income and their well-being (Anderson & Feder, 2004; FAO, 1997; Kristin, 2008; Swanson & Rajalahti, 2010). The information and knowledge provided can include estimates of future prices of farm products, new research products, and farm practices (how to use input for example).

Many Sub-Sahara African countries have been using extension services as a means to help increase agricultural productivity and production, farmers’ income and to improve rural development. A study conducted by Bindlish and Everson in Burkina Faso and Kenya (1997) has shown that areas covered by extension services had higher yield than those which were not and that farmers participating directly in extension services had the highest yield. The National Agricultural Advisory Services program promoted in Uganda led farmers to adopt improved production technologies and practices and that enabled farmers to avoid large declines in their income (Benin et. al., 2007). In the highlands of Ethiopia, Elias, Nohmi, Yasunobu and Ishida (2013) have shown that smallholders’ participation in extension programmes has increased farm productivity by 20%.

From late 1950-1960s until the post-structural adjustment period (2000s), extension services in African countries have been delivered mainly by the public sector through
the Ministries of Agriculture because extension information is a public good (Ponniah, Puskur, Workneh, & Hoekstra, 2008). In this system, decision-making and management are highly centralized and formalized (FAO, 2008). The decisions and priorities are taken at the top by the government functionaries and are applied through Extension Field Staff (EFS).

Around the world and particularly in developed countries, the growth of commercial farm sector and trade liberalisation have contributed to a rapidly developing global food system and a wide range of new and proprietary technologies for many of the major crops. That has led technology transfer systems to become progressively privatised since production technologies were becoming more and more private good (Swanson, 2008). Delivering information to farmers is the core aspect of extension services. Agricultural information can be either general or non-excludable (market information, improved agricultural techniques or cropping patterns, etc.) or specialised and excludable (advices in the use of fertilizer for a specific field or farm operation, etc.). In the first case, such information tends to be a public good and in the second case, it tends to be a private good (Anderson & Feder, 2004).

For African countries, many aspects of extension were supposed to have strong public good characteristics that is why public extension has been common in the region. However, the public extension has been criticized for not being relevant, effective and efficient (FAO, 2008). Several reasons can explain this situation, but the main ones are the low staff morale and the financial stress which has put extreme pressure on governments to demonstrate the pay-off to investment in extension and has led to the need to explore alternative options by involving the private sector, local communities and producer groups (FAO, 2008; Ponniah et. al, 2008). In addition, farmers express demand for information and may be ready to pay for it provided that they perceive the
information useful for their activities. Therefore, even if the role of the public sector remains important in supporting farmers, it is more and more advised that private sector should increase its role in providing extension services in partnership with public sector whose role would be to create a good legal environment for private enterprises (Swanson, 2008; Virmani, 2013).

The institutional arrangements for public and private extension services are different. Public extension refers to agricultural extension service that is formulated, funded and provided by the Government through state agencies. Such services can include supply of information about market prices, input supply, technology transfer, research and development, and training for adoption of new farming techniques. Such services are most of the time seen as public goods whose supply may not be profitable for private enterprises, because of the non-excludability of the services. Private extension on the other hand is provided by organisations which are not under the direct authority of a Government. Their intervention policy, the management of their team and mode of delivery of extension services are independent of Government. The service providers can involve the third sector (civil society, Non-Governmental Organisations), the private business enterprises and the farmer organisations. However, in terms of funding source for both private and public extension services, many alternatives exist in the sense that private actors can finance public services (fee-for extension service and contracts with public institution) and public actors can also finance private services (subsidies to providers of extension services and publicly financed contracts for extension services) (Anderson & Feder, 2004).

In the case of Burkina Faso, the delivery of extension services has always been part of the overall agricultural policy. During the colonial period, extension services were focused firstly on cash crops and they were provided exclusively by foreign agencies
or governments. But after independence in 1960, extension activities were progressively provided by the national government with the financial and technical support of foreign governments or agencies (Direction Générale des Productions Végétales (DGPV), 2010). Besides the government, Non-Governmental Organisations (NGOs), and farmers’ cooperatives are getting more and more engaged in the delivery of agricultural extension activities such as facilitating access to credit, providing market information, promoting new farmers’ organisations, disseminating new farming techniques and training farmers to protect the environment and increase productivity (DGPV, 2010). These actors are financially supported by donors (international NGOs) or their members (in the case of farmer organisations); they also sometimes hire the services of public extension agents. Apart from the cotton sector, where three cotton companies are providing extension services on a for-profit basis, providing information and knowledge to farmers with full cost recovery is not found in Burkina Faso (DGPV, 2010).

1.2. Problem Statement

The constraints to Burkina Faso’s agricultural sector are many and related to access to inputs, equipment, credit, markets and more generally information to improve productivity and farm management. For instance, only eight per cent of farmers have access to credit and a low proportion of cereal output is marketed (7% for millet, 10% for sorghum and 30% for maize in 2009) (Direction de la Prospective et des Statistiques Agricoles et Alimentaires (DPSAA), 2011). The proportion of area receiving agricultural input was 21.4% in 2010 (DPSAA, 2011); in 2013 only 44% of the target of 11,026 farmers being covered by extension services was realised (Secrétariat Permanent/Stratégie de Croissance Accélérée et de Développement Durable (SP/SCADD), 2013). Agricultural extension services are supposed to support farmers
in different ways (providing knowledge about new agricultural practices, organisation, access to input, access to credit and access to market) and therefore are supposed to help mitigate the constraints indicated above. The agricultural sector in Burkina Faso is characterised by a dominance of smallholder farmers (900,000) with 72.2% having less than 5 ha, and 1.1% having more than 20 ha. For smallholder farmers, the yields are low and many of the commodities (except for rice and cotton) are produced mainly for self-consumption because these farmers are facing challenges to increase their yield and they cannot rely on markets to make profit. While rural development requires the creation of opportunities for rural dwellers to increase their incomes, and well-being, relying only on subsistence agriculture may not promote the development of Burkina Faso’s rural areas.

Smallholder farmers have low access to agricultural extension services not only because the government budget is limited, but also because their needs are not well defined. For instance, from 2006 to 2010, when the total proportion of public expenditure for agriculture exceeded 10%, the share of that amount was 3% for technology transfer, 3% for commercialization, and 6% for agricultural research. Besides, the proportion of expenditure to agriculture has declined since 2010 (FAO 2013). This makes it difficult to reach all the farmers and provide them with appropriate services. In addition, the farmers’ needs are not well addressed because they are not properly involved in the process of designing the extension services to be delivered and the approaches and methods to be used, making them supply-driven. Consequently, so far, the public extension service has failed to help farmers achieve the goals of enhancing productivity and income. Generally, public extension is facing criticisms on the costs involved in providing extension activities, low funding, not targeting the right population for these activities, low response to the extension needs of farmers and ultimately the
effectiveness of these activities (Alexopoulos, Koutsouris, & Tzouramani, 2009; FAO, 2008; FAO, 1997).

Therefore, to improve and expand extension activities with the objective of less government involvement, several strategies have been developed. Due to the financial constraints and the need to support farmers through appropriate services, in 2010, Burkina Faso adopted a national framework for promoting and improving agricultural extension services called ‘Systeme National Vulgarisation et d’Appui Conseil Agricoles (SNVACA)’. The framework recommends a progressive privatisation of agricultural extension services to complement public extension. This is motivated by the following reasons: (i) meeting the targeted and real needs of producers through a demand-orientated provision of services, (ii) the possibility of multiplicity of choices of services available to farmers or farmers’ organisations (pluralism in extension services), (iii) increasing the participation and accountability of farmers or farmers’ organisation in the mobilisation and management of their resources and (iv) the participation of farmers or farmers’ organisation in the management boards of public advisory services.

Private extension is seen as a way to overcome limitations of public extension in the sense that it can be more efficient in the delivery of services; it can lower government expenditure and it can provide higher quality of services (Sulaiman, Hall, & Suresh, 2005). For instance, Riaz (2010) has shown that in Pakistan, farmers seem to trust the information from the private sector since that information is supposed to be more relevant, up-to-date, accurate and timely compared to information from the public sector. However, whether private extension is effective and appropriate is not so clear.

1 National agricultural extension and advisory system
(Hanyani-Mlambo, 2002; Sulaiman et al., 2005; Virmani, 2013) and the privatisation policy promoted by Burkina Faso is not based on any empirical study that takes into account the local context. Studies on agricultural extension services have been focused on women empowerment in the management of farms (Evenson & Siegel, 1999) and on the impact of Training and Visit on farm yield (Bindlish & Evenson, 1997). Ouedraogo (2004) also assessed the rate of return to public investments in agricultural research and found that it was estimated at 81.28%. Therefore and since Burkina Faso experiences has some private initiatives in the delivery of extension services, the potential success of the privatisation policy in the context of smallholder and subsistence farming raises the following research questions:

1. Do farmers perceive private extension to have higher quality than public extension?

2. In the context of privatisation, are farmers willing to pay economic prices for the services delivered? If yes, what amounts are they willing to pay?

3. Are farmers receiving extension services from private organisation more technically efficient than farmers receiving extension from the public extension service?

4. Finally, is private extension service delivery profitable as an incentive to attract private business?

1.3. Objectives of the Study

The major objective of the study is to assess and compare quality and economic performance of public with private extension services in Burkina Faso.

The specific objectives are to:

1. assess farmers’ perceptions about the quality of public and private extension services;

2. assess farmers’ willingness to pay (WTP) for better private extension services;
3. compare the technical efficiency of farms operating under private and public extension;

4. analyse the profitability in delivering extension services by a private agency.

The private sector will be represented by a catholic NGO called Organisation Catholique pour le Développement et la Solidarité (OCADES-CARITAS) (Catholic Organisation for development and Solidarity) and the public sector will be represented by the extension services of the Ministry of Agriculture. The study does not take into account the three private companies supporting cotton farmers in their activities for two main reasons. Firstly, cotton companies’ support focuses on cotton which is a commercial crop while the study aims to bring out opportunities for privatisation of extension services for any kind of farmers, particularly cereals farmers who constitute the majority of farmers in Burkina Faso, in terms of superficies cultivated and production (Ministère de l’Agriculture et des Aménagements Hydrauliques (MAAH), 2016). Secondly, many non-cotton farmers are supported by private initiatives like NGOs and farmer based organisations and focusing on such private initiatives for the study may help to be better realistic in bringing out opportunities for privatisation (DGPV, 2010).

1.4. Relevance of the Study

Though efforts have been made by the Government of Burkina Faso to support farmers with extension, very few studies have been undertaken to empirically assess the performances of previous Government extension policies and strategies. While Government is encouraging private sector to engage in extension delivery, empirical evidence about the quality of extension already delivered by some private agencies such as NGOs, farmer based organisations and also by public sector itself (performance of
farmers and farmers’ perception about the quality of services received) is not available. Assessing the quality of extension services from the farmers’ viewpoint can help to know whether they are satisfied with the current extension services, what they want to be improved and therefore give information about the services to promote and the way to deliver them. Comparing the technical efficiency of farms under private and public extension may help to give information about the performance of farm management in order to know whether there is significant difference in the outcome services delivered and therefore which of the services to promote.

Moreover, no attempt has been made to document the extent to which farmers will agree to participate to a cost recovery extension programmes. And this study aims to provide information about the extent to which privatisation is possible and very effective, and the incentives needed. By asking farmers their WTP for better extension services and by eliciting the amounts they are willing to pay, the study can give information about the extent to which actors delivering extension services can recover their costs and which service to propose to farmers. It can be an incentive for for-profit private enterprises to invest in extension delivery activities.

By analysing the profitability of a private NGO delivering extension services, the study aims to provide information about the financial sustainability of not-for-profit private initiatives in the delivery of extension services. It can help to know the extent to which any initiative can make efforts to make extension delivery activities more sustainable and reduce financial challenges in undertaking extension delivering activities.
1.5. Organisation of the Thesis

The thesis is organised into five chapters. The first chapter introduces the study by stating the research problem and objectives. The second chapter reviews theoretical and empirical literature on extension approaches across the world and particularly in Burkina Faso, effectiveness of extension on farmers’ production and productivity and their willingness to pay for extension services. The third chapter presents the theoretical and conceptual frameworks of the study, the data and methods of analysis used for the study by objective. The fourth chapter discusses the results, and the last chapter presents a summary of the findings, conclusions and policy recommendations.
CHAPTER TWO
LITERATURE REVIEW

2.1. Concept of Agricultural Extension

2.1.1. Origin and definition of agricultural extension

Several texts discovered by archaeologists in some parts of the world date the origin of dissemination of information to farmers back to thousand years ago (Swanson, Bentz & Sofranko 1997; Swanson & Rajalahti, 2010). In Mesopotamia (1800 B.C.), Egypt (200 B.C.-4 A. D.) and China (25-225 A. D.), there were different attempts to educate farmers in best agricultural practices to avoid crop losses, increase their production and therefore enable them to pay taxes. The actual use of the term extension originated in England in 1867 to report adult education programmes organised by Cambridge and Oxford universities. The objective of these programmes was to bring the work of universities out of the campuses by making the research findings useful to ordinary people (Ponniah et al., 2008; Swanson, 2008; Swanson, Bentz, & Sofranko, 1997; Swanson & Rajalahti, 2010).

Later, other educational institutions in England and other countries developed their own extension programmes. For instance, in the United States (U.S.), extension was adopted during the late 1860s by different universities. As the university extension was growing, the Government of U.S. mandated the Land Grant Universities to deliver extension programmes (Swanson, 2008). The Government added research activities and extension activities as part of each university’s official mandate in 1887 and 1914 respectively. In Europe, Australia, New Zealand and Canada, extension has also been developed progressively. But the general trend in several European countries was to transfer responsibilities for agricultural extension services to ministries of agriculture.
and they were officially called advisory services. In most developing countries, extension services was recommended and funded by donors as a way to develop agricultural sector (Swanson, 2008; Swanson & Rajalahti, 2010). They directly supported governments and that led to public agricultural extension (Swanson & Rajalahti, 2010).

There are many philosophies about agricultural extension but all focus on the support of people engaged in agriculture in order to help them improve their livelihoods and well-being. For instance, Dube (1993) argues that agricultural extension is a non-formal education which consists of transmitting information to individual’s farmers or groups of farmers expecting that they will effectively use it. Zivkovic, Jelic and Rajic (2009) note that agricultural extension service seeks “to assist family holdings or farmers in improvement of the methods and techniques of agricultural production, farm management, and increase income and productivity and production quality, increase of standard of living and elevating of social and educational standards in villages” (Zivkovic et. al, p.5). It is an approach to rural development through agriculture which aims to improve farmers’ skills and productive capacities (Bonye, Kpieta, & Jasaw, 2012).

Novkovic, Vasiljevic and Matkovic (2013) opine that agricultural extension services is a system pursuing both state’s goals which are strategic (food security), economic (export of market surplus), ecological (production of healthy food and protection of the environment) and sociological (development of villages) and farmers’ goals which are economic (increase of economic performance), technical (improving working conditions) and sociological (settlement of social needs). Agricultural extension system involves tasks which are divided into five groups including (i) two-way information (informing farmers and informing the state), (ii) providing services (legal advices,
administrative services, business services, and technological services), (iii) education and training (technical, organisational, economic, etc.), (iv) experiments (direct transfer of modern scientific knowledge into the practice) and (v) connecting and collaboration (with processors, equipment producers, raw material producers, scientific institutions, educational institutions, etc.) (Novkovic et al., 2013). The second group of tasks includes services related to facilitation of access to credit and facilitation of access to market. The third and fourth groups include services related to the traditional technical support and the fifth group of tasks includes services related to facilitation of input provision. According to Davis (2008), extension was traditionally focused on increasing production and yields, by transferring technology to farmers through different methods. But currently it goes beyond these traditional roles to include facilitation by assisting farmer groups to deal with marketing issues, create and manage partnership with a broad range of extension service agencies.

2.1.2. Overview of extension approaches

Extension approach is the organisation’s doctrine which guides its mission, vision, leadership, programmes, strategies and linkages and therefore influences the results and impacts of the extension efforts on the target audience. It is the basic philosophy which guides principles applied for planning, organizing, managing the extension institution and implementing practical extension work (Ponniak et al., 2008). In the literature, authors have used different words such as system, approach and models, to explain the same concept and that may lead to confusion. A system is a set of objects that are interrelated and that have relationships with the environment. An approach is referred to as the philosophy which guides a system to influence the way the system works. A model is a schematic description of the system which summarizes how the system
works. In this study, “system”, “approach” and “model” will refer to the same concept and therefore will be used interchangeably.

Extension approaches adopted by developing countries can be classified into several types: technology transfer, farming systems, cost-sharing, participatory and market-orientated extension and specialised commodity approaches. All these approaches have the following characteristics: they use non formal education, their contents are related to agriculture and they use communication techniques in order to improve rural people’s skills (Ponniah et al., 2008).

**Technology transfer extension approaches**

The Technology Transfer Extension model is a linear model which links researchers to farmers through extension agents. It was driven by public agencies under the ministries of agriculture. The model is generally characterised by three elements: efficiency-based, focused on specific objectives (high crop yield and low production costs), and linear or supply driven (Ponniah et al., 2008; Swanson & Rajalahti, 2010). The method generally used in this model was the Training and Visit (T&V) method which was introduced in the mid-1970s by the World Bank in about 70 countries in order to improve the impact of agricultural extension services (Anderson & Feder, 2004; Bonye et al., 2012; Swanson & Rajalahti, 2010). Through projects, the T&V method sought to enhance the extension management system by increasing the extension agent–farmer ratio and providing basic support services (offices, housing, transportation, extension materials, etc.) to extension field staff. The model faced many challenges due mainly to financial constraints. The number of permanent extension workers significantly increased and that created budgetary problems in the long-term. In addition, most of these field extension agents were not sufficiently trained in order to acquire the necessary
capabilities to effectively implement new extension programmes (Swanson & Rajalahti, 2010). Due to inadequate training and resources, including transportation, many of these field-level extension workers were less on the fields than in offices (Swanson & Rajalahti, 2010).

**Farming systems approach**

This approach tried to facilitate relevant technology production locally, particularly by small-scale farmers themselves through an iterative process. The approach assumes close ties with research centres and extension personnel who, together control the success of the programmes. Field trials and analysis are carried out on farmers’ fields and in homes. Success is measured as the extent to which farmers adopt technologies developed by the programme and continue to use them over time.

**Cost-sharing approach**

This approach is based on local people sharing part of the cost of the extension programme, and aims to improve accountability and responsibility of farmers and extension providers. Extension providers are more accountable since they charge farmers who may not be ready to pay again if the results are mitigated. Farmers are more responsive and expect more accountability from service providers since they pay to receive extension services and may consider their investment as a loss if the results are mitigated. Success is measured by farmers’ willingness and ability to provide some share of the cost, be it individually or through local government units.
Participatory extension approaches

Participatory models are premised on the idea that it is important to raise farmers’ consciousness and involve them in all actions that are taken to improve their well-being because they are skilled in food production from their land (Ponniah et al., 2008; Swanson & Rajalahti, 2010). Two models can be identified: Rural Animation and Farmers-based Extension Organisations.

Introduced by the French in Francophone Africa, Rural Animation was the first model used to introduce participatory methods into extension systems. This model has consisted of choosing an individual (called animateur ou animatrice) to be trained, supervised and supported by the government’s rural development agency and therefore is the link between the village and the agency. This individual would not be necessarily involved in the village leadership and would share their knowledge with other individuals from their village and other villages (Swanson & Rajalahti, 2010).

Farmer-Based Extension Organisations is a fully demand-driven extension system. In this system, farmers direct, operate and finance themselves extension services needed (Swanson & Rajalahti, 2010). This model concerns mainly large-scale farmers who are better organized and have more economic power. That is why it is generally found in developed countries. In developing countries, characterised by small-scale farmers who are not well organised into groups, this model will take considerable time and effort to be introduced.

Market-oriented extension models

In the context of African countries, the market-oriented model refers to provision of extension to mainly export crop farmers such as cocoa, rubber, oil palm, coffee, cotton and sugar cane farmers. Generally, a private-sector firm is responsible for delivering
these commodity-based extension services (Swanson & Rajalahti, 2010). Generally this type of extension is seen both as effective and efficient because of three reasons. Firstly, because it is related to only one commodity, training farmers and extension agents is simple and straightforward and that positively impacts the results. Secondly, this type of extension serves specific agro-ecological areas where the export crops can be grown and the extension personnel works closely with farmers who grow these particular crops. Thirdly, the farmers themselves have an economic incentive in adopting extension workers’ recommendations, so that they can sell their respective crops and that enhances the effectiveness and efficiency of this type of extension (Ponniah et al., 2008). In addition, the model helps farmers to diversify their agricultural activity in the sense that small-scale subsistence farm households still continue to produce the basic food crops needed for home consumption.

Specialised commodity approach

The approach is focused on one particular commodity, it is fairly centralised and aims to increase the production of this particular commodity. In this system, extension agents are generally provided with adequate resources (sufficient financial resources, vehicles, equipment, etc.), and farmers are better served with input and advice. Farmers are also likely to improve their income through the improvement of production and productivity and the opportunity to have access to market and sell at better prices.
2.2. Evolution of Pluralistic Agricultural Extension

2.2.1. Progressive transition of public technology transfer to the private sector

The primary objective of agricultural extension in developing countries was first to achieve food security goal through technology transfer for staple crops. As it has been said earlier, extension services were delivered by the public sector. T&V method was introduced into 70 countries in order to help farmers to improve their production. However this method proved to be unsustainable in most countries due to the high wage bill for extension agents and operational costs (Anderson & Feder, 2004; Ponniah et al., 2008; Swanson & Rajalahti, 2010). In addition, farmers express a growing demand for information and technology but the public sector has financial constraints to produce the information and technologies and/or disseminate it to farmers. That led to a major change in the sense that private sector started playing an important role in extension system through the sale of all types of technologies (biological/genetic, chemical, mechanical, etc.) and information (Swanson et al., 1997; Swanson, 2008;; Swanson & Rajalahti, 2010).

2.2.2. Transition towards decentralized, farmer-led and market-driven extension

There are different changes farmers are confronting with and that has led to a change in the agricultural extension systems. Firstly, there is increased variability in the demand and supply for staple food crops, input costs and therefore in the prices and the profitability of staple food crops. These changes in the agricultural economy are likely to negatively affect small-scale and subsistence farmers if they are not well prepared. Therefore, agricultural extension has the role of providing more management skills to farmers in order to help them deal with economic change. Secondly, due to rising economic growth in most developing countries including sub-Saharan Africa, demand
for fruits, vegetables, livestock and fish is also increasing mostly in urban areas. To respond to the increasing demand for these high-value products, farmers need additional skills in production techniques, processing and marketing. This can be done through agricultural extension which may help them acquiring specific skills about the management of these new enterprises (Saliu, Obinne, & Audu, 2009; Swanson, 2008).

2.2.3. Financial constraints limiting the effectiveness of public extension system

In most developing countries, the effectiveness of public extension systems has been limited by financial constraints which have not enabled government extension agencies to adequately cover extension operational costs (Anderson & Feder, 2004; Ponniah et al., 2008; Swanson & Rajalahti, 2010). It is difficult to cut salaries too much and to reduce benefits or basic services such as electricity and internet access. The routine is to cut operational part of the budget at the district or sub district levels. Activities affected include field demonstrations, workshops and field trips for farmers to visit innovative farmers located in other districts in order to learn more about how to manage their own farms better.

In addition, most field extension offices do not have communication equipment (telephones and computer with internet access), as well as adequate transportation means (vehicles, motorcycle). In the context of transition towards a market-driven approach, extension field staff need market information regularly throughout the country, technical knowledge and management information for different high-value crops and enterprises and getting access to this information is made easier through access to internet and mobile phones (Swanson, 2008).
2.3. Extensions Approaches in Burkina Faso

2.3.1. Brief history of agricultural extension in Burkina Faso

The improved agricultural production practices were first introduced in Burkina Faso in 1924 by the Governor Hesling, during the colonial period. That was the first attempt to support the compulsory cotton production. In 1944, the creation of the Directions de l’Agriculture, de l’Elevage et des Eaux et Forêts (Agriculture Livestock and Forestry Directions) by the Governor General of West Africa, allowed the gradual implementation of technical services whose support to agriculture was very specific (service in charge of livestock, service in charge of fish, service in charge of cash crops, service in charge of food crop). Overall, the history of extension and research/development can be divided into five major historical periods (DGPV, 2010; Toe & Pouahoukiga, 2009).

The period 1947 - 1960 (colonial period)

This period was characterised by the involvement of several foreign structures in the provision of extension, which was focused on cash crops. Research centres were established in order to support the action of these foreign structures (World Bank, 1988). These structures were characterised by a quasi-taxation strategy to the producers to stimulate the production of mainly cash crops. The instruments or tools used for diffusion/dissemination of technological innovations were: (i) pilot farms, (ii) rural extension centres, (iii) the provident societies.

The period 1960 -1980

This period was characterised by the coordination of the elaboration and implementation of agricultural policies by the government. The transfer of
technologies was mainly made by a network of agents who received training on technological packages developed by research stations from their technical directors (DGPV, 2010; World Bank 1988).

**The period 1980 – 1990**

The year 1981 is characterised by the creation of the Service National de la Vulgarisation (National Extension Service), transformed in 1985 to Service de Vulgarisation et d’Animation Rurale (Extension Service and Rural Animation (SVAR)), and turned into the Direction de la Vulgarisation Agricole (Directorate of Agricultural Extension (DVA)) in 1988. However, intervention methods have remained top-down under one organisation.

**The period 1990 – 2000**

This period was characterised by the adoption and generalization of a single Système National de Vulgarisation Agricole (National Agricultural Extension System (SNVA)). During this period, the Structural Adjustment Program (SAP) was adopted. These reforms led to the reorganisation of agricultural offices and has influenced the organisational framework and content agricultural extension. It also led to the emergence of new private initiatives (NGOs, projects, associations, etc) which helped in providing technical support about farming practices, input and raw materials.

**The period 2000 to date**

This period is characterised by the continuation of the SNVA with the following key facts:(i) regression or the abandonment of the “Training and Visits” model, mainly due limited resources (human, material and financial resources), (ii) strengthening of local development approaches and the entrenchment of decentralization (iii) advisory
support test, (iv) the adoption of several strategies for rural areas, especially the necessary link of production to market.

2.3.2. Current status of extension and advisory systems

Different actors have played and continue to play an important role in agricultural extension and advisory system in Burkina Faso. Four main types of actors can be identified (DGPV, 2010; Global Forum for Rural Advisory Services (GFRAS), 2016): the state through the ministries in charge of rural development (agriculture, livestock and environment), the Research Institutes and Universities, the farmers’ organisations and private organisations such as NGOs and cotton companies.

Since the era of structural adjustment, the public structures providing extension services have not had a clear agenda. Due to financial constraints, their activities are restricted to the training of extension staff (office and field staff) and to the implementation of research programmes in collaboration with research institutes. On the field, the technical staff are mostly hired by NGOs or farmers-based organisations (Faso Farmers Confederation, National Federation of Naam groups, etc) to deliver advisory services. The research institutes are more involved in the extension system through research to improve crops, and production techniques and in technology transfer and advisory services to rural areas. The universities are less involved in extension services since their activities are restricted to the training of extension specialists notably at the Polytechnic University of Bobo-Dioulasso.

In its report, the DGPV (Extension Research and Development Directorate) of the Ministry of Agriculture (2010) states that the lessons learnt from the extension and advisory systems of Burkina Faso are as following (DGPV, 2010; Toe & Pouahoukiga, 2009):
- The different approaches implemented failed to consider efficiently the research aspects of extension while a Research-Extension-Production linkage is necessary for an efficient and sustainable extension system;

- The extension system was supply-driven and that did not allow farmers to be correctly involved in the system in order to better identify and address their needs;

- The extension system involved costs which were not always covered by government due to budget constraints.

2.3.3. New extension approaches

To better ensure transfer of technologies to the producer, new approaches have been developed by the DGPV with technical and financial partners. These different approaches are:

**The farmers’ field schools (FFS)**

Farmers Field School (FFS) aims at increasing the capacity of producers to make decisions regarding the management of their fields using learning techniques developed for non-formal education (Ponniah et. al., 2008). Its principles are (DGPV, 2010):

(i) to conduct the training according to the seasonal cycle of the crop;

(ii) to train the extension agent to become a facilitator;

(iii) the farmers at the end of training are considered as some experts in their own farms.

**Demonstration Plots**

The demonstration is an extension operation and advisory support in order to show practical technologies to farmers and lead them to compare the results of the new
technology to their usual practices. So, plot demonstration is a plot for supporting the demonstration of a practicality and/or results of an innovation to convince producers.

2.4. Empirical Evidence on the Effectiveness of Extension services and the Willingness to Pay for Extension Services

Many studies aiming at evaluating the impact/effectiveness/effect of extension services have been undertaken across the world and have used various research methods. For instance, Evenson (2000), reviewing more than 20 studies undertaken in developing countries and using estimated rates of return to investments as proxy for economic impacts, concludes that the median estimated rate of return often exceeds 40 per cent. Taye (2013) also reviewed 21 studies on Sub-Saharan Africa and considering several impact indicators including yields growth, productivity, production, farm income, poverty and technology adoption, he found that 71% of extension programmes had positive/satisfactory/significant impact, while the impacts of 29% were unsatisfactory/non-significant. However, as far as our literature review is concerned, evidence on quality and willingness to pay for extension services is less sparse compared to that on effect/impact/efficiency.

2.4.1. Impact evaluation of extension programmes

Generally, as Evenson (2000) and Taye (2013) conclude, the review shows that extension programmes have had positive impacts on farm performances (yield growth, productivity, income) and therefore have helped in promoting rural development. Ahmad, Jamal, Ikramullah and Himayathullah (2007) evaluating the effect of extension services on farm productivity in Pakistan, found that the extension effect on rice output was 61%, 47% for onion and 37% for tomato. Nwankwo (2010) came to the same conclusion of a positive effect on food production from their analysis of extension and
rural farmers in Ibiaku in Nigeria. Still in Nigeria, Olagunju and Adesiji (2011) found that in Ogun State, extension services have helped to increase cocoyam production of participants compared to those who did not benefit from the programme. The same positive result was gotten by Haq (2011) who evaluated the effect of extension services on rice productivity in Gazipur district (Bangladesh). Focusing on new technology adoption and crop yields, Ali and Rahut (2013), in Pakistan, concluded that extension had a significant role in new technology adoption and crop yields increase of farmers who benefitted compared to those who did not benefit. Elias, Nohmi, Yasunobu and Ishida (2013) and Hasan, Ismai and Sato (2013) also found a positive effect of extension programme on farm productivity in both Ethiopia and Uganda.

Assessing the profitability in term of rate of return on investments in research and extension activities, only information about public initiatives has been found. In Ghana Dankyi (1999) found a positive rate of return on investment in maize research and extension from 1979 to 1997, which was between 50% and 79 % for financial rate of return and 25% to 33% for economic rate of return and Jatoe (2000) found a positive rate of return to sorghum research which is estimated at 8%. Doing the same assessment in Burkina Faso, Ouedraogo (2004) found that the rate of return on investments in research and extension activities is about 81.28% for improved varieties of maize.

Only two studies reviewed reported no significant impact of extension on farm performances. Benin et. al. (2007) concluded that there was no significant difference in yield growth of participants and non-participants of Uganda National Agricultural Advisory Services (NAADS)’ participants and non-participants, although the programme had a positive impact on the availability and quality of advisory services. Cerdan-Infantes, Maffioli and Ubfal (2008) came to the conclusion that the extension programme designed for grape farmers in Argentina, had no significant impact on
switching or introducing new grape varieties, and had limited impact on increasing the production of highest quality varieties.

2.4.2. Extension services and technical efficiency

Thanasack (2012) in Laos, undertaking a research on rice farmers and using stochastic frontier production model, found that farmers taking part of an extension programme are likely to perform in term of technical efficiency. Other factors such as education level and use of improve seeds were also found to be positively related to the efficiency level of farmers which was estimated on average at 53%.

In Greece, Yiang (2014) assessed the relationship between extension services and farm efficiency. He used both econometrical (Stochastic Frontier Analysis (SFA) model) and descriptive statistics (mean, standard deviation) to compute the levels of technical efficiency and identify the determinants of farm technical efficiency. His results showed, even if farmers who receive extension services have a higher productivity than those who do not receive, there is no statistical difference in the level of technical efficiency between the two groups.

In Ethiopia, Abebe (2014) used SFA model to assess the effect of off-farm income on technical efficiency of smallholder farmers. He found that technical efficiency is positively affected not only by off-farm income, but also by access to extension services.

Mwajombe and Mlozi (2015), measuring farm-level technical efficiency of urban agriculture in Tnazanian towns, and came to the conclusion that urban farmers are 72% technically efficient in their farming activities. They therefore advised government to better promote extension services for this type of farmers.
2.4.3. Challenges in impact evaluation of extension services

Researchers have been using various methods of data analysis in assessing results of extension albeit with same conclusions. These methods included descriptive statistics (analysis by means or percentage, mean, t-test of mean differences) (Ahmad et al., 2007; Nwankwo, 2010; Benin et al., 2007; Olagunju & Adesiji, 2011), inferential statistics and matching techniques (Ali & Rahut, 2013; Cerdan-Infantes et al., 2008; Elias et al., 2013; Elias et al., 2014; Hasan et al., 2013). Several factors appear as challenges when undertaking impact evaluation analysis. Firstly, in evaluating extension impact on one group of farmers, the lack of comparable group can lead to a type II error (false negative error due to the diffusion of knowledge and information from participants to non-participants). Type I error (false positive error) may also arise due to individual factors that differentiate the non-participants and participants other than the extension programme and are likely to exaggerate the net impact. Secondly, the challenge can be related to the endogeneity in extension agent-farmer interaction because extension contact can be affected by farmers’ characteristics and actions (more productive farmers tend to look for extension support and information and extension agents tend to have more contact with good farmers). Thirdly, other sources of information and technology that farmers can have access to, if they are not controlled, can lead to over or underestimation of the impact of the extension programmes. Finally, in the context of developing countries and particularly African countries, availability, good-quality and access to data can be a challenge when evaluating the impact of extension services on farm performances (Anderson & Feder, 2004; Taye, 2013).
2.4.4. Willingness to pay for extension services

Asadi, Akbari, Fami and Alambaigri (2008) investigated farmers’ WTP for extension under the Wheat Consulting Engineers Project (WCEsP) (as a private extension service) in Esfahan province (Iran), during 2007. The data were collected from 95 wheat consultant engineers and 100 farmers. The results showed that 64 per cent of farmers were not willing to pay because of poor performance (low yields) of their farms. Also 63% of WCEs did not receive any money from farmers. Factors affecting farmers’ WTP positively were quantity of irrigated lands, farmers’ income and membership of cooperatives while the literacy had non-significant effect on farmers’ WTP.

Mwaura, Muwanika and Okoboi (2010) tried to evaluate farmers’ WTP for extension services in crop and animal husbandry in Uganda. Using descriptive analysis (frequency distributions), they found that 40% of 3,318 of livestock farmers and 35% of 5,363 of crop farmers were willing to pay respectively on average Ugandan shillings 3,700 (US$ 2) and 3,400 (US$ 1.8), per trip for extension services. The key determinant factors of the willingness to pay included education level, age, sex, preferred means to receive the services and regions of residence.

In Nigeria, Ozor, Garforth and Madukwe (2013) assessed farmers’ willingness to pay for agricultural extension services by using a stochastic payment card. Farmers during the interviews, were asked to indicate their WTP or not for improved extension services. Several amounts of money were proposed to farmers, against which they were asked to state their WTP range from Definitely Yes to Definitely No. The amounts falling under Definitely and Probably Yes were considered as amounts farmers were willing to pay while those under Not Sure, Probably No and Definitely No were considered as amounts they were not willing to pay. The WTP was ascertained by means of
percentage scores. The results showed that of 268 farmers, 95.1 per cent were willing to pay for improved extension services in case these services met their needs. They were ready to pay up to 1000 Naira (US$ 5) yearly for these services. Factors positively affecting WTP were farmers’ major and minor occupations, number of years spent in school, sale of farm product, items originally paid for while the non-significant factors were age of household head, gender of household head, average incomes from major and minor occupations, size of farmland cultivated, number of years involved in agriculture, frequency of extension visits and membership of cooperative group.

Yegbeme, Yabi, Heubach, Bauer and Nuppenau (2014) investigated maize farmers’ willingness to be (better) informed (WTI) about how to react to climate change and to pay for agricultural extension services as far as they can help to adapt to climate change in Northern Benin. The authors first determined farmers’ WTI by asking them directly whether they want information about climate change predictions and documented adaptation strategies. The second stage was for those who answered ‘Yes’ to the first question, to ask for their WTP for the services concerned. They finally asked to those who still answered ‘Yes’ to the second question, the amount they are willing to pay for the services identified. To deal with the sample selectivity problem raised from the first two steps indicated, the authors used Heckman sample selectivity probit model for modelling farmers’ WTI and WTP. The results showed that almost the entire 336 farmers interviewed were willing to be informed (99%) and to pay for extension services related to modes of adaptation to climate change; however almost equal proportion were willing to pay for documented climate change adaptation strategies (95%) and for climate change predictions (94 per cent). They were willing to pay on average Franc CFA 14,793.62 (US$ 24.66) for having these services (as one-time payment). The WTP was mainly affected by the age of the household head (negative
effect), the experience in agriculture (positive effect) and the access to credit (positive effect) since it could enable farmers to afford opportunity costs related to agricultural extension services.

Undertaking a study in Kodi State (Nigeria), Onuche, Adejoh and Adah (2015) assessed farmers’ willingness to pay (WTP) for extension services in a context of sustainable agricultural development. Using descriptive statistics and econometric methods, they found that are willing to pay 1.8 USD per month in average to share the costs of extension services with government. They also found that farmers had little confidence in the current extension services and were more willingness to pay as their education status, income and farm size increase.

2.5. Perceptions of and Attitude towards Quality of Extension Services

In this section, the first group of studies reviewed covers quality of private or public extension services taken separately, and the second group informs about the comparison of private and public extension services. In most of the cases, private sector is performing better than public sector.

2.5.1. Quality of private or public extension services

Dube (1993) in Swaziland tried to analyze the perceptions of public agricultural extension held by field officers, extension officers and farmers. Using statistical procedures (frequency distribution and mean), he found that extension agents and farmers were indecisive about the current objectives of agricultural extension, did not support compulsory farmer participation in extension meetings and moderately appreciated the great majority of teaching methods
In their study, Sarker and Itohara (2009) tried to identify the determinant factors of the effectiveness of PROSHIKA’s (NGO) organic agriculture extension programme in improving the livelihood of the smallholder organic farmers in Bangladesh. They also attempted to learn the perceptions of farmers and Extension Workers (EW) about this programme. The perception was about the following aspects: crop production, income, confidence, well-being, environmental awareness, health awareness and knowledge of balance use of natural resources. Sixty-two per cent of the respondent farmers had a good perception about the effectiveness of PROSHIKA’s services in their livelihood improvement; 50% felt that the extension workers of PROSHIKA are credible and about 52% had a better perception about the quality of the extension workers.

Mcharo (2013) assessed maize farmers’ perception of the effectiveness of their extension agents in knowledge transfer in Kilindi District (Tanzania). The perceived effectiveness of agricultural extension activities in knowledge transfer was estimated using a five point Likert scale. The results showed that farm size, household size, age and contacts with agricultural extension agents had an effect on technology transfer to maize growers in the study area. It was also found that 25.6% of respondents were affected by plant diseases and pests and 75.2% of them had low yields. Again, 63% to 96.6% of the respondents strongly disagreed on the effectiveness of AEAs in knowledge transfer and 90.9% to 99.2% of respondents had negative perceptions about the advantages of AEAs.

Buadi, Namaman, Kwarteng (2013) analyzed farmers’ perceptions of the quality of extension services provided by four NGOs in the Central Region of Ghana. These organisations are Adventist Development and Relief Agency (ADRA), World Vision International (WVI), International Association for the Advancement of Women in Africa (ASAWA) and the Central and Western Fishmongers Improvement Association
of Ghana. The study assessed six services provided including (i) information support, (ii) provision of input, (iii) training, (iv) technology transfer, (v) supply of credit and (vi) monitoring and evaluation of activities. Using a 5 point Likert scale of measurement, they found that farmers had generally a good perception about the relevance of the services for their operations. However, they had mixed opinions concerning adequacy, availability and timeliness of supply of the services. Monitoring and evaluation of extension activities by NGOs was generally acceptable to farmers.

In Cross-River State (Nigeria), Agbarevo (2013) investigated how farmers perceive or evaluate the effectiveness of extension delivery based on an aggregation of nine indicators: awareness of village extension workers, extension workers’ visits per month, field meeting, regularity of meeting, field days, demonstration, supervision, research extension linkage and farmer training. Numeral scores were assigned to each performance indicators and farmers were asked to measure effectiveness by choosing effective=1, effective=2 or very effective=3. The data collected from 180 farmers participating in extension programme in Cross River State were analysed using the t-test of significance of difference between sample and population means. The study found that farmers felt extension delivery process to not be very effective as there was no significant difference between the population and sample means at 95% confidence level.

2.5.2. Comparison of private and public extension services

Onyenkazi and Gana (2009), assessed the effectiveness of agricultural extension programmes in Etche (Nigeria) by comparing public and private sources of extension. They found that the private sector extension agency (Shell) was more effective than the public sector extension agency. The private sector disseminated agricultural
information better and had better human relations with the farmers since their agents had more regular contacts with them. More farmers under Shell project also adopted improved farm technologies compared to farmers under public sector agency.

Mengal et al. (2012), in assessing the private and public sector extension system for technology transfer in Pakistan, found that private extension system in Balochistan has performed better than public extension system due to its effective planning, continuous staff training, availability of funds, networking, strong linkages with research and farmers, monitoring and evaluation.

In India, Ali (2013) analyzed farmers’ responses on quality of agricultural information services from public and private sources. He interviewed 461 farmers from eight districts and captured their perceptions about quality of agricultural information services from public and private sources through simple statistical techniques such as descriptive analysis, cross-tabulation and analysis of variance (ANOVA). The sources for public information services were e-Choupal (information-technology based knowledge dissemination centres), television, radio and extension workers. The private sector information delivery sources were NGOs, e-Choupals and input dealers. He came to the conclusion that farmers perceived the private sector information delivery sources provided significantly better quality information to them as compared to public sector information delivery systems.

Rana, Reddy and Sontakki (2013) investigated the perceived quality of public and private sector organisations in agriculture. To do so, seven indicators, access (ease of contact), assurance (quality control and quality determination service), empathy (individual concern and customer relation management), reliability (competence to take the service in dependable and accurate ways), responsiveness (prompt and considerate
service from the staff), tangibility and timeliness, were selected for quality assessment and were proposed to farmers in four of India’s districts. Through a 10 point Likert scale of measurement, they were asked to state their levels of satisfaction ranging from 1=strongly disagree to 10=strongly disagree. The results from 360 farmers interviewed showed that there was significant difference between public and private sector services in term of perceived value with private sector services perceived as better than public sector services.

Naeem and Hassan (2014), evaluated the performance of public and private sector (NGO) in delivering extension services. Their results showed that both sectors used electronic media and print media for information dissemination. Both were also providing services related to education, capacity building and trainings of farmers, inputs supply, vaccination of livestock and awareness about modern agriculture. Finally, they found that private sector performed better than public sector but the private sector activities need to be improved as effectiveness falls to the medium level.

2.6. Conclusions

The literature review has covered theoretical and empirical aspects of extension services such as extension concept and approaches around the world and particularly in Burkina Faso, extension impacts and perceived quality of extension services and willingness to pay for extension services. From these sections, several conclusions related to the present research can be made.

Firstly, the review shows that very few studies have been undertaken in Burkina Faso, not only to assess the performance of public or private extension services, but also to compare the quality of services provided by both private and public sectors. Even if efforts have been made to support farmers better and design policies and strategies for
extension and advisory services, it is clear that these strategies were weakly based on empirical studies and evidence. The present study will therefore produce more evidence to inform better policy making.

Secondly, the approaches undertaken in most of the studies considered extension services either as a whole (number of contacts between farmers and extension agents no matter the particular methods used for information dissemination or type of information disseminated), or as a particular service provided to farmers. However, with the new approach of extension which goes beyond just technical training to include every information provided in order to help farmers improve their skills and gain from their activities. It becomes necessary to consider different types of services for analysis such as input provision, support in access to market and support in access to credit.

Thirdly, the review covered a wide range of methods to analyse effects of extension services, perceived quality of extension and willingness to pay for extension services. These include statistical and econometrics methods and can be adapted to that context in order to give more accurate and reliable information. A five-point Likert scale technique can be used to assess farmers’ perception about the quality of extension services. Analysis can be made through the use of frequency distribution, means and standard deviation. To analyse WTP for extension services, probit model can used while technical efficiency can be estimated using Cobb-Douglas model in a frontier regression. The determinants of technical efficiency can be identified using a tobit model.
CHAPTER THREE

METHODOLOGY

3.1. Theoretical and Conceptual Framework

3.1.1. Conceptual framework

This study aims at proposing a better way to deliver extension services to farmers in terms of institutional characteristics of actors delivering services through assessment of current quality and performances of extension services already provided. The supply of extension services must quantitatively and qualitatively meet the real needs of farmers in order to be effective. Several factors can influence the way farmers express a demand for extension services. First, when farmers are already experiencing some services, they may be influenced by their perceptions of or attitude towards the quality of services they receive when expressing a demand for more of the same services or for other services. Second and in case of not-for-free services, farmers may be willing to pay for the services proposed to actually express a demand. And that willingness to pay can be influenced both by their perceptions of the quality of services they already receive and by their socio-economic characteristics. Third, farmers could also express a demand for a certain quantity and quality of services based on their farm performances (production, productivity and technical efficiency). And these performances can be also influenced by their socio-economic characteristics. The provision of extension can be made both by public and private sectors.

In this case, extension services go beyond mere technology transfer because they include every kind of support given to farmers. Therefore public and private sectors design services and provide them to farmers based on farmers’ income and well-being.
Figure 3.1.: Conceptual framework of the study

Source: Author
3.1.2. Theoretical framework

The market theory forms the basis for analysing agricultural information production and dissemination. As it has been argued, extension supposes information production and dissemination. Information can therefore be analysed as a good or service which links producers (extension organisations) and consumers (farmers) (Frisvold, Fernicola, & Langworthy, 2001; Laurent, Cerf, & Labarthe, 2006).

In the model developed, demand and supply of extension services are supposed to be endogenous, and simultaneously determined variables (Dinar, 1989; Frisvold et al., 2001). It is assumed that an extension system provides information related to one commodity. Extension information can include seed variety performance, fertilizer variety performance, best agricultural practices (for soil conservation, pest and disease control, efficient use of water), credit opportunities for farm investments and market opportunities. It is also assumed that there is a cumulative stock of information provided to farmers. Farmers express a demand for additional extension information based not only on that stock, but also on exogenous variables reflecting costs and benefits of requesting information.

If $D_{it}$ represents the demand for extension information of farmer $i$ at time $t$, $S_{it}$ the stock of extension information provided to farmer $i$ at time $t-1$ (with $S_{i0}$ the basic level of information provided) and $X_{it}$ a set of exogenous variables, the functional form of the demand for extension information is given by:

$$D_{it} = D_{it}(S_{it-1}, X_{it}) \quad (3.1)$$

Extension information received during a previous period stimulates the demand for the same information in the current period and extension information received in the current period will stimulate demand for the same information in the next period. The
stock of information can therefore affect positively or negatively the demand depending on the perceived quality of that extension information (Costa, Garcia, & Ibanez, 2007). Quality can refer to several attributes such as availability, relevance, timeliness, affordability, accuracy and perceived change in agricultural productivity and efficiency.

Extension organisations supply extension information based not only on the demand expressed by farmers, but also on exogenous variables affecting costs or constraints of extension information provision. If \( S_{it} \) represents the provision of extension information to farmer \( i \) at time \( t \), \( D_{it} \) the demand for extension information of farmer \( i \) at time \( t \) and \( Z_{it} \), the set of exogenous variables, the functional form of the supply of extension information is given by:

\[
S_{it} = S_{it}(D_{it}, Z_{it}) \quad (3.2)
\]

The demand for extension information as well as the exogenous factors can affect positively or negatively the supply of extension information. The exogenous variables can include the costs of extension information provision (salaries, fuel expenditures, research expenditures, equipment expenditures, etc.), the benefits expected from the provision of extension information and the legal and institutional environment under which extension information is provided.

From the extension provision function, the inverse extension provision function is derived as following:

\[
D^{-1}_{it} = D^{-1}_{it}(S_{it}, Z_{it}) \quad (3.3)
\]

Both the demand function of extension information \( D_{it} \) and the inverse provision function \( D^{-1}_{it} \) determine the adjustment path of extension demand and provision over
the time period. Their common point gives the optimal level of extension information to provide.

Two main characteristics differentiate extension services from other services. Firstly, the use of information through extension services by one farmer does not prevent the use of the same information by other farmers, since the producer cannot hinder one farmer (who already has the information) to share the same information with other farmers. Secondly, farmers do not value properly the extension services until they have effectively applied them and that generates information asymmetry in the market. These two characteristics of extension services lead to market failure in the relationships between extensions services producers and consumers (Laurent et al., 2006).

Information disseminated through extension services aims to improve the well-being services consumers (farmers) by improving their farm management. That information is a set of activities including training sessions, diffusion of information through mass media, individual advice, etc. The demand for information through extension is more and more complex and is not necessarily clearly expressed.

Before expressing a demand for a certain quantity of extension information, farmers solve the following maximisation problem:

\[
\max [\mu_0(\pi(\Omega_0)) + \varepsilon_0, \mu_1(\pi(\Omega_1)) + \varepsilon_1]
\]  

(3.4)

where \(\mu_a\) represents the indirect utility function associated with alternative \(a (a=0,1)\), \(\pi\) represents the individual’s expected profit function, \(\Omega_a\) represents the extension information set individual expects to have if alternative \(a\) is chosen and \(\varepsilon_a\) represents the unobserved component of indirect utility.

Since it is assumed that expected profit increases with extension information set, farmers will choose the alternative extension set which gives higher profit for their
activities. To estimate the value of extension information, a compensating variation value \( c \) is subtracted from the profit generated by the extension information provision in order to make farmers indifferent between alternatives. This value is implicitly defined by the following relation:

\[
\mu_0\left(\pi(\Omega_0)\right) + \varepsilon_0 = \mu_1(\pi(\Omega_1) - c) + \varepsilon_1 \quad (3.5)
\]

When equation (3.5) is solved, the general function of \( c \) is given by:

\[
c = c(\pi(\Omega_0), \pi(\Omega_1), \varepsilon) \quad (3.6)
\]

where \( \varepsilon = \varepsilon_0 - \varepsilon_1 \) (Roe, Haab, & Sohngen, 2002).

Since the exact forms of the profit function and the indirect utility function are unknown, the indirect utility function is approximated by a linear function of parameters as following:

\[
\mu(\pi(\Omega)) = X\beta \quad (3.7) \quad (Roe, Haab, & Sohngen, 2002)
\]

\( X \) represents a set of explanatory variables that affect indirect utility and \( \beta \) represents a set of parameters.

Assuming that compensating variation is non-negative, the total willingness to pay for the extension information is specified as a semi-log function:

\[
WTP = \exp(X\beta + \varepsilon) \quad (3.8)
\]

with \( X \) representing the same set of variables in equation (3.7).

To express a demand for additional extension information, farmers also assess the benefit of stock of information provided previously on their production. Production refers to the economic process of converting inputs into outputs through time and space (Hulten, 2000; Debertin, 2012). That process includes three aspects: the quantity of the
good or service produced, the form of the good or service created and the temporal and spatial distribution of the good or service produced. Production is therefore a process of combining various material inputs and non-material inputs in order to create an output (good or service) which has value and contributes to satisfy human needs. The inputs used in the production process are called factors of production and can include: raw materials, labor services, capital goods and land. In the ‘short run’, these factors are fixed while in the ‘long run’, they can be adjusted. The production process is modelled as follow:

The firm’s production function for a particular good \((q)\) shows the maximum amount of the good that can be produced using alternative combinations of inputs (capital \(k\) and labour \(l\) for our example). That production function is given by the following equation:

\[
q = f(k, l) \quad (3.9)
\]

3.2. Methods of Analysis

3.2.1. Estimation of farmers’ perception quality of public and private extension services

3.2.1.1. Theoretical considerations for a product or service quality perception

The quality of a service or product can be expressed in two main forms: actual quality and perceived quality. The first one refers to the merits of the real product or service which can be evaluated based on corresponding standards while the second one refers to the consumers’ subjective evaluation and judgment. Therefore, the quality perception of a service or product is more abstract than a specific attribute of that product or service and is an overall assessment of that product or service that resembles attitude in some cases (Zeithaml, 1988). Perception itself refers to the process by which a person selects, arranges and interprets stimuli which are filtered and adjusted to become one’s own
view of the world. It includes the exposure stage, the attention stage and the interpretation stage according to one’s previous experience and desires (Aspfors, 2010). Therefore, two persons may not have the same perception of something even if they are exposed to the same situations in the same environment. Then, generalizing perceived quality of a product or service is difficult. Indeed, specific or concrete attributes differ across products and services as well as intrinsic attributes differ across individuals.

Quality attributes can include: assurance (the customers believe in the firm and feel safe with the service provided), reliability of the service (the firm provides its customers with the right service, at the right time and without mistakes from the beginning), empathy (the firm tries to solve its customer’s troubles in the best way and always acts in the interest of its customers), responsiveness (the firm gives its customers proper service and is always service minded), etc. (Aspfors, 2010; Buadi et al., 2013; Zeithaml, 1988). Different attempts exist to transfer qualitative information such as perceived quality into quantitative measures. Likert (1932) developed a procedure for measuring attitudinal scales. He used a series of questions with the following response alternatives: strongly approve (1), approve (2), undecided (3), disapprove (4), and strongly disapprove (5). These responses were later combined to create an attitudinal measurement scale instead of analyzing individual responses. The SERVQUAL model as presented by Zeithaml (1988), measures the gap between the customers’ expectations and their experiences by asking them to measure how well their expectations meet their experience.
3.2.1.2. Empirical approach for assessment of farmers’ perceptions of quality of extension services

In agriculture, the perceptions of farmers (consumers of agricultural extension services) about the quality of services is important for the success or failure of those services (Rana, Reddy, & Sontakki, 2013). The actual quality of services is also important if those services greatly contribute to reduce poverty of farmers and improve their incomes and well-being. As noted above, farmer value services referring to the quality attributes embodied in these services (Buadi et. al., 2013). High levels of these quality attributes can increase the value and usefulness of the services.

Keeping in mind the desire to shift towards privatisation of agricultural extension services, it is essential to assess farmers’ perceptions about the quality of current services they receive by type of services and source (private or public sector). Since agricultural extension is beyond just technology transfer as it has been argued previously, four elements of services are assessed in order to ascertain the farmers’ perceptions about the quality of the following types of services receive: (i) technical support or training, (ii) provision of input, (iii) facilitation of access to credit, and (iv) facilitation of access to market. These four services are on the agenda of both private and public organisations in the study area.

Extension related to training or technical support refers to activities related to technology and knowledge transfers in order to raise farmers’ skills and improve their farming techniques. It includes training in production techniques, organisation of visits of good farmers’ fields, organisation of training session with farmers from other regions for experience sharing.
Extension related to provision of input outcome means making input physically available to farmers and advising them about the quality and right use of these input. It includes advices about the right inputs to use according to crop cultivated and the right use of these inputs and making input physically available to farmers (transportation to farmers’ villages).

Extension related to access to credit outcome refers to either the direct provision of credit to farmers, or the technical support to farmers in order to increase their potential to contract credit.

Extension related to access to market refers to either the provision of market information (market prices, where to sell produce, where to get transport, transport prices, and preference of the market) or to make product available in quantity and in time.

3.2.1.3. Analytical method

Farmers’ perceptions about the quality of extension services is assessed using simple 5-points Likert scale of measurement based on five quality attributes: (i) relevance (the service is relevant for farming activities), (ii) availability (the service is available for possible use of farmers at every time), (iii) timeliness (as soon as the farmer expresses a demand for a service and need this service, that service is supplied), (iv) cost (the cost of the service is affordable), and (v) appropriateness of the delivery methods (information given through the service is easy to understand and capture). In the questionnaire, farmers were asked to state their level of satisfaction for each service and by attribute, by choosing between the following five Likert scale: 1=Very Satisfied, 2=Satisfied, 3= Undecided, 4=Dissatisfied and 5=Very Dissatisfied.
The assessment was carried out with farmers receiving public extension services and those receiving private services. The NGO project staff and the regional extension service staff have agreed to supply services in different zones within the region. Therefore, farmers do not have possibility to receive both private and public extension services at the same time.

The data was analysed with descriptive statistics; means to capture central tendency and standard deviation to capture variability of the 5-point Likert scale answers. (Agbarevo, 2013; Boone, & Boone, 2012; Clason & Dormody, 1994).

3.2.2. Assessment of farmers’ willingness to be served by private enterprises and to pay for private extension services

3.2.2.1. Theoretical considerations for analysing willingness to pay

A utility function measures an individual’ preference for a set of goods or services considering his/her wealth. Every utility function must be twice differentiable with respect to wealth and satisfies the following two properties: non satiation and risk aversion. The property of non-satiation implies that the first derivative of utility function with respect to wealth is positive, that means that utility increases as wealth increases. The property of risk aversion implies that the second derivative of utility function with respect to wealth in negative, that means that marginal utility of wealth decreases as wealth increases.

Therefore, a consumer or an investor who has to choose among several and competitive sets of goods or services and investment alternatives, will choose the set or alternative which will maximize his/her expected utility.

Formally, let us assume A, a set of competing feasible investment alternatives, X (I) the ending value (consequence) of the investment for the time period considered, and
U, the utility function of a potential investor. For a rational investor, the problem will be to find an optimal investment alternative $I_{opt} \in A$ so that:

$$E(U(X(I_{opt}))) = \max_{I \in A} E(U(X(I_{opt}))) \quad (3.10)$$

Rather than choosing a direct outcome or consequence, the investor will choose probability distribution over the outcomes or consequences. Let us assume $c_i$ one consequence of an alternative over $n$ consequences and $p_i$ the probability associated with the consequence $c_i$ so that, $\sum_{i=1}^{n} p_i = 1$. The Expected Utility function is given by the following relationship:

$$U(p_i) = \sum_{i=1}^{n} p(c_i)u(c_i) \quad (3.11)$$

$u(c_i)$ is called Von Neumann-Morgenstern utility function which represents the utility function over consequences. $p(c_i)$ is the probability distribution over consequences. Consumer has no direct control over consequences but can set probabilities over consequences of her choices. Therefore, if preferences over probabilities have an expected utility representation, it is as if consumer has preferences over consequences.

To get to the result of consequences over choices, we go through a latent or unobserved choice made by the consumer. Therefore, a binary outcome model can be used to model the choices of the consumer.

Let us assume a latent or unobserved variable $y^*$ ranged from $-\infty$ to $+\infty$ and related to independent variables by the following equation:

$$y_i^* = x_i \beta + \epsilon_i \quad (3.12)$$

where $i$ indicates the observation $x_i$ a vector of independent variables; $\beta$ a vector of parameters and $\epsilon$ is a random error.
The observed variable \( y \) is assumed equal to 1 when the latent variable \( y^* \) is strictly positive and equal to 0 when \( y^* \) is negative, hence the equation:

\[
y_i = \begin{cases} 
1 & \text{if } y_i^* > 0 \\
0 & \text{if } y_i^* \leq 0
\end{cases} \quad (3.13)
\]

\( y^* \) is like a continuum answer to a question that we could not observe directly. In fact, if we have to give our opinion to a question, we could strongly agree or disagree, weakly agree or disagree or be evasive. As one does not observe exactly the opinion about the question, it is practical to range the observed opinion in the two extreme points of strongly agree and strongly disagree. The idea behind the latent variable is that an underlying propensity to give a particular opinion leads to the observed answer. And since the propensity to give an opinion is at some point in time a change in \( y^* \) generates a change in what is observed \( y \). We then have the following equation:

\[
\Pr(y = 1|x) = \Pr(y^* > 0|x) \quad (3.14)
\]

When we substitute the structural equation and rearrange the terms, we get the following equation:

\[
\Pr(y = 1|x) = \Pr(\varepsilon > -[\beta x]|x) \quad (3.15)
\]

This equation means that the probability depends on the distribution of the error term \( \varepsilon \).

Two distributions of \( \varepsilon \) are commonly assumed with both assuming mean equal to 0.

The first distribution is the normal distribution with \( \text{Var}(\varepsilon) = 1 \). This is the binary probit model with the following probability form:

\[
\Pr(y = 1|x) = \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2}\right) dt \quad (3.16)
\]
The second distribution is the logistic distribution with Var (\( \varepsilon \)) = \( \frac{\pi^2}{3} \). This is the binary logit model with the following probability form:

\[
\Pr(y = 1|x) = \frac{\exp(\beta x)}{1+\exp(\beta x)} \quad (3.17)
\]

For the two models, the theoretical form of the equation is expressed as following:

\[
\Pr(y_i = 1|x) = \beta x_i + \varepsilon_i \quad (3.18)
\]

where \( i \) indicates an individual farmer, \( x \) is a vector of independent variables, \( \beta \) is a vector of parameters and \( \varepsilon \) is the error term.

### 3.2.2.2. Empirical approach for analysing willingness to pay for private extension

WTP for a good or a service represents the maximum amount of money a person would be willing to pay for a given quantity of that good or service (Mwaura et. al, 2010; Yegbemey et. al., 2014; Breidert & Reutterer, 2006). Farmers under public extension zone receive services for free, unless for input provision such as subsidized fertilizer. But farmers receiving private extension services pay for these services even if the amounts do not cover the total cost of the services delivered by the NGO.

Therefore, farmers in the zone of public extension were asked their willingness to be served and pay for private extension services (assuming these services will be qualitatively better than what they already receive); famers in the zone of private extension, on the other hand, were asked about their willingness to pay more for the services they already receive (assuming these services can be improved and made sustainable). Services were divided into the four types stated in the preceding section: (i) technical support or training, (ii) provision of input, (iii) facilitation of access to credit, and (iv) facilitation of access to market.
Farmers under private zone were directly asked to indicate their willingness to pay for better and sustainable services, without indicating a range of bids. It was an opened question. For farmers under public zone and for each type of service, a range of seven bids was indicated and farmers were asked to state against these bids their level of WTP as follows: Definitely Yes, Probably Yes, Not Sure, Probably No and Definitely No. The level of Definitely Yes was considered as amount that farmers are willing to pay for the type of service indicated whereas the bids that ranged from Probably Yes to Definitely No were considered as amounts that farmers are not willing to pay.

The bids were estimated on the basis of interviews with the private NGO and were therefore based on what the private NGO is already charging. From the estimated existing bids, a fixed amount was added and subtracted in order to get a range of seven bids as presented in Table 3.1.

**Table 3.1. Range of Bids by Type of Service (bids in FCFA²/month)**

<table>
<thead>
<tr>
<th></th>
<th>Technical support and training</th>
<th>Input provision</th>
<th>Facilitation of access to credit</th>
<th>Facilitation of access to market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bids</td>
<td>175</td>
<td>210</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>225</td>
<td>270</td>
<td>270</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>275</td>
<td>330</td>
<td>330</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>360</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>325</td>
<td>390</td>
<td>390</td>
<td>390</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

Since the problem is a binary response problem and assuming the error term follows the normal distribution, a binary probit model is used to analyse farmers’ willingness to pay for extension. Based on (Mwaura et. al., 2010; Onuche et. al, 2015; Ozor et. al.,

---

² Ghc 1=140 FCFA and 1 US$=590 FCFA
the response is regressed to the WTP question on bids, age of the household head (Age), gender of the household head (Gender), of-farm activity (Offarm), farm size (Farmsize), education status (Edu), agricultural experience (Agricexp), farmer based organisation membership (FBO), farm ownership (Farmown), type of crop grown (Croptype) and yield (Yield). Then, the empirical model is as following:

\[
Response_i = \alpha_1 * C + \alpha_2 * Bid_i + \alpha_3 * Age_i + \alpha_4 * Gender_i + \alpha_4 * Offarm_i + \alpha_5 * Farmsize_i + \alpha_6 * Edu_i + \alpha_7 * Agricexp_i + \alpha_8 * FBO_i + \alpha_9 * Farmown_i + \alpha_{10} * Croptype_i + \alpha_{11} * Yield_i + \varepsilon_i
\] (3.19)

The explanatory variables, their labels, measurement s and expected signs are presented in Table 3.2.

### Table 3.2. List of Explanatory Variables for the Probit Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Labels</th>
<th>Measurement</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of the household head</td>
<td>Age</td>
<td>Number of years</td>
<td>-</td>
</tr>
<tr>
<td>Gender of the household head</td>
<td>Gender</td>
<td>Dummy (1=male; 0=Female)</td>
<td>+</td>
</tr>
<tr>
<td>Participation in off-farm activities</td>
<td>Offarm</td>
<td>Dummy (1=Yes; 0=No)</td>
<td>+/-</td>
</tr>
<tr>
<td>Farm size</td>
<td>Farmsize</td>
<td>Hectare</td>
<td>+</td>
</tr>
<tr>
<td>Education status or literate</td>
<td>Edu</td>
<td>Dummy (1= Educated; 0=Non-educated)</td>
<td>+</td>
</tr>
<tr>
<td>Agricultural experience</td>
<td>Agricexp</td>
<td>Number of years</td>
<td>-</td>
</tr>
<tr>
<td>Farmer based organisation membership</td>
<td>FBO</td>
<td>Dummy (1=Yes; 0=No)</td>
<td>+/-</td>
</tr>
<tr>
<td>Farm ownership</td>
<td>Farmown</td>
<td>Categorical (1=Family; 2=Personal; 3= Lease)</td>
<td>+</td>
</tr>
<tr>
<td>Yield</td>
<td>Yield</td>
<td>Kilogram per hectare</td>
<td>+</td>
</tr>
<tr>
<td>Type of crop grown</td>
<td>Croptype</td>
<td>Dummy (1= Maize; 0=other crops)</td>
<td>+/-</td>
</tr>
</tbody>
</table>
3.2.2.3. Estimation methods

Since farmers were directly asked their WTP, descriptive statistics were used to capture the different bids farmers of the two groups are willing to pay.

The Maximum Likelihood Estimation method was used to assess the factors influencing the WTP. Since the dependent variables for the two groups do not have the same forms, a single equation estimation could not be done in order to capture significant differences between the two groups.

For farmers in the public extension zone and for each type of services, the range of bids and the willingness to pay for each bid indicated in the questionnaire for each farmer were generated. With this, a probit model of the effects of independent variables (including bids) on the willingness to pay response was run for each type of services. Finally, the mean of bids farmers are willing to pay was estimated. For the group in the private extension zone, a probit model was also run on the willingness to pay response for better and sustainable extension services with the same explanatory variables (without the bids indicated for farmers in the private zone).

3.2.3. Technical efficiency of farms operating under private and public extension

3.2.3.1. Theoretical considerations for analysing technical efficiency

The efficiency of a firm is its ability to produce in the best and most profitable way under a given technology (Mwajombe & Mlozi, 2015). Productive efficiency comprises technical and allocative efficiencies. Technical efficiency reflects the ability of the firm to maximize output for a given set of inputs. Allocative efficiency, on the other hand, is the ability of a firm to choose its input in a cost minimizing way (Coelli, Rao, O’Donnell, & Battese, 2005).
Production efficiency can be measured by parametric and non-parametric techniques. The Data Envelope Analysis (DEA) method is used as non-parametric technique. With that approach, no functional form is imposed on the production frontier and no assumption is made on the error term. Despite its flexibility due to the absence of imposed functional form, DEA has limitations because it does not consider the stochastic component of production which accounts for measurement errors and unobserved heterogeneity. The stochastic frontiers approach (SFA) is the most popular parametric approach. It accounts for the effect of random factors such as errors of measurement, unspecified variables, or hazard factors. However, it relies on strong assumptions about the functional form of the production function and can lead to biased measures of technical efficiencies scores due to misspecification issues.

Despite its shortcomings, SFA appears to be the more suitable approach to assess technical efficiency of agricultural activities (Coelli et al., 2005). Indeed, agricultural production is characterised by of high variability level which can be due to adverse effects of notional policies, climate change, etc.; and agricultural studies are likely to be affected by measurement errors.

With the stochastic frontier approach, a stochastic frontier production function is used to model inefficiency. The original specification involved a production function specified for cross-sectional data that had an error term with two components, one to account for random effects and another to account for technical inefficiency. Using a Cobb-Douglas function, the model can be expressed as following:

\[ \ln Y_i = \beta_0 + \sum \beta_i \ln X_{ij} + \varepsilon_i \quad (3.20) \]

Where \( Y_i \) is the production of the \( i^{th} \) farmer, \( X_i \) is a vector of inputs used by the \( i^{th} \) farmer, \( \beta \) is a vector of unknown parameters, and \( \varepsilon_i = V_i - U_i \) where \( V_i \) is a random variable
which captures the variation in output due to factors outside the control of the farmer
(Vi~ iid N(0, δ^2)) and U_i which is nonnegative random variable assumed to account for
technical inefficiency in production.

The farmer’s specific technical efficiency representing maximum possible output is
then given by:

\[ Y_i^* = f(X_i; \beta) \exp(V_i) \] (3.21)

that is \[ Y_i = Y_i^* \exp(-U_i) \] (3.22)

The technical efficiency of the \( i^{th} \) farmer is therefore given by the relation

\[ TE_i = \frac{Y_i}{Y_i^*} = \exp(-U_i) \] (3.23)

3.2.3.2. Empirical model for analysing technical efficiency

A Cobb-Douglas production function was used as the empirical model of farm
production. The study did not focus on one particular crop; three crops were identified
based on the ones farmers valued the most in their farming activities. Farmers were
asked about the three main crops they are growing in terms of farm size and inputs used.
Maize appears to be the first crop grown for the two groups, whereas sorghum was the
second crop for public extension group and rice was the second crop for private
extension group. To take into account the different crops, the level of production in
value (FCFA) was considered as dependent variable. The following empirical
production model was regressed:

\[ \ln(Production\ value_i) = \alpha_1 \times C + \alpha_2 \times \ln(\text{Labourqty}_i) + \alpha_3 \times \ln(\text{Seedvalue}_i) + \alpha_4 \times \ln(\text{Fertilizervalue}_i) + \alpha_5 \times \ln(\text{Farmsize}_i) + v_i - u_i \] (3.24)
The independent variables for the production model, their labels, measurements and expected signs are presented in Table 3.3. Variables such as value of irrigation/water used, pesticide used and mechanisation used could have been included in the production function. Unfortunately, it has been a bit difficult to gather accurate information about these variables from the farmers.

**Empirical model for analysing factors affecting technical efficiency**

To capture the sources of technical efficiency, a Tobit model was used. That model is suitable in the sense that technical efficiency scores (TES) predicted from the regression (3.24) is bounded (comprised into 0 and 1). The model includes one dependent variable that is the technical efficiency scores and independent variables as following:

\[
TES_i = \delta_0 + \delta_1 \cdot \text{Age}_i + \delta_2 \cdot \text{Gender}_i + \delta_3 \cdot \text{Offarm}_i + \delta_4 \cdot \text{Farmsize}_i + \delta_5 \cdot \text{Edu}_i + \delta_6 \cdot \text{Agricexp}_i + \delta_7 \cdot \text{Farmsize}_i + \delta_8 \cdot \text{FBO}_i + \delta_9 \cdot \text{Group}_i + \epsilon_i \tag{3.25}
\]

The independent variables for this model, their labels, measurements and expected signs are presented in Table 3.4.

**Table 3.3. List of Explanatory Variables for the Production Function**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Labels</th>
<th>Measurement</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of seed used</td>
<td>Seedvalue</td>
<td>Product of the quantity of seed used and the mean market price of the seed (in FCFA)</td>
<td>+</td>
</tr>
<tr>
<td>Value of fertilizer used</td>
<td>Fertilizervalue</td>
<td>Product of the quantity of fertilizer used and the mean market price of the fertilizer (in FCFA)</td>
<td>+</td>
</tr>
<tr>
<td>Quantity of labour</td>
<td>Labourqty</td>
<td>Number of adults working in the farm</td>
<td>+</td>
</tr>
<tr>
<td>Farm size</td>
<td>Farmsize</td>
<td>Hectare</td>
<td>+</td>
</tr>
</tbody>
</table>
Table 3.4. List of Explanatory Variables for the Technical Efficiency Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Labels</th>
<th>Measurement</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender of the household head</td>
<td>Gender</td>
<td>Dummy (1=male; 0=Female)</td>
<td>+</td>
</tr>
<tr>
<td>Participation in off-farm activities</td>
<td>Offarm</td>
<td>Dummy (1=Yes; 0=No)</td>
<td>+/-</td>
</tr>
<tr>
<td>Education status or literate</td>
<td>Edu</td>
<td>Dummy (1=Educated; 0=Non-educated)</td>
<td>+</td>
</tr>
<tr>
<td>Agricultural experience</td>
<td>Agricexp</td>
<td>Number of years</td>
<td>+</td>
</tr>
<tr>
<td>Farmer based organisation membership</td>
<td>FBO</td>
<td>Dummy (1=Yes; 0=No)</td>
<td>+</td>
</tr>
<tr>
<td>Farm ownership</td>
<td>Farmown</td>
<td>Categorical (1=Personal; 2=Family; 3=Lease)</td>
<td>+</td>
</tr>
<tr>
<td>Type of crop grown</td>
<td>Croptype</td>
<td>Dummy (1=Maize; 0=other crops)</td>
<td>+/-</td>
</tr>
<tr>
<td>Extension group</td>
<td>Group</td>
<td>Dummy (1=farmers under private zone; 0=farmers under public zone)</td>
<td>+</td>
</tr>
</tbody>
</table>

3.2.3.3. Estimation methods

Using Stata software, the first step of the estimation was to regress the Cobb-Douglas production function (through the Maximum Likelihood Estimation method), from which technical efficiency scores were derived. Then, the technical efficiency scores are regressed on the independent variables stated previously. Three tests were performed in order to conclude about the reliability of the results. The first one was to test weather Cobb-Douglas is an adequate representation of the production technology.

The second test was to verify whether there exists considerable inefficiency among farmers and the last test was to check whether the independent variables can significantly explain the variation of technical efficiency. The tests were done based on the log likelihood ratio test.
3.2.4. Profitability of private sector in delivering extension services

3.2.4.1. Theoretical considerations for analysing profitability

Profitability is generally defined as the ability of a given instrument to earn a return from its use. Profit is an absolute figure, hence it is difficult to use it for historical comparison of firm performance or inter-firm performance since the size of investment or volume of sales may differ (Jayaratne, 2007; Michl, 1987). Therefore, a better way for analysing firm performance is to measure performance relative to size of investment or other inputs. Thus, profitability may be regarded as a relative term measurable in terms of profit and its relation with other elements that can directly influence the profit. Profit of an enterprise, gives information about the financial and operational efficiency of the business by stating the amount of earnings of that business during a special period; whereas, profitability denotes whether these profits are constant, improving or deteriorating, how and to what extent they can be improved. It indicates how well the enterprises is managed in terms of generating earnings (Soto, 2006).

The most effective tool for profitability analysis is ratio analysis. Ratios revealing profitability are popularly called profitability ratios. These ratios can slightly differ whether we refer to financial analysis or economic analysis. Considering financial profitability analysis, two major ratios can be distinguished: profit margin and return on investment.

Profit margin

Profit margin is the return generated by the firm’s assets and represents the difference between revenues and total expenditure. The best way of calculating profit margin is to express them as a percentage of net sales. A firm is expected to earn adequate profit on
each unit of sale, otherwise it would fail to give reasonable returns to its shareholders and will not be able to cover fixed costs and fixed charges on debts.

$$Net\ Profit\ Margin = \frac{Profit\ after\ tax}{Sales} \quad (3.26)$$

A high net profit margin would ensure adequate return to the owners as well as enable a firm to face adverse economic conditions.

**Return on Investment**

Return on investment is the end-profit of a series of a quantitative variables representing different interconnected and interdependent factors of business operations. The return on investment is calculated by dividing the total value of benefits by the total value of cost. Profitability on the basis of return on investment can be analysed and interpreted under following categories: (i) Return on capital employed, (ii) Return on shareholder’s equity/Net worth, (iii) Return on paid-up share capital.

$$Return\ on\ Gross\ (Net)\ Capital\ Employed = \frac{Net\ Profit\ before\ interest\ and\ taxes}{Gross\ (Net)\ Capital\ Employed} \times 100 \quad (3.27)$$

$$Return\ on\ Net\ Worth = \frac{Net\ Profit\ After\ Interest\ and\ Taxes}{Total\ shareholders'\ equity} \times 100 \quad (3.28)$$

$$Return\ on\ Equity\ Capital = \frac{Net\ Profit\ After\ Interest\ and\ Taxes}{Paid-up\ Equity\ Capital} \times 100 \quad (3.29)$$

Economic profitability analysis refers in this study to Cost-Benefit Analysis. Cost-Benefit Analysis involves systematically comparing programme benefits with programme costs to assess the relative value of each (Cellini & Kee, 2010). In addition to market price of goods and services, benefit value includes values derived from cost avoidance or cost saving (due to the programme), time saved (due to the programme) and increased productivity (due to the programme). The monetary value of costs
includes cost of capital assets, sunk costs (investments previously made in the programme) and indirect costs (a certain percentage of the total direct costs). The Benefit-Cost ratio is used to compare costs with revenue in the Cost-Benefit analysis. From cost and benefit values derived, it is also useful to compute the return on investment ratio, which gives the proportion of the net value of benefits in the total costs of the programme. These ratios are respectively given in equations (3.30) and (3.31).

\[
\text{Benefit Cost Ratio} = \frac{\text{Total Value of Benefits}}{\text{Total Costs}} \quad (3.30)
\]

\[
\text{Return On Investment} = \frac{\text{Net value of Benefits}}{\text{Total Costs}} \times 100 \quad (3.31)
\]

The Net Value of Benefits is derived from the following formula:

\[
\text{Net Value of Benefits} = \text{Value of Total Benefits} - \text{Value of Total Costs} \quad (3.32)
\]

### 3.2.4.2. Analytical methods

To analyse the profitability of private sector in the delivery of extension services, two indicators of benefit-cost analysis were chosen: benefit-cost ratio and return on investment. These ratios require proper determination of the monetary value of benefits and costs.

In the study, the benefits of the private extension programme include only the market prices since it was not possible to properly derive the values of cost avoidance, time saved and increased productivity due to the programme. Market prices were considered in two different ways. The first way was based on what farmers currently pay for the services and the second way was based on estimated values of amounts farmers are willing to pay for each service.
The costs of private extension programme were estimated as the organisational overhead expenditures which includes expenditures for support staff time, specialists’ time, administrators’ time, buildings, equipment, traveling, printing and other consumables.

Since the revenues and costs were spread over four years, a discount rate was used to estimate the present values of amounts indicated. The idea for the use of present values is that one FCFA available now is worth more than one FCFA in the future. One FCFA today can be spent immediately or invested, and a person would prefer to take decision about the use of that FCFA today rather than following years. The discount rate chosen for the analysis is the interest rate at which banks were remunerating savings at the beginning of the project. It was estimated at 5.25% (Banque Centrale des Etats de l’Afrique de l’Ouest (BCEAO), 2012).

The values of benefits and costs determined above were used to determine the benefit-cost ratio and return-on investment with the following formulas:

\[
\text{Benefit Cost Ratio} = \frac{\sum_{n=1}^{4} \frac{B_n}{(1+i)^n}}{\sum_{n=1}^{4} \frac{C_n}{(1+i)^n}} \quad (3.33)
\]

\[
\text{Return On Investment} = \frac{\sum_{n=0}^{4} \frac{B_n-C_n}{(1+i)^n}}{\sum_{n=0}^{4} \frac{C_n}{(1+i)^n}} \times 100 \quad (3.34)
\]

with \( n \) representing the number of periods, and \( i \) representing the interest rate.
3.3. Methods of Data Collection

3.3.1. Sampling

Sample size

The following formula is used to determine the sample size.

\[ N = \frac{z^2p(1-p)}{ME^2} \tag{3.35} \]

with \( ME \) representing the desired margin of error, \( p \) the proportion of population of interest, \( z \) is the z-score and \( N \) is the sample size to be found.

The proportion of smallholder cereals farmers in the study area is evaluated at 80\% of all farmers in the study area (DPSAA, 2011), the margin of error is assumed at 5\% and therefore \( z \) is equal to 1.96. Thus, the sample size is estimated at 246. This size was increased by 10\% to take into account contingencies such as recording errors, hence the total of 270 as sample size.

Sampling design

As stated previously, OCADES-CARITAS (NGO) and the public sector extension services intervene in different localities in the same area, each sector operating in three localities (Departments). The private sector operates in Tiébélé, Gomboussougou and Zabré and the public sectors operates in Manga, Po and Toécé. Therefore, equal number of respondents from the two sectors were selected and spread among the three localities. 135 farmers were selected for OCADES-CARITAS and 136 for public agencies. A minimum of 45 farmers from each of the three localities covered by either the NGO or the private sector. A random selection of the beneficiaries of OCADES-CARITAS services and public services was made in each of the six localities identified. Farmers selected were interviewed face-to-face with a guided questionnaire (Appendix 1).
The staff of OCADES-CARITAS (Project coordinator and Accountant) and public agencies (Regional director of agricultural department) were interviewed, in order to obtain the impact data of their intervention, the cost of their actions and the evaluation of the value of benefits of their intervention.

3.3.2. Study area

Burkina Faso has 13 administrative regions. Each administrative region is divided into one to six provinces, each province is divided into seven to 47 departments and each department is divided into rural and/or urban communities (municipalities). The study sought to analyse extension services from private and public sectors. The private sector was represented by a Catholic NGO called Organisation Catholique pour le Développement et la Solidarité (OCADES-CARITAS) located in Manga. The public sector was represented by the provincial representations of the Ministry of Agriculture. The Catholic Diocese of Manga includes localities from two administrative regions: Région du Centre-Sud (South Central Region) and Région du Centre-Est (East Central Region) as presented in Table 3.5.

Diocese of Manga has a total population of 762,632 and covers around 11,457 square kilometers (Institut National de la Statistique et de la Démographie [INSD], 2014). Agriculture is the principal economic activity of the area and involves around 85% of the regional active population. The South Central and East Central regions are respectively the eighth and sixth poorest region of Burkina Faso.
Table 3.5. Localities of the Catholic Diocese of Manga

<table>
<thead>
<tr>
<th>Region</th>
<th>Province</th>
<th>Department</th>
<th>Extension zone</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Région du Centre-Sud</td>
<td>Bazèga</td>
<td>Toécé</td>
<td>Public</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Nahouri</td>
<td>Pô</td>
<td>Public</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tiébéélé</td>
<td>Private</td>
<td>45</td>
</tr>
<tr>
<td>Zoundwéogo</td>
<td>Gomboussougou</td>
<td>Private</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Manga</td>
<td>Public</td>
<td></td>
<td>46</td>
</tr>
<tr>
<td>Région du Centre-Est</td>
<td>Boulgou</td>
<td>Zabré</td>
<td>Private</td>
<td>45</td>
</tr>
</tbody>
</table>
Figure 3.2. Map of the study area

Source: https://www.google.com
CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1. Introduction

This chapter discusses the different results from the data analysis. The socio-economic characteristics of the farmers by type of extension system (private system and public system) are first presented. The results on perceptions about the quality of service, willingness to pay for private extension services, technical efficiency of farms operating under private and public system and profitability of private extension organisation; are then presented. Each result presented is discussed in order to raise and record better information for conclusion and policy recommendations.

4.2. Socio-economic Characteristics of Respondents

4.2.1. Farmers operating under public extension services

The respondents under public extension zone are dominated by men which account for 86.03% whereas women account for 14% (Table 4.2). Most of the farmers interviewed (52%) are in the middle age followed by young farmers and the old ones (respectively 35% and 13%) (Table 4.1). The proportion of most experienced and least experienced farmers are equal (29%) (Table 4.1). This suggest a great variability in experience between the farmers interviewed. However, the overall distribution shows that farmers in the sample are very experienced in terms of years involved in agriculture. Non educated farmers have the highest proportion in the sample (57%) compared to educated farmers (43%), even if the gap is low. Also note that most of the farmers undertake off-farm activities and are members of a farmer based organisation (respectively 85% and 83% of the whole sample). Majority of the farmers interviewed
(82%) are small scale farmers holding at most 2 hectares for the major crop they are growing (Table 4.1). The land is generally a family or personal land (respectively 85% and 14%) compared to leased land (1%). Maize is the major crop (37% grow the crop) in this zone followed by cotton (27%). Generally cereals are the most important products grown in that zone (more than 50%) and mainly for consumption.

Table 4.1. Socio-economic Characteristics of Farmers under Public Extension System (Continuous variables)

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 18-35 (young)</td>
<td>47</td>
<td>34.56</td>
<td></td>
</tr>
<tr>
<td>36-59 (middle age)</td>
<td>71</td>
<td>52.20</td>
<td></td>
</tr>
<tr>
<td>60-82 (old)</td>
<td>18</td>
<td>13.24</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Experience in agriculture</td>
<td>24.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-11</td>
<td>39</td>
<td>28.68</td>
<td></td>
</tr>
<tr>
<td>12-21</td>
<td>24</td>
<td>17.64</td>
<td></td>
</tr>
<tr>
<td>22-31</td>
<td>34</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>32-60</td>
<td>39</td>
<td>28.68</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Farm size</td>
<td>1.5478</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25-2</td>
<td>112</td>
<td>82.35</td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>20</td>
<td>14.71</td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>4</td>
<td>2.94</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field data, 2016

Table 4.2. Socio-economic Characteristics of Farmers under Public Extension System (Categorical variables)

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>117</td>
<td>86.03</td>
</tr>
<tr>
<td>Females</td>
<td>19</td>
<td>13.97</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
</tr>
<tr>
<td>Education status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educated</td>
<td>58</td>
<td>42.65</td>
</tr>
<tr>
<td>Non educated</td>
<td>78</td>
<td>57.35</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
</tr>
<tr>
<td>Participation in off-farm activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>85</td>
<td>62.5</td>
</tr>
<tr>
<td>No</td>
<td>51</td>
<td>37.5</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
</tr>
<tr>
<td>Membership of a FBO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable name</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>Yes</td>
<td>83</td>
<td>61.03</td>
</tr>
<tr>
<td>No</td>
<td>53</td>
<td>38.97</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
</tr>
<tr>
<td>Farm ownership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal land</td>
<td>19</td>
<td>13.97</td>
</tr>
<tr>
<td>Family land</td>
<td>115</td>
<td>84.56</td>
</tr>
<tr>
<td>Lease</td>
<td>2</td>
<td>1.47</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
</tr>
<tr>
<td>Crop cultivated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>51</td>
<td>37.5</td>
</tr>
<tr>
<td>Peanut</td>
<td>7</td>
<td>5.15</td>
</tr>
<tr>
<td>Cotton</td>
<td>37</td>
<td>27.21</td>
</tr>
<tr>
<td>Bean</td>
<td>1</td>
<td>0.74</td>
</tr>
<tr>
<td>Millet</td>
<td>16</td>
<td>11.76</td>
</tr>
<tr>
<td>Sorghum</td>
<td>13</td>
<td>9.56</td>
</tr>
<tr>
<td>Sesame</td>
<td>11</td>
<td>8.09</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

### 4.2.2. Farmers operating under private extension services

Table 4.4 indicates that most of the farmers interviewed in the private extension group are female (74% against 26%). This is observed because the NGO operating in that zone has a female preference in their intervention. About 80% of farmers in the group are between 36 and 59 years old followed by young farmers who are between 18 and 35 years old (Table 4.3). However, it is observed that the proportion of farmers in the sample decreases as the years of experience in agriculture increases (Table 4.3). That means that farmers are less experienced in the private extension group compared to those in the public extension group. This could also be due to the programme itself which appears to be more attractive to farmers with less experience because it is those farmers who may expect to benefit more from the programme. Educated farmers have a lower proportion (17%) compared to non-educated farmers (83%), indicating a higher gap compared to the first group. Farmers in this group are also very involved in off-farm activities (72%) and farmers’ organisations (71%). As observed in the first group,
majority of the farmers are smallholders’ farmers with land area not exceeding 2 hectare (98.52%) (Table 4.3). However large scale farmers have been interviewed as shown in Table 4.3. The distribution of farmers by land tenure is 57% for personal property, 34.81% for family land and 8.15% for leasing. Finally, maize is the major crop cultivated by this group (52% of farmers), similar to the first group. The second major crop is rice (13%) against cotton for the first group.

Table 4.3. Socio-economic Characteristics of Farmers under Private Extension System (Continuous variables)

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>43.13</td>
</tr>
<tr>
<td>18-35</td>
<td>41</td>
<td>30.37</td>
<td></td>
</tr>
<tr>
<td>36-59</td>
<td>80</td>
<td>59.26</td>
<td></td>
</tr>
<tr>
<td>60-77</td>
<td>14</td>
<td>10.37</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Experience in agriculture</td>
<td></td>
<td></td>
<td>14..6963</td>
</tr>
<tr>
<td>2-11</td>
<td>62</td>
<td>45.93</td>
<td></td>
</tr>
<tr>
<td>12-21</td>
<td>46</td>
<td>34.07</td>
<td></td>
</tr>
<tr>
<td>22-31</td>
<td>19</td>
<td>14.07</td>
<td></td>
</tr>
<tr>
<td>32-50</td>
<td>8</td>
<td>5.93</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Farm size</td>
<td></td>
<td></td>
<td>1.5478</td>
</tr>
<tr>
<td>0.12-2</td>
<td>133</td>
<td>98.52</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>1.48</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field data, 2016

Table 4.4. Socio-economic Characteristics of Farmers under Private Extension System (Categorical variables)

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>35</td>
<td>25.93</td>
</tr>
<tr>
<td>Females</td>
<td>100</td>
<td>74.07</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>100</td>
</tr>
<tr>
<td>Education status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educated</td>
<td>23</td>
<td>17.04</td>
</tr>
<tr>
<td>Non educated</td>
<td>112</td>
<td>82.96</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>100</td>
</tr>
<tr>
<td>Participation in off-farm activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>97</td>
<td>71.85</td>
</tr>
<tr>
<td>No</td>
<td>38</td>
<td>28.15</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>100</td>
</tr>
</tbody>
</table>
### Variable name | Frequency | Percentage
--- | --- | ---
Membership of a FBO  |  |  
Yes | 96 | 71.11  
No | 39 | 28.89  
Total | 135 | 100
Farm ownership  |  |  
Personal land | 77 | 57.04  
Family land | 47 | 34.81  
Lease | 11 | 8.15  
Total | 135 | 100
Crop cultivated  |  |  
Maize | 71 | 52.59  
Peanut | 13 | 9.83  
Bean | 3 | 2.22  
Rice | 18 | 13.33  
Millet | 11 | 8.15  
Sorghum | 1 | 0.74  
Sesame | 18 | 13.33  
Total | 135 | 100

Source: Field data, 2016

### 4.3. Assessment of Farmers’ Perceptions about the Quality of Extension Services

#### 4.3.1. Farmers under public extension system

Among the 136 farmers interviewed in the public extension group, it was observed that less than 30 have access to the service related to facilitation of access to credit. They find the relevance (2.25), availability (2.87), affordability (2.45) and accuracy (2.62) of the service satisfactory while they are undecided about the timeliness of the service (3.33).

#### Table 4.5. Farmers' Perceptions about the Quality of Facilitation of Access to Credit (public system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance of the service</td>
<td>24</td>
<td>2.2</td>
<td>1.29</td>
</tr>
<tr>
<td>Affordability of the service</td>
<td>24</td>
<td>2.46</td>
<td>1.21</td>
</tr>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>24</td>
<td>2.58</td>
<td>1.33</td>
</tr>
<tr>
<td>Availability of the service</td>
<td>24</td>
<td>2.87</td>
<td>1.51</td>
</tr>
<tr>
<td>Timeliness of the service</td>
<td>24</td>
<td>3.33</td>
<td>1.17</td>
</tr>
</tbody>
</table>


Source: Field data, 2016
On the facilitation of input provision, results presented in Table 4.6 show that farmers are globally satisfied with the relevance (2.38), affordability (2.41) and accuracy (2.92) of the service. However, they tend to be undecided about the timeliness and availability of the service (3.28 and 3.51) as it is also shown by the Table 4.7. That means that they do not get the information as they want and even if it is available, it is not provided at the time they need it.

Table 4.6. Farmers’ Perceptions about the Quality of Facilitation of Input Provision (public system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance of the service</td>
<td>39</td>
<td>2.37</td>
<td>0.94</td>
</tr>
<tr>
<td>Affordability of the service</td>
<td>39</td>
<td>2.41</td>
<td>1.23</td>
</tr>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>39</td>
<td>2.92</td>
<td>1.57</td>
</tr>
<tr>
<td>Timeliness of the service</td>
<td>39</td>
<td>3.28</td>
<td>1.17</td>
</tr>
<tr>
<td>Availability of the service</td>
<td>39</td>
<td>3.51</td>
<td>1.12</td>
</tr>
</tbody>
</table>


Source: Field data, 2016

Table 4.7. Distribution of Public Extension Zone’s Farmers according to their Perceptions about the Timeliness and Availability of Input Provision

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeliness of the service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very satisfied</td>
<td>2</td>
<td>5.13</td>
</tr>
<tr>
<td>Satisfied</td>
<td>9</td>
<td>23.08</td>
</tr>
<tr>
<td>Undecided</td>
<td>11</td>
<td>28.21</td>
</tr>
<tr>
<td>Dissatisfied</td>
<td>10</td>
<td>25.64</td>
</tr>
<tr>
<td>Very dissatisfied</td>
<td>7</td>
<td>17.95</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>100</td>
</tr>
<tr>
<td>Availability of the service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied</td>
<td>9</td>
<td>23.08</td>
</tr>
<tr>
<td>Undecided</td>
<td>11</td>
<td>28.21</td>
</tr>
<tr>
<td>Dissatisfied</td>
<td>9</td>
<td>23.08</td>
</tr>
<tr>
<td>Very dissatisfied</td>
<td>10</td>
<td>25.64</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field data, 2016
Farmers find the technical information for their farming practices satisfying in terms of relevance (2.15), availability (2.87), timeliness (2.95), affordability (2.1) and accuracy (2.82) (Table 4.8).

Provision of services related to access to market is satisfying for farmers in terms of relevance (2.72), availability (2.45) and affordability (2.72), even if they are close to being undecided on affordability. However, they cannot decide about the quality in terms of timeliness and accuracy (Table 4.9).

Table 4.8. Farmers’ Perceptions about the Quality of Technical Support (public system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability of the service</td>
<td>40</td>
<td>2.1</td>
<td>1.15</td>
</tr>
<tr>
<td>Relevance of the service</td>
<td>40</td>
<td>2.15</td>
<td>0.97</td>
</tr>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>40</td>
<td>2.82</td>
<td>1.26</td>
</tr>
<tr>
<td>Availability of the service</td>
<td>40</td>
<td>2.87</td>
<td>0.94</td>
</tr>
<tr>
<td>Timeliness of the service</td>
<td>40</td>
<td>2.95</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

Table 4.9. Farmers’ Perceptions about the Quality of Facilitation of Access to Market (public system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of the service</td>
<td>11</td>
<td>2.45</td>
<td>0.93</td>
</tr>
<tr>
<td>Relevance of the service</td>
<td>11</td>
<td>2.72</td>
<td>1.27</td>
</tr>
<tr>
<td>Affordability of the service</td>
<td>11</td>
<td>2.72</td>
<td>1.19</td>
</tr>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>11</td>
<td>3.00</td>
<td>1.26</td>
</tr>
<tr>
<td>Timeliness of the service</td>
<td>11</td>
<td>3.18</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

When the different attributes are aggregated in order to assess the farmers’ perceptions about the quality, it is observed that farmers positively appreciate services related to access to credit (2.70), input provision (2.90), technical support (2.58), and access to market (2.81). However the scores for three services (access to credit, input provision
and access to market) tend to be close to 3 (Table 4.10). This means that even if they are satisfied, they tend to be undecided about the real quality of these services. This is consistent the results of Gababolokwe and Hulela (2014) who found that T&V programme was perceived relevant by Botswana’ farmers in their farming activities. But, the result is in contradiction with the findings of Sathish, Chandargui and Meti (2016), Egbe and Eze (2014), Agbarevo (2013), Qtaishat and Al-Sharafat (2012) who found that public extension delivery was not very effective or was of low quality from the farmers’ view-point respectively in India, Nigeria and Jordan.

The results further showed that in the public zone, farmers have low access to extension services with the highest participation rates at 29% and 29% respectively for input provision and technical support and the lowest rates at 18% and 8% for facilitation of access to credit and access to market respectively. This could be due to financial constraints of government; which makes it difficult to adequately reach a large proportion of farmers for the two services most provided. For facilitating access to credit and access to market, it seems that it has not been a priority so far for government which focuses its intervention on activities that can directly impact the production and productivity levels.

Table 4.10. Overall Perceptions about the Quality of Public Services

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptions about quality of technical support</td>
<td>40</td>
<td>2.58</td>
<td>0.55</td>
</tr>
<tr>
<td>Perceptions about quality of facilitation of access to credit</td>
<td>24</td>
<td>2.71</td>
<td>0.92</td>
</tr>
<tr>
<td>Perceptions about quality of facilitation of access to market</td>
<td>11</td>
<td>2.82</td>
<td>0.73</td>
</tr>
<tr>
<td>Perceptions about quality of facilitation of input provision</td>
<td>39</td>
<td>2.90</td>
<td>1.26</td>
</tr>
</tbody>
</table>

Source: Field data, 2016
4.3.2. Perceptions of farmers under private extension system

Facilitation of access to credit is perceived as relevant (1.31), available (1.26), timely (1.19), affordable (1.28) and accurate (1.29) by respondents under private zone, since they are very satisfied with respect to the five attributes (Table 4.11).

For farmers in the private zone, as shown by results presented in Table 4.12, the service related to input provision is perceived as very relevant (1.43), available (1.42), timely (1.36), affordable (1.45) and accurate (1.37). Affordability, timeliness and availability of the service are even very satisfactory for these farmers since the maximum score assigned is 2.

Table 4.11. Farmers' Perceptions about the Quality of Facilitation of Access to Credit (private system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeliness of the service provision</td>
<td>95</td>
<td>1.19</td>
<td>0.46</td>
</tr>
<tr>
<td>Availability of the service</td>
<td>95</td>
<td>1.26</td>
<td>0.51</td>
</tr>
<tr>
<td>Affordability of the service</td>
<td>95</td>
<td>1.28</td>
<td>0.58</td>
</tr>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>95</td>
<td>1.29</td>
<td>0.52</td>
</tr>
<tr>
<td>Relevance of the service</td>
<td>95</td>
<td>1.32</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

Table 4.12. Farmers' Perceptions about the Quality of Facilitation of Input Provision (private system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeliness of the service provision</td>
<td>87</td>
<td>1.37</td>
<td>0.48</td>
</tr>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>87</td>
<td>1.38</td>
<td>0.55</td>
</tr>
<tr>
<td>Availability of the service</td>
<td>87</td>
<td>1.42</td>
<td>0.52</td>
</tr>
<tr>
<td>Relevance of the service</td>
<td>87</td>
<td>1.44</td>
<td>0.56</td>
</tr>
<tr>
<td>Affordability of the service</td>
<td>87</td>
<td>1.45</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Source: Field data, 2016
Farmers under private zone who have access to technical support are also very satisfied with relevance (1.49), availability (1.36), timeliness (1.36), affordability (1.42) and accuracy of the service (1.34), since the scores assigned were high. None of them tends to be very dissatisfied with respect to the five attributes indicated (Table 4.13).

In addition, as observed in Table 4.14, none of the farmers interviewed is very dissatisfied with the service related to access to market. They even are on average very satisfied with the relevance (1.26), availability (1.3), timeliness (1.27), affordability (1.19) and accuracy of the service.

### Table 4.13. Farmers’ Perceptions about the Quality of Technical Support (private system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>96</td>
<td>1.34</td>
<td>0.54</td>
</tr>
<tr>
<td>Timeliness of the service</td>
<td>96</td>
<td>1.36</td>
<td>0.54</td>
</tr>
<tr>
<td>Availability of the service</td>
<td>96</td>
<td>1.36</td>
<td>0.54</td>
</tr>
<tr>
<td>Affordability of the service</td>
<td>96</td>
<td>1.43</td>
<td>0.58</td>
</tr>
<tr>
<td>Relevance of the service</td>
<td>96</td>
<td>1.45</td>
<td>0.58</td>
</tr>
</tbody>
</table>


Source: Field data, 2016

### Table 4.14. Farmers’ Perception about the Quality of Facilitation of Access to Market (private system)

<table>
<thead>
<tr>
<th>Quality attributes</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability of the service</td>
<td>26</td>
<td>1.19</td>
<td>0.63</td>
</tr>
<tr>
<td>Appropriateness of the delivery methods</td>
<td>26</td>
<td>1.23</td>
<td>0.65</td>
</tr>
<tr>
<td>Timeliness of the service delivery</td>
<td>26</td>
<td>1.27</td>
<td>0.67</td>
</tr>
<tr>
<td>Relevance of the service</td>
<td>26</td>
<td>1.27</td>
<td>0.67</td>
</tr>
<tr>
<td>Availability of the service</td>
<td>26</td>
<td>1.31</td>
<td>0.68</td>
</tr>
</tbody>
</table>


Source: Field data, 2016

Aggregation of the average scores of perception about each attribute by type of service provided by the private extension system shows that farmers are very satisfied about...
the quality of each of the services; the average scores of each service range between 1.25 and 1.41 (Table 4.15). For service related to input provision, we even find that all the farmers interviewed are satisfied about the quality of the service provided (maximum rate of 2) whereas for the three other services, some are dissatisfied but none of them is very dissatisfied.

As presented in Table 4.16, among farmers interviewed, the percentage of those who reported to have access to private services is greater than the percentage of those who reported to have access to public services: 70% of farmers under private system interviewed reported to receive facilitation of access to credit against 18% for farmers under public system; 64% of farmers under private system interviewed reported to receive facilitation of input provision against 29% for farmers under public system; 71% of farmers under private system interviewed reported to receive technical support against 29% for farmers under public system and 19% of farmers under private system interviewed reported to receive facilitation of access to market against 8% for farmers under public system. However, in the two cases, it appears that farmers have less access to service related to access to market than any other service. The reason could be due to the consideration given mostly to food crops when supporting farmers, while food crops in our context are generally consumed by the farm families. It can also be concluded (comparing the scores from the two different groups by service) that farmers under private extension system are more stratified with the services they receive than farmers under public extension system. Compared to public extension, Ali (2013), Nnadi, F., Umunakwe, Nnadi, C., Chikaire and Okafor (2012), Sarker and Itohara (2009) also found private extension delivery very effective and qualitative.
Table 4.15. Overall Perceptions about the Quality of Private Services

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of respondents</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptions about quality of facilitation of access to market</td>
<td>26</td>
<td>1.25</td>
<td>0.62</td>
</tr>
<tr>
<td>Perceptions about quality of facilitation of access to credit</td>
<td>95</td>
<td>1.27</td>
<td>0.42</td>
</tr>
<tr>
<td>Perceptions about quality of technical support</td>
<td>96</td>
<td>1.39</td>
<td>0.48</td>
</tr>
<tr>
<td>Perceptions about quality of facilitation of input provision</td>
<td>87</td>
<td>1.41</td>
<td>0.43</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

Table 4.16. Access to the four types of services by extension zone

<table>
<thead>
<tr>
<th></th>
<th>Public zone Farmers interviewed</th>
<th>Public zone Farmers covered</th>
<th>Percentage</th>
<th>Private zone Farmers interviewed</th>
<th>Private zone Farmers covered</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical support</td>
<td>136</td>
<td>40</td>
<td>29.41</td>
<td>135</td>
<td>96</td>
<td>71.11</td>
</tr>
<tr>
<td>Input provision</td>
<td>136</td>
<td>39</td>
<td>28.68</td>
<td>135</td>
<td>87</td>
<td>64.44</td>
</tr>
<tr>
<td>Access to credit</td>
<td>136</td>
<td>24</td>
<td>17.65</td>
<td>135</td>
<td>95</td>
<td>70.37</td>
</tr>
<tr>
<td>Access to market</td>
<td>136</td>
<td>11</td>
<td>8.09</td>
<td>135</td>
<td>26</td>
<td>19.26</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

4.4. Assessment of Farmers’ Willingness to Pay for Private Extension Services

4.4.1. Farmers under public extension system

4.4.1.1. Determinants of the demand for extension services

For the four services as presented in Table 4.17, it is observed that demand for the services decreases as the bids required for access to these services increases. The probability of willingness to pay for facilitation of access to market is less affected by bids compared to the other services, followed by facilitation of access to credit, input provision and technical support. This could be due to the fact that farmers in the public extension zone have less access to extension related to access to market and access to
credit, as it has been shown in the preceding section. However farmers who wish to pay
to have access to private services related to facilitation of access to market are fewer
(93%) than farmers who wish to be served by private sector for facilitating input
provision (99%), technical support and facilitation of access to credit (97%).

Age of the household head significantly and negatively affects the probability to
express a demand for extension services related to facilitation of access to credit (at
10%), facilitation of input provision (at 5%) and facilitation of access to market (at 1%).
The results confirm the a priori expectations. Age is assumed to be related with greater
knowledge and greater experience. Therefore, older farmers tend to be self-sufficient
and hence neglect the importance of extension services to them and do not express a
demand for these services. This result is consistent the findings of Yegbemey et. al.
(2014) but not with the results of Temesgen and Tola (2015), Ozor et. al. (2013) and
Oladele (2008). The coefficient of years of experience in farming is significantly (5%)
and negatively related to facilitation of access to credit. As it has been hypothesized,
longer years of farming assumes that farmers have experience managing farming issues
or challenges. They have therefore developed some skills and are supposed to be
sufficient for their current activities, hence the higher probability to not be willing to
pay for private extension services. This result is consistent with the findings of
Yegbemey et al. (2014) and Oladele (2008).

Undertaking an off-farm activity tends to decrease the probability of a farm expressing
a demand for each of the services with a significance level of at 1% for technical support,
5% for facilitation of access to credit and facilitation of access to market, and at 10%
for input provision. As Asadi et al. (2008) opined, this result could be due to the fact
that farmers rely less on agriculture to generate their income, since they can generate
additional income from other activities. They are less disposed to invest more revenue
in farming and therefore are less willing to pay for any service provided on a cost recovery basis. Being a member of a farmers’ organisation decreases significantly at 5% the probability that farmers express a demand for facilitation of access to market. Most of the organisations in the public zone offer not only opportunity for input provision, but also for product marketing. It is therefore possible that farmers do not need more in terms of quantity and quality, hence their unwillingness to pay.

As land becomes a personal property or a hired property, farmers are less willing to pay facilitation of access to market. This result is not consistent with the expectation but consistent with the findings of Asadi et al. (2008). Compared to family property, personal and hired properties give more responsibilities to the management of the farm (input purchase, output use management) and can positively affect financial constraints of the farmer. These financial constraints can therefore affect negatively their support of other charges in their farming activities (for extension services for example).

Large scale farmers are found to be more willing to pay for input provision than small scale farmers. Though the level of significance is weak, this is as expected since large scale farmers are more exposed to risks and need more in terms of input for their activities. Yield also affects positively the willingness to pay, but only for facilitation of access to market. This result can be explained by the fact that higher yield could be related to higher income through access to market. And that may encourage farmers to be ready to pay for that service.

Finally, maize farmers are more willing to pay for technical support (significant at 10%), but less willing to pay (significant at 5%) for facilitation of access to market than farmers who are growing other crops. Since maize is the first crop cultivated in that zone, farmers could need better support in terms of farming practices and techniques in
order to enhance their production. However, that crop is mainly consumed at the household level, hence their willingness to pay less for facilitation of access to market.

Table 4.17. Determinants of the Demand of Extension by type of Services

<table>
<thead>
<tr>
<th>Variables</th>
<th>wtp_ac</th>
<th>wtp_ip</th>
<th>wtp_ts</th>
<th>wtp_am</th>
</tr>
</thead>
<tbody>
<tr>
<td>bid_ac</td>
<td>-0.0166***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00375)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bid_ip</td>
<td></td>
<td>-0.0208***</td>
<td></td>
<td>-0.012***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00543)</td>
<td></td>
<td>(0.0029)</td>
</tr>
<tr>
<td>bid_ts</td>
<td></td>
<td></td>
<td>-0.0226***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.00533)</td>
<td></td>
</tr>
<tr>
<td>bid_am</td>
<td></td>
<td></td>
<td></td>
<td>-0.0502***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.01836)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.0250*</td>
<td>-0.0733**</td>
<td>-0.0279</td>
<td>-0.0502***</td>
</tr>
<tr>
<td></td>
<td>(0.0139)</td>
<td>(0.0326)</td>
<td>(0.0219)</td>
<td>(0.01836)</td>
</tr>
<tr>
<td>Agricexp</td>
<td>-0.000843**</td>
<td>0.0258</td>
<td>0.000341</td>
<td>0.00075</td>
</tr>
<tr>
<td></td>
<td>(0.000390)</td>
<td>(0.0288)</td>
<td>(0.00762)</td>
<td>(0.00076)</td>
</tr>
<tr>
<td>Edu</td>
<td>0.488</td>
<td>-0.314</td>
<td>0.685</td>
<td>-1.1648</td>
</tr>
<tr>
<td></td>
<td>(0.347)</td>
<td>(0.442)</td>
<td>(0.433)</td>
<td>(0.4069)</td>
</tr>
<tr>
<td>Gender</td>
<td>0.589</td>
<td>-0.0674</td>
<td>0.389</td>
<td>0.3998</td>
</tr>
<tr>
<td></td>
<td>(0.397)</td>
<td>(0.548)</td>
<td>(0.440)</td>
<td>(0.4181)</td>
</tr>
<tr>
<td>Offarm</td>
<td>-0.848**</td>
<td>-1.108*</td>
<td>-2.409***</td>
<td>-2.2767**</td>
</tr>
<tr>
<td></td>
<td>(0.413)</td>
<td>(0.653)</td>
<td>(0.721)</td>
<td>(0.8910)</td>
</tr>
<tr>
<td>FBO</td>
<td>-0.279</td>
<td>-0.435</td>
<td>-0.287</td>
<td>-0.7613**</td>
</tr>
<tr>
<td></td>
<td>(0.339)</td>
<td>(0.353)</td>
<td>(0.363)</td>
<td>(0.3364)</td>
</tr>
<tr>
<td>Farmown</td>
<td>-0.463</td>
<td>-1.157</td>
<td>-0.685</td>
<td>-1.152**</td>
</tr>
<tr>
<td></td>
<td>(0.470)</td>
<td>(0.898)</td>
<td>(0.433)</td>
<td>(0.5855)</td>
</tr>
<tr>
<td>Farmsize</td>
<td>-0.0174</td>
<td>0.299*</td>
<td>0.155</td>
<td>0.1957</td>
</tr>
<tr>
<td></td>
<td>(0.145)</td>
<td>(0.181)</td>
<td>(0.225)</td>
<td>(0.1587)</td>
</tr>
<tr>
<td>Croptype</td>
<td>-0.0465</td>
<td>0.317</td>
<td>0.624*</td>
<td>-0.7746**</td>
</tr>
<tr>
<td></td>
<td>(0.303)</td>
<td>(0.394)</td>
<td>(0.371)</td>
<td>(0.3590)</td>
</tr>
<tr>
<td>Yield</td>
<td>-0.00001</td>
<td>0.000062</td>
<td>0.000150</td>
<td>0.000235*</td>
</tr>
<tr>
<td></td>
<td>(0.000112)</td>
<td>(0.000171)</td>
<td>(0.000108)</td>
<td>(0.000133)</td>
</tr>
<tr>
<td>Constant</td>
<td>7.036***</td>
<td>13.78***</td>
<td>11.77***</td>
<td>10.92***</td>
</tr>
<tr>
<td></td>
<td>(1.658)</td>
<td>(3.534)</td>
<td>(2.535)</td>
<td>(2.4923)</td>
</tr>
<tr>
<td>Observations</td>
<td>133</td>
<td>135</td>
<td>133</td>
<td>127</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

LR chi2(9) = 45.91/ Prob > chi2 = 0.0000/ Log likelihood = -206.57312/ Pseudo R2 = 0.1000
LR chi2(9) = 58.29/ Prob > chi2 = 0.0000/ Log likelihood = -212.11245/ Pseudo R2 = 0.1208
LR chi2(9) = 46.69/ Prob > chi2 = 0.0000/ Log likelihood = -229.05498/ Pseudo R2 = 0.0925
LR chi2(9) = 46.47/ Prob > chi2 = 0.0000/ Log likelihood = -218.26659/ Pseudo R2 = 0.0962

Source: Field data, 2016

3 Diagnostic of model 1 (wtp_ac)
4 Diagnostic of model 2 (wtp_ip)
5 Diagnostic of model 3 (wtp_ts)
6 Diagnostic of model 4 (wtp_am)
4.4.1.2. Estimates of the willingness to pay (in FCFA/month)

Table 4.18 presents farmers’ bids for each of the four extension services. These bids are by farmers currently receiving public extension services. To be facilitated in access to credit, farmers under public extension system who are willing to pay are ready to give on average about 300.00\textsuperscript{7} FCFA/month with a minimum amount of 190.00 FCFA/month and a maximum amount 390.00 FCFA/month.

For facilitation of input provision, farmers are willing to pay about 455.00 FCFA with minimum and maximum amounts of 315.00 FCFA/month and 2695.00 FCFA/month with three farmers ready to pay more than 2000.00 FCFA/month.

For technical support, on average, farmers are ready to pay 400.00 FCFA/month. The minimum amount is estimated at 300.00 FCFA/month while the maximum amount is estimated at 575.00 FCFA/month.

Finally farmers are willing to give on average 450.00 FCFA/month with minimum and maximum amounts at 250 FCFA/month and 1595 FCFA/month for facilitation of access to market. About 27 \% of farmers interviewed in that zone are cotton farmers, and since cotton is a commercial crop, farmers may be willing to give more in terms of maximum amount for help in commercialization. Particularly for cotton farmers, this situation could also mean that they are not totally satisfied with the market opportunities proposed by the cotton companies and may be interested in other opportunities, hence that amount indicated.

Generally, it is observed that amounts farmers are willing to pay for each of the four services differ, unless for facilitation of input provision and access to market (results of

\textsuperscript{7} 1 Ghc=140 FCFA and 1 US$=590 FCFA. The bid is rounded off because the smallest unit used in FCFA is 5 FCFA
tests of difference are indicated in Appendix 2). Farmers are willing to pay less for facilitation of access to credit, followed by technical support. They are willing to pay more for facilitation of input provision and access to market. These two services can therefore, be more valued by farmers in terms of their importance in the management of their farms, farm production and income generating. This result can also be due to the fact that farmers under public system are less satisfied for these two services as indicated in Table 4.10.

**Table 4.18. Bid Estimates**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observation</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to pay for facilitation of access to credit</td>
<td>133</td>
<td>302.06</td>
<td>45.62</td>
<td>190.53</td>
<td>390.41</td>
</tr>
<tr>
<td>Willingness to pay for facilitation of input provision</td>
<td>135</td>
<td>454.92</td>
<td>332.78</td>
<td>313.90</td>
<td>2693.96</td>
</tr>
<tr>
<td>Willingness to pay for technical support</td>
<td>134</td>
<td>398.41</td>
<td>61.50</td>
<td>291.88</td>
<td>573.29</td>
</tr>
<tr>
<td>Willingness to pay for facilitation of access to market</td>
<td>127</td>
<td>446.17</td>
<td>186.52</td>
<td>251.37</td>
<td>1593.05</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

4.4.2. Farmers under private extension system

4.4.2.1. Factors affecting the willingness to pay more for better and sustainable extension services

For farmers under private extension zone, the Table 4.19 shows that farm ownership is the only determinant which affects the four services. Indeed, moving from family land, personal land to hired land increases the probability of being willing to pay more for better and sustainable services. In that zone, the NGO already invests in land conservation practices and encourages better ownership system for land management.
Since farmers already appreciate what has been done so far, it is then coherent that they might be willing to pay more for better private services, no matter the services which are provided.

Table 4.19. Determinants of the WTP Additional Amount for better Services

<table>
<thead>
<tr>
<th>Variables</th>
<th>WTP for access to credit</th>
<th>WTP for input provision</th>
<th>WTP for technical support</th>
<th>WTP for access to market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.0116</td>
<td>0.00534</td>
<td>0.00088</td>
<td>0.0053</td>
</tr>
<tr>
<td>Agricexp</td>
<td>-0.0134</td>
<td>-0.00314</td>
<td>0.00119</td>
<td>-0.0242</td>
</tr>
<tr>
<td>Edu</td>
<td>-0.124</td>
<td>0.287</td>
<td>0.0133</td>
<td>-0.154</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.439</td>
<td>0.0863</td>
<td>0.376</td>
<td>-0.0358</td>
</tr>
<tr>
<td>Offarm</td>
<td>0.187</td>
<td>0.524*</td>
<td>0.341</td>
<td>0.217</td>
</tr>
<tr>
<td>FBO</td>
<td>0.0271</td>
<td>0.0995</td>
<td>0.0657</td>
<td>0.286</td>
</tr>
<tr>
<td>Farmown</td>
<td>0.807**</td>
<td>0.729**</td>
<td>0.679**</td>
<td>0.807**</td>
</tr>
<tr>
<td>Farmsize</td>
<td>0.669</td>
<td>0.957**</td>
<td>0.898**</td>
<td>0.706*</td>
</tr>
<tr>
<td>Croptype</td>
<td>0.174</td>
<td>0.403</td>
<td>0.435</td>
<td>0.361</td>
</tr>
<tr>
<td>Yield</td>
<td>-0.00632</td>
<td>-0.00056</td>
<td>-0.00785</td>
<td>-0.00066</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.981</td>
<td>-1.526**</td>
<td>-1.085</td>
<td>-1.167</td>
</tr>
<tr>
<td>Observations</td>
<td>135</td>
<td>135</td>
<td>135</td>
<td>135</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

Wald chi2(9) = 31.44/ Prob > chi2 = 0.0002/ Log pseudolikelihood = -53.228354/Pseudo R2 = 0.1771
Wald chi2(9) = 19.12/ Prob > chi2 = 0.0242/ Log pseudolikelihood = -49.576368/Pseudo R2 = 0.1739
Wald chi2(9) = 14.83/ Prob > chi2 = 0.0957/ Log pseudolikelihood = -45.815213/Pseudo R2 = 0.1357
Wald chi2(9) = 24.95/ Prob > chi2 = 0.0030/ Log pseudolikelihood = -57.931666/Pseudo R = 0.1978

Source: Field data, 2016

It is also observed that farm size significantly (at 5%) increases the willingness to pay more for facilitation of input provision, technical support and access to market as it has been hypothesized. It is assumed that large farmers are more exposed to risks than small

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8 Diagnostic of model 1 (WTP for access to credit)
9 Diagnostic of model 2 (WTP for input provision)
10 Diagnostic of model 3 (WTP for technical support)
11 Diagnostic of model 4 (WTP for access to market)
farmers. Therefore, they may be willing to pay for better support in order to deal with risks. Particularly for facilitation of access to market, since large farms can be associated with higher production, it could become necessary for them to get better information for commercialization. This result is consistent with Temesgen et al. (2015), Onuche et al. (2015) and Yebgemey et al. (2014).

Finally, off-farm activities has a significant positive effect on facilitation of input provision. This result can be explained by the fact that farmers invest their additional income in their farming activities. That increases their financial capacity and then make them more willing to pay for input provision.

**4.4.2.2. Estimates of the bids farmers are willing to pay more for better and sustainable extension services**

On average, 88.48% (110 farmers over 135) of farmers under private extension system interviewed, are willing to pay an additional amount of 245.00 FCFA/month for better and sustainable services related to access to credit. This bid is ranged from a minimum of 25.00 FCFA/month to a maximum of 3000.00 FCFA/month. If they effectively pay that amount the total amount they will definitively pay will be estimated at around 500.00 FCFA/month for that service (since they already pay 250.00 FCFA).

For facilitation of input provision, 83.70% of farmers interviewed (113 over 135) are willing to pay in average 855.00 FCFA/month more for better and sustainable service with a minimum of 50.00 FCFA/month and a maximum of 5000.00 FCFA/month. Accounting for what they already pay, the total amount they may be ready to pay can be estimated at 1155.00 FCFA (since they already pay 300.00 FCFA/month for the service).
For technical support, 86.67% of farmers interviewed (117 over 135) are ready to pay a minimum of 50.00 FCFA/month and a maximum of 5000.00 FCFA/month as additional amount for better quality services. In average, they are willing to pay 825.00 FCFA/month more to get better technical support. This amount raises to 1025.00 FCFA the total amount they may be ready to pay for better quality service, since they already pay 300.00 FCFA/month for that service.

Finally and to be facilitated in access to market, 75.55% of farmers interviewed (102 over 135) are ready to pay in average 900.00 FCFA/month as additional amount for better and sustainable services. However, they are ready to pay a minimum of 50.00 FCFA/month and a maximum of 10000.00 FCFA/month as additional amount for that service. Then, the total amount they are ready to pay can be estimated at 1200.00 FCFA/month since they already pay 300.00 FCFA/month for that service.

In conclusion, compared to the group under public extension system, it is observed that a lower proportion of farmers interviewed are willing to pay more for better services. This situation is as expected and can be explained by the financial constraints those farmers are experiencing with the services they already pay for. However, when analysing additional amounts the farmers are willing to pay, it comes out that they are ready to give on average, more than farmers under public zone (almost the double for each amount) and for each service (except facilitation of access to credit). This situation may be explained by the fact that they are already paying services, and may better understand what is involved in these services in terms of financial and technical constraints for the provider, hence the effort that is needed to make provision of these services better and sustainable.
Table 4.20. Estimates of the Additional Amounts

<table>
<thead>
<tr>
<th>Variables</th>
<th>Observations</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness for facilitation of access to credit</td>
<td>110</td>
<td>243.39</td>
<td>427.62</td>
<td>25</td>
<td>3000</td>
</tr>
<tr>
<td>Willingness to pay for facilitation of input provision</td>
<td>113</td>
<td>853.12</td>
<td>886.24</td>
<td>50</td>
<td>5000</td>
</tr>
<tr>
<td>Willingness to pay for technical support</td>
<td>117</td>
<td>823.72</td>
<td>870.62</td>
<td>50</td>
<td>5000</td>
</tr>
<tr>
<td>Willingness to pay for facilitation of access to market</td>
<td>102</td>
<td>901.25</td>
<td>1445.58</td>
<td>50</td>
<td>10000</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

4.5. Technical Efficiency of Farmers Operating under Private and Public Extension

4.5.1. Tests of hypothesis

The first test implies that the Cobb-Douglas function is adequate to model the production frontier. The second test implies that there is presence of inefficiency in the farmers activities from the data collected. The last test implies that the parameters selected to explain the inefficiency are not conjointly equal to zero. Therefore, the tobit model is a good specification of the relation between the independent and dependent variables.

4.5.2. Estimation of production function

The coefficients of the values of seed, fertilizer and the quantity of labour force are positive and significant. Indeed when the values of fertilizer and seed increase by 1%, the total value of production increases by 17.2% and 11.6% respectively. In addition, elasticity of the quantity of adults working in the farm is 22.7. These results concern farmers producing maize as first crop for those under private and public system, and sorghum and rice as second crops respectively for those under public and private system.
respectively. The positive relationship between the use of seed, fertilizer and labour force with the production level, are consistent with several findings (Abebe, 2014; Bhatt & Bhat, 2014; Mwajombe & Mlozi, 2015; Shittu, 2014; Thanasack, 2012).

Table 4.21. Hypothesis Tests Results

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>Calculated $\chi^2$</th>
<th>Degree of freedom</th>
<th>Critical value $\chi^2_{df, 0.95}$</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_0 = \beta_{ij} = 0$ (production function specification)</td>
<td>144.05</td>
<td>4</td>
<td>9.49</td>
<td>We reject Ho</td>
</tr>
<tr>
<td>Inefficiency parameter: $H_0$: $\sigma_u = 0$ (absence of inefficiency)</td>
<td>09.30</td>
<td>1</td>
<td>3.8414</td>
<td>We reject Ho</td>
</tr>
<tr>
<td>$H_0$: $\delta_0 = \delta_1 = \ldots = \delta_{12} = 0$ (inefficiency function)</td>
<td>27.39</td>
<td>8</td>
<td>15.51</td>
<td>We reject Ho</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

Table 4.22. Estimated Production Function

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnFertilizer value</td>
<td>0.172***</td>
</tr>
<tr>
<td></td>
<td>(0.0407)</td>
</tr>
<tr>
<td>lnSeed value</td>
<td>0.116*</td>
</tr>
<tr>
<td></td>
<td>(0.0663)</td>
</tr>
<tr>
<td>lnLabour qty</td>
<td>0.227***</td>
</tr>
<tr>
<td></td>
<td>(0.1389)</td>
</tr>
<tr>
<td>lnFarm size</td>
<td>-0.052</td>
</tr>
<tr>
<td></td>
<td>(0.1052)</td>
</tr>
<tr>
<td>Constant</td>
<td>7.416***</td>
</tr>
<tr>
<td></td>
<td>(0.7091)</td>
</tr>
<tr>
<td>lnSig2v</td>
<td>-1.635***</td>
</tr>
<tr>
<td></td>
<td>(0.379)</td>
</tr>
<tr>
<td>lnSig2u</td>
<td>0.176</td>
</tr>
<tr>
<td></td>
<td>(0.2502)</td>
</tr>
<tr>
<td>Observations</td>
<td>155</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Field data, 2016

lnSig2v and lnSig2u are the estimates of the standard deviation of the idiosyncratic component of the error and the inefficiency component of the error respectively.
4.5.3. Technical efficiency scores

Table 4.23 presents the technical efficiency scores generated by the model. For farmers under public extension system, the technical efficiency (TE) score is estimated on average at 54 % with a minimum of 06 % and a maximum of 86 %. For farmers under private extension system, they fall between a minimum TE score of 2 % and a maximum score of 85 % with an average score of 46 %. This means that farmers in the public zone get on average 54 % of the potential maximum output from the given set of input, while those in the private zone get on average 46 %. There is therefore, from the existing input set under the control of farmers, opportunity to increase farm output by about 46 % for farmers in the public zone and by about 54 % for farmers in the private zone. For the pooled data of farmers, farmers get about 50 % of the potential maximum output from the given set of input under their control. The mean score is less than what Thanasack (2012) found in Laos for rice production (53 %), Mwajombe and Mlozi (2015) found in Tanzania for urban agriculture (72 %), Abebe (2015) found in Ethiopia (53 %). However, this TE score is greater than the scores found by Bhatt and Bath (2014) and Shittu (2014) which were 48 % and 18 % respectively.

Table 4.23. Technical efficiency scores

<table>
<thead>
<tr>
<th>Variables</th>
<th>Observation</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers under public extension system</td>
<td>74</td>
<td>.54</td>
<td>.20</td>
<td>.06</td>
<td>.86</td>
</tr>
<tr>
<td>Farmers under private extension system</td>
<td>81</td>
<td>.46</td>
<td>.18</td>
<td>.02</td>
<td>.85</td>
</tr>
<tr>
<td>Overall technical efficiency</td>
<td>155</td>
<td>.50</td>
<td>.20</td>
<td>.02</td>
<td>.86</td>
</tr>
</tbody>
</table>

Source: Field data, 2016
4.5.4. Determinants of technical efficiency of farmers

As presented in Table 4.24, gender of the household head is positively related to the level TE. Being a male would increase the TE score by 0.0661, while holding all the other variables constant. It is assumed that men have more physical capacity than women and have then a higher possibility to raise productivity and production level.

Holding all the other variables constant, growing maize as the first major crop, would increase the TE score by 0.109. Farmers who are growing maize as first crop are therefore, more technically efficient than the other farmers. Since maize is their first crop, the situation can be explained by the maize preference when affecting farm resources such as land cultivated and input purchases.

The TE score of farmers in the private zone would be 0.084 lower than the one for those in the public extension zone, when holding other variables constant (Table 4.24). This result is not consistent with the expectation since farmers under private extension system were assumed more efficient because of better support. However, this result can be explained by the fact that many farmers in the public zone are supported in cotton production by private companies. And they may transfer some knowledge and information gotten from that support to their cereal farming activities as Kaminski (2008) argued when he was assessing cotton-cereal systems in West and Central Africa. That situation could positively impact their performance in term of productivity compared to those under private system, since the cotton extension is better developed and delivered than the NGO’s extension. This assumption is confirmed in the meta-analysis. Indeed, the TE score of farmers growing cotton under public zone was estimated on average at 61%, while it was at 38% for those (under public zone) who are not growing cotton. And the TE score (46%) of farmers in the private zone is even
higher than that for those in the public zone and who are not growing cotton; meaning that overall, private extension seems to be more efficient than public extension in terms of improving farmers’ production and productivity.

**Table 4.24. Determinants of Technical Efficiency Levels**

<table>
<thead>
<tr>
<th>Variables</th>
<th>model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.0661*</td>
</tr>
<tr>
<td></td>
<td>(0.0348)</td>
</tr>
<tr>
<td>Edu</td>
<td>0.0157</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
</tr>
<tr>
<td>Offfarm</td>
<td>0.0155</td>
</tr>
<tr>
<td></td>
<td>(0.0316)</td>
</tr>
<tr>
<td>FBO</td>
<td>0.0375</td>
</tr>
<tr>
<td></td>
<td>(0.0320)</td>
</tr>
<tr>
<td>Farmown</td>
<td>-0.0281</td>
</tr>
<tr>
<td></td>
<td>(0.0249)</td>
</tr>
<tr>
<td>Agricexp</td>
<td>-0.0007</td>
</tr>
<tr>
<td></td>
<td>(0.0013)</td>
</tr>
<tr>
<td>Croptype</td>
<td>0.109***</td>
</tr>
<tr>
<td></td>
<td>(0.0375)</td>
</tr>
<tr>
<td>Group</td>
<td>-0.084**</td>
</tr>
<tr>
<td></td>
<td>(0.0357)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.4542***</td>
</tr>
<tr>
<td></td>
<td>(0.0357)</td>
</tr>
<tr>
<td>Sigma</td>
<td>0.1791***</td>
</tr>
<tr>
<td></td>
<td>(0.0876)</td>
</tr>
<tr>
<td>Observations</td>
<td>155</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

LR chi2(9) = 78.15/ Prob > chi2 = 0.0000/ Log likelihood = 50.233301/ Pseudo R2 = -3.5026

Source: Field data, 2016

**4.6. Analysing the Profitability of Delivering Extension Services by the Private Agency**

**4.6.1. Total value of expenditures (in FCFA)**

The intervention period covered by this study is 43 months (October 10th 2012 to April 30th 2016). During that period, the total expenditure of the NGO was estimated at 424 407 996 FCFA consisting of investment costs and operating costs (Table 4.25). The different periods are spread as following:

- period 1: from October, 1st 2012 to September, 30th 2013;
- period 2: from October, 1\textsuperscript{st} 2013 to September, 30\textsuperscript{th} 2014;

- period 3: from October, 1\textsuperscript{st} 2014 to September, 30\textsuperscript{th} 2015;

- period 4; from October, 1\textsuperscript{st} 2015 to April, 30\textsuperscript{th} 2016.

The amounts spent during the four period were different. The organisation spent more money in period 2 (155,284,567 FCFA), followed by period 3 (113,613,703 FCFA) and less money in period 4 (63,207,669 FCFA) and period 1 (92,102,057 FCFA).

The different types of costs considered were: investments in Building (boreholes for irrigation, toilets); other investments such us car (one vehicle 4x4), 10 bicycles, financial management software; expenditures in farmers support activities (farmers training, land establishment, input provision); salaries of employees and other operating costs such as electricity, water and communication bills, vehicle reparation, trips, etc.

Table 4.26 shows the present values of the different amounts indicated in Table 4.25.
Table 4.25. Total expenditures (in FCFA)

<table>
<thead>
<tr>
<th>Items</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investments in Building</td>
<td>23,239,651</td>
<td>49,093,680</td>
<td>23,240,630</td>
<td>8,759,047</td>
<td>104,533,008</td>
</tr>
<tr>
<td>Other Investments</td>
<td>713,696</td>
<td>430,500</td>
<td>1,000,000</td>
<td>35,000</td>
<td>2,179,196</td>
</tr>
<tr>
<td>Operating costs-Salaries of employees</td>
<td>38,898,895</td>
<td>44,401,261</td>
<td>44,329,758</td>
<td>30,548,131</td>
<td>158,178,045</td>
</tr>
<tr>
<td>Operating costs-Expenditures in farmers support</td>
<td>15,057,325</td>
<td>45,214,430</td>
<td>30,430,998</td>
<td>13,389,215</td>
<td>104,091,968</td>
</tr>
<tr>
<td>Other operating costs</td>
<td>14,192,490</td>
<td>16,144,696</td>
<td>14,612,317</td>
<td>10,476,276</td>
<td>55,425,779</td>
</tr>
<tr>
<td>Total</td>
<td>92,102,057</td>
<td>155,284,567</td>
<td>113,613,703</td>
<td>63,207,669</td>
<td>424,407,996</td>
</tr>
</tbody>
</table>

Source: Field data (NGO financial statement), 2016
Table 4.26. Present values of expenditures (in FCFA)

<table>
<thead>
<tr>
<th>Items</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investments in Building</td>
<td>22,080,428</td>
<td>44,318,125</td>
<td>19,933,409</td>
<td>7,137,866</td>
<td>93,469,828</td>
</tr>
<tr>
<td>Other Investments</td>
<td>678,095</td>
<td>388,623</td>
<td>857,696</td>
<td>28,521</td>
<td>1,952,935</td>
</tr>
<tr>
<td>Operating costs-Salaries of employees</td>
<td>36,958,570</td>
<td>40,082,157</td>
<td>38,021,482</td>
<td>24,894,088</td>
<td>139,956,297</td>
</tr>
<tr>
<td>Operating costs-Expenditures in farmers support activities</td>
<td>14,306,247</td>
<td>40,816,226</td>
<td>26,100,563</td>
<td>10,911,053</td>
<td>92,134,089</td>
</tr>
<tr>
<td>Other operating costs</td>
<td>13,484,551</td>
<td>14,574,231</td>
<td>12,532,934</td>
<td>8,537,260</td>
<td>49,128,976</td>
</tr>
<tr>
<td>Total</td>
<td>87,507,891</td>
<td>140,179,362</td>
<td>97,446,084</td>
<td>51,508,788</td>
<td>376,642,125</td>
</tr>
</tbody>
</table>

Source: Field data (NGO financial statement), 2016
4.6.2. Presentation of the total value of benefits

4.6.2.1. Estimation of the programme’ revenue based on costs currently paid by farmers

During the programme period, the NGO received an amount 1,130,000 FCFA during the first period, 9,327,590 FCFA during the second period and 11,852,575 FCFA during the last period. Therefore, the total revenue for the four periods is estimated at **22,310,165 FCFA** for the whole period (Table 4.26). Accounting for the discount rate, the present value of revenue is estimated at **19,659,801 FCFA**.

Table 4.27. Total revenue of the NGO based on current services costs (in FCFA)

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Periods</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Cummulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of revenue</td>
<td>1,130,000</td>
<td>9,327,590</td>
<td>11,852,575</td>
<td>0</td>
<td>22,310,165</td>
</tr>
<tr>
<td>Present value of revenue</td>
<td>1,073,634</td>
<td>8,420,254</td>
<td>10,165,913</td>
<td>0</td>
<td>19,659,801</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

4.6.2.2. Estimation of the potential revenue based on what farmers under public extension services are willing to pay on average

During the period of 43 months, the programme covered 569 farmers for facilitation of access to credit, 2017 farmers both for facilitation of input provision and technical support, and 773 farmers for facilitation of access to market (information based on the NGO interview). Assuming the same period of 43 months, the same number of farmers to cover by type of service and considering the estimated amount farmers under public system are willing to pay for private services (300 FCFA/month for facilitation of access to credit, 455 FCFA/month for facilitation of input provision, 400 FCFA/month for technical support and 455 FCFA/month for facilitation of access to market), a total
revenue of 96,452,655 FCFA can be anticipated for the whole period. For 569 farmers and 43 months, the private organisation could collect a total amount of 7,340,100 FCFA for facilitation of access to credit if each farmer pays actually 300 FCFA/month. For 2017 farmers and 43 months, the organisation could collect respectively 39,462,605 FCFA and 34,692,400 FCFA for facilitation of access to input and technical support, if each farmer pays respectively 455 FCFA/month and 400 FCFA/month. Finally, if each farmer actually pays 450 FCFA/month for facilitation of access to market, the organisation could collect a total amount of 14,957,550 FCFA for a period of 43 months (Table 4.28). The present values of these amounts are presented in Table 4.29.
Table 4.28. Potential Revenues based on Estimates of Farmers’ Bids in FCFA (for farmers under Public System)

<table>
<thead>
<tr>
<th>Items</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitation of access to credit</td>
<td>2,048,400</td>
<td>2,048,400</td>
<td>2,048,400</td>
<td>1,194,900</td>
<td>7,340,100</td>
</tr>
<tr>
<td>Facilitation of input provision</td>
<td>11,012,820</td>
<td>11,012,820</td>
<td>11,012,820</td>
<td>6,424,145</td>
<td>39,462,605</td>
</tr>
<tr>
<td>Technical support</td>
<td>9,681,600</td>
<td>9,681,600</td>
<td>9,681,600</td>
<td>5,647,600</td>
<td>34,692,400</td>
</tr>
<tr>
<td>Facilitation of access to market</td>
<td>4,174,200</td>
<td>4,174,200</td>
<td>4,174,200</td>
<td>2,434,950</td>
<td>14,957,550</td>
</tr>
<tr>
<td>Total</td>
<td>26,917,020</td>
<td>26,917,020</td>
<td>26,917,020</td>
<td>15,701,595</td>
<td><strong>96,452,655</strong></td>
</tr>
</tbody>
</table>

Source: Field data, 2016
Table 4.29. Present values of Potential Revenues based on Estimates of Farmers’ Bids in FCFA (for farmers under public system)

<table>
<thead>
<tr>
<th>Items</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Cummulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitation of access to credit</td>
<td>1,946,223</td>
<td>1,849,143</td>
<td>1,756,905</td>
<td>973,740</td>
<td>6,526,011</td>
</tr>
<tr>
<td>Facilitation of input provision</td>
<td>10,463,486</td>
<td>9,941,555</td>
<td>9,445,658</td>
<td>5,235,123</td>
<td>35,085,822</td>
</tr>
<tr>
<td>Technical support</td>
<td>9,198,669</td>
<td>8,739,828</td>
<td>8,303,875</td>
<td>4,602,306</td>
<td>30,844,678</td>
</tr>
<tr>
<td>Facilitation of access to market</td>
<td>3,965,985</td>
<td>3,768,157</td>
<td>3,580,197</td>
<td>1,984,273</td>
<td>13,298,612</td>
</tr>
<tr>
<td>Total</td>
<td>25,574,363</td>
<td>24,298,683</td>
<td>23,086,635</td>
<td>12,795,442</td>
<td><strong>85,755,123</strong></td>
</tr>
</tbody>
</table>

Source: Field data, 2016
4.6.2.3. Estimation of the potential revenue based on the maximum amounts farmers under public extension services are willing to pay

If the maximum amounts farmers under public extension system are willing to pay are considered and under the same conditions (same number of farmers covered by type of service for 43 months), the organisation may recover 9,542,130 FCFA for facilitation of access to credit, 233,566,583 FCFA for input provision, 49,696,873 FCFA for technical support and 52,949,727 FCFA for facilitation of access to market. The total potential revenue is therefore estimated at \( \text{345,755,313 FCFA} \) (Table 4.30) with a present value of \( \text{307,407,724 FCFA} \) (Table 4.31).

The maximum amount is noted for input provision, followed by facilitation of access to market, technical support and facilitation of access to credit.
Table 4.30. Potential Revenues based on Estimates of the Maximum Farmers’ Bids in FCFA (for farmers under Public System)

<table>
<thead>
<tr>
<th>Items</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitation of access to credit</td>
<td>2,662,920</td>
<td>2,662,920</td>
<td>2,662,920</td>
<td>1,553,370</td>
<td>9,542,130</td>
</tr>
<tr>
<td>Facilitation of input provision</td>
<td>65,181,372</td>
<td>65,181,372</td>
<td>65,181,372</td>
<td>38,022,467</td>
<td>233,566,583</td>
</tr>
<tr>
<td>Technical support</td>
<td>13,868,892</td>
<td>13,868,892</td>
<td>13,868,892</td>
<td>8,090,197</td>
<td>49,696,873</td>
</tr>
<tr>
<td>Facilitation of access to market</td>
<td>14,776,668</td>
<td>14,776,668</td>
<td>14,776,668</td>
<td>8,619,723</td>
<td>52,949,727</td>
</tr>
<tr>
<td>Total</td>
<td>96,489,852</td>
<td>96,489,852</td>
<td>96,489,852</td>
<td>56,285,757</td>
<td>345,755,313</td>
</tr>
</tbody>
</table>
Table 4.31. Present Values of Potential Revenues based on Estimates of maximum Farmers’ Bids in FCFA

<table>
<thead>
<tr>
<th>Items</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitation of access to credit</td>
<td>2,530,090</td>
<td>2,403,886</td>
<td>2,283,977</td>
<td>1,265,862</td>
<td>8,483,815</td>
</tr>
<tr>
<td>Facilitation of input provision</td>
<td>61,930,044</td>
<td>58,840,897</td>
<td>55,905,840</td>
<td>30,985,026</td>
<td>207,661,807</td>
</tr>
<tr>
<td>Technical support</td>
<td>13,177,094</td>
<td>12,519,804</td>
<td>11,895,301</td>
<td>6,592,811</td>
<td>44,185,010</td>
</tr>
<tr>
<td>Facilitation of access to market</td>
<td>14,039,589</td>
<td>13,339,277</td>
<td>12,673,897</td>
<td>7,024,329</td>
<td>47,077,092</td>
</tr>
<tr>
<td>Total</td>
<td>91,676,817</td>
<td>87,103,864</td>
<td>82,759,015</td>
<td>45,868,028</td>
<td>307,407,724</td>
</tr>
</tbody>
</table>


4.6.3. Ratios computation

4.6.3.1. Ratios based on services costs currently supported by farmers

**Benefit cost ratio**

\[
\text{Benefit cost ratio} = \frac{19,659,801}{376,642,125} = 0.0522 \quad (4.1)
\]

**Return on investment**

\[
\text{Return on investment} = \frac{19,659,801 - 376,642,125}{376,642,125} \times 100 = -94,78\% \quad (4.2)
\]

The revenue collected by the NGO from farmers as their contribution to the cost of extension services received covers only 5.22% of the costs incurred; the return on investment is therefore negative and it is not profitable to the NGO to provide these services at the current prices. These results are expected since the NGO, in principle does not provide the service on a total cost-recovery basis.

4.6.3.2. Ratios based on what farmers under public extension services are willing to pay on average

**Benefit cost ratio**

\[
\text{Benefit cost ratio} = \frac{85,755,123}{376,642,125} \times 100 = 0.2277 \quad (4.3)
\]

**Return on investment**

\[
\text{Return on investment} = \frac{85,755,123 - 376,642,125}{376,642,125} = -77,23\% \quad (4.4)
\]

If it is assumed that each farmer under the public system had to pay the estimated mean bids they have indicated, the revenue collected by the NGO from farmers’ contribution to costs of extension services would be 85,755,123 FCFA. That revenue reported to the total value of costs gives a ratio of 0.2277. This means that the total value of revenue
would cover around 22.77% of the total costs of providing the services. Therefore, we can conclude that even at the estimated willingness to pay, it is not beneficial to the NGO to provide the four services. The same conclusion is reached with the negative sign of the return on investment (-0.7723) even if in that case, the NGO could have recovered more of its investment compared to the current situation.

These results show that, the amounts farmers are willing to pay are not sufficient to make the provision of financially sustainable. In fact, for the time period and total expenditure costs considered, at least 5376 farmers may have to pay on average at least 1.520 FCFA/month (424 407 996/5376/52) for the package of 4 services to make the service provision profitable and sustainable.

4.6.3.3. Ratios based on the maximum amounts that farmers under public extension services are willing to pay

**Benefit cost ratio**

\[
\text{Benefit cost ratio} = \frac{307,407,724}{376,642,125} \times 100 = 0.8162 \quad (4.5)
\]

**Return on investment**

\[
\text{Return on investment} = \frac{307,407,724 - 376,642,125}{376,642,125} = -18.38\% \quad (4.6)
\]

When the maximum amounts farmers under public extension system are willing to pay are considered rather than the values of mean, it is observed that the situation improves but still remains not profitable for the NGO. The ratio of revenue reported to the total value of costs is 0.8. This means that the total value of revenue would cover around 82% of the total costs of providing the services (against 22.77% when means are considered). The negative sign of the return on investment ratio leads to the same conclusion. The
same conclusion is reached with the negative sign of the return on investment. But, at the rate of 18.38%, the NGO could not recover only 18.38% of its investments compared to 77.23% when values of the mean are considered.

These results show that, the amounts indicated as willingness to pay are not sufficient to make the provision of services financially sustainable. For the time period (43 months) and total expenditure costs considered (376,642,125 FCFA), the NGO should have received at least 8,759,120 FCFA/month to start recovering its cost. For a total of 5376\footnote{Total number of farmers who have paid for at least one of the four services} farmers assuming paying for the package of four services, each farmer should have paid at least 1,630\footnote{Ratio of total revenue per month over total number of farmers} FCFA/month to make the service provision profitable for the NGO.
CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter has three specific objectives. The first one is to summarize the whole work in order to help capture major and usable findings. The second part gives a conclusion to the work based on the major findings compared to expectations. Finally, the last part makes some policy recommendations.

5.2. Summary

Government of Burkina Faso, in its national extension and advisory services policy, has encouraged a progressive privatization of extension services. Several reasons such as public financial constraints, accountability, higher quality service and effectiveness were evoked to justify this recommendation. The aim of this study was to analyse the opportunity for such a policy, based on what is already done in the sector in order to inform the government for better policy design. Therefore, the main objective of the study was to assess and compare economic performance and quality of public and private extension services in the South Central Burkina Faso. The four specific objectives were to: i) assess and compare the farmers’ perceptions about the quality of existing extension services delivered respectively by private and public sectors; ii) assess demand for private extension services by farmers currently receiving public extension services (where quality was supposed to be improved) and the willingness of farmers currently paying for extension services, to pay more to receive better quality services; iii) assess and compare the current technical efficiencies of farms operating under private and public extension system; iv) assess the profitability of private extension services.
The private sector was represented by an NGO called OCADES-CARITAS and the public sector was represented by the extension services of the Ministry of Agriculture in two regions.

On the first objective, it was found that farmers under public extension system have low access to the four types of services analysed (facilitation of access to credit, facilitation of input provision, facilitation of access to market and technical support) compared to farmers under private extension system in terms of proportion of farmers. Both groups were generally satisfied about the quality of the services, but farmers under private system were more satisfied than farmers accessing public extension. Facilitation of input provision was the least satisfactory service for the two groups, while facilitation of access to market and technical support were the most satisfactory services for farmers under private and public systems.

On the second objective, since farmers were not experiencing the same situation in terms of cost supported for the four types of services; different questions were asked to each group in order to capture the financial commitments they were ready to make, in order to get better and sustainable services. The results showed that farmers under public zone, even if they do not currently pay for services, were still ready to pay provided that quality of services would be greatly improved. Using descriptive statistics, it was found that farmers under public zone are willing to pay on average less for facilitation of access to credit (300.00 FCFA/month), followed by technical support (400.00 FCFA/month), facilitation of access to market (450.00 FCFA/month) and input provision (455.00 FCFA/month).

Farmers under private extension system were willing to pay on average 245.00 FCFA/month more for facilitation of access to credit, 825.00 FCFA/month more for
technical support, 855.00 FCFA/month more for facilitation of input provision and 900.00 FCFA/month more for facilitation of access to market.

For farmers under public system, age, bids, experience in agriculture, land tenure, being a member of an FBO, and undertaking off-farm activities were found to be negatively related to the willingness to pay; whereas gender of the household head and being a maize farmer were positively related to the willingness to pay for respectively facilitation of access to credit and technical support. For farmers under private system, undertaking off-farm activities, farm size and land tenure were positively related to the willingness to pay for one or more services.

Using descriptive statistics and econometric tools, the technical efficiency of farmers under private and public systems were assessed. It was found that on average, farmers under public extension system have a technical efficiency score of 54.0% (with a minimum of 6.0% and maximum of 86.0%), while those under private system have a score of 46.0% (with a minimum of 2.0% and a maximum of 85.0%). Farmers of the two groups are on average technically inefficient, since they only produce 54.0% and 46.0 % of the potential output they could get with the given set of input for those under public and private systems respectively. Being a male and having maize as major crop cultivated were found to be positively related to the level of TE, while being in the private zone was found to affect negatively the potential TE.

Cost benefit ratio and return on investment were used to assess the opportunity of privatising extension services. The benefit estimation was made from three points of view: based on what farmers are already paying for the service; based on the mean values of bids and based on the maximum values of bids estimated as willingness to pay for each service. The results showed that based on what is already being paid and
potential revenues (mean and maximum values of bids estimates for farmers under public extension system), it was not and would not be profitable for the NGO to provide the services. The return on investment was negative for the three cases: -0.94 with what is already paid; -0.77 with the means values and -0.18 for the maximum values. There is however room for the NGO to recover the costs if farmers are ready to pay at least 1630 FCFA/month for the four services together.

5.3. Conclusion

Provision of agricultural extension services is a means to help farmers to deal with challenges faced in the management of their farms. It can help them to increase their production, their productivity, and therefore improve their well-being. But provision of extension services needs resources (human, material and financial) which are not always available or sufficient. And if these resources are not available or sufficient, it would be very difficult for agricultural extension services to effectively be effective and efficient.

In Burkina Faso, Government is financially constrained and that led to a progressive involvement of private initiatives in the provision of extension services. As revealed by the study, farmers positively appreciate extension services received from the two types of providers (public and private sectors) even if private extension was more appreciated by farmers than public extension.

And even if the provision of private extension services is not yet profitable as it has been shown, amounts farmers indicated as their willingness to pay and their levels of technical efficiency show that there is room for extension initiatives to be developed, improved and to more involve farmers in the design and financing of extension activities.
5.4. Policy Implications

Several policy recommendations can be raised from findings of the study.

1. Since farmers served by public extension are satisfied with the provision of the services and are willing to pay for them, government can still offer the services but start charging farmers who receive the services, incrementally.

2. Farmers are interested by all the services and providing the services as a package has the potential to make such provision profitable as shown for the NGO. Therefore, in providing services, government and private organisations may pay attention to the four services (provide them as a package), provided that each service is well explained and well delivered to farmers.

3. Even if farmers are ready to make financial commitments to get quality and sustainable services, providing these services to them is not yet beneficial with the rates farmers under private system are currently paying. However, there is still a room for initiatives to recover the costs of extension provision from farmers. The extension privatisation policy recommended has therefore to be continued, but government can create a better fiscal and business environment (at the early stage of these initiatives) to make provision of extension a lucrative private sector activity.

5.5. Suggestions for Future Research

This study did not consider the impact of public investment in research and extension services. There were challenges (unavailability of researchers, lack of financial information about research and extension costs, constraints for data collection about farmers’ adoption with respect to improved input used, etc.) in collecting accurate information from public research centres and extension offices. If those challenges are
well addressed, it could be very useful to assess impact of public investment compared to private investment in research and agricultural information dissemination.

In analysing the opportunity for privatisation of extension services, drawing a map of private organisations delivering extension services across the country could be very useful. This information can include the intervention zones, the services provided, the number of farmers covered, the amount of money spent for delivering extension, etc.

Finally, it could also be useful to undertake another research to elicit the willingness to pay for extension services based on a full cost-recovery basis.
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APPENDIX

1. Questionnaires

1.1. Questionnaire addressed to farmers under public extension services

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS

UNIVERSITY OF GHANA, LEGON

COMPARATIVE ANALYSIS OF ECONOMIC PERFORMANCE AND QUALITY OF PUBLIC VERSUS PRIVATE EXTENSION SERVICES IN BURKINA FASO

(ANALYSE COMPARATIVE DE LA PERFORMANCE ECONOMIQUE ET DE LA QUALITE DES SERVICES PUBLICS ET PRIVES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES AU BURKINA FASO)

QUESTIONNAIRE FOR THE SURVEY ADDRESSED TO FARMERS UNDER PUBLIC EXTENSION

QUESTIONNAIRE D’ENQUETE ADRESSE AUX PRODUCTEURS COUVERTS PAR L’ETAT

This survey is being out by Ahmed Yves Sylla for his PhD research. The objective of the survey is to compare public and private extension services in terms of economic performance and quality. All the information gathered will be treated with much confidentiality and would be solely for this academic purpose. Your support and contribution would be very much appreciated. For further enquiries, please contact him on syllayves@gmail.com or Tel: (+226) 70377114/ (+233) 268691144.

(Cette enquête est entreprise par Ahmed Yves Sylla dans le cadre de la préparation d’un PhD en Economie et Politiques agricoles. L’objectif de l’enquête est de comparer les
services publics et privés de vulgarisation et d’appui-conseil agricoles en termes de performance économique et de qualité. Toutes les informations collectées seront traitées avec confidentialité et utilisées uniquement dans un cadre académique. Votre soutien et votre contribution seront très appréciés. Pour plus d’information, vous pouvez contacter l’intéressé à syllayves@gmail.com ou aux numéros suivants : (+226) 70377114/ (+233) 268691144.)

INTRODUCTION (INTRODUCTION)

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<tr>
<td>2</td>
<td>Province (Province)</td>
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<tr>
<td>3</td>
<td>Department (Département)</td>
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<tr>
<td>4</td>
<td>Farm household Number (Numéro du ménage agricole)</td>
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<tr>
<td>5</td>
<td>Full name and phone contact of household head (Nom complet et contact du chef de ménage agricole)</td>
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</table>

SECTION I: SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENT (CARACTERISTIQUES SOCIO-ECONOMIQUES DU REPONDANT)

1. Gender (Genre): a. Male (Masculin) [ ] b. Female (Féminin) [ ]

Age of respondent (Age du répondant) ………………………….years (années)
2. Marital status (Statut matrimonial):  a. Single (Célibataire) [ ]  b. Married (Marié) [ ]  c. Divorced (Divorcé) [ ]  d. Separated (Séparé) [ ]  e. Widowed (Veuve ou veuve) [ ]  f. Other (Autre) [ ], specify (spécifier), ........................................

3. Religion (Religion):  a. Catholic (Catholique) [ ]  b. Protestant (Protestant) [ ]  c. Moslem (Musulman) [ ]  d. Traditional (Traditionnel) [ ]  e. Christian and Traditional (Chrétien et Traditionnel) [ ]  f. Moslem and traditional (Musulman et Traditionnel) [ ]  g. atheist (Athée) [ ]  h. Other (Autre) [ ], specify (Spécifier), ........................................

4. Level of Education (Niveau d’éducation):  a. No schooling (Non scolarisé) [ ]  b. Primary school (Ecole primaire) [ ]  c. JHS (1er cycle de l’enseignement secondaire) [ ]  d. SHS (2nd cycle de l’enseignement secondaire) [ ]  e. Tertiary (enseignement tertiaire) [ ]  f. Other (Autre) [ ], specify, ........................................

5. Number of years spent to attain this level of education (Nombre d’années passées pour atteindre ce niveau)).............................................................years

6. i) Do you own a mobile phone? (Possédez-vous un téléphone portable ?)  a. Yes (Oui) [ ]  b. No (Non) [ ];  ii) If yes, How long (Si oui, depuis quand vous le possédez?)........................................years (années)

7. i) Do you own a radio? (Possédez-vous un poste radio?)  a. Yes (Oui) [ ]  b. No (Non) [ ];  ii) If yes, How long (Si oui, depuis quand vous le possédez?)........................................years (années)
8. i) Do you own a Television? Possédez-vous une télévision?)
   a. Yes (Oui) [ ]  b. No (Non) [ ];
   ii) If yes, How long (Si oui, depuis quand vous le possédez?)………………………………….years (années)

9. Do you have access to newspapers (Avez-vous accès aux journaux)  a. Yes (Oui) [ ]  b. No (Non) [ ];
   ii) If yes, How long (Si oui, depuis quand vous le possédez?)………………………………….years (années)

10. What is the size of your household (including yourself)?……………person(s).
    (Quelle est la taille de votre ménage (y compris vous) ?…………….personne(s))

<table>
<thead>
<tr>
<th>Number of adults (≥18 years) (Nombre d'adultes (&gt;18 ans))</th>
<th>Number of children &lt; 18 (Nombre d’enfants (&lt;18 ans))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males (Hommes)</td>
<td>Females (Femmes)</td>
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</tbody>
</table>

11. Number of years of experience in farming (Nombre d’années d’expériences dans l’agriculture)…………………………………………………..years (années)

12. Which crops do you cultivate? (Quels sont les produits que vous cultivez?) a. Maize (Mais) [ ]  b. Millet (Mil) [ ]  c. Sorghum (Sorgho) [ ]  d. Rice (Riz) [ ]  e. Cotton (Coton) [ ]  f. Other (Autre) [ ], specify (Spécifier)………………

13. What are the farm sizes associated with the crops grown? (Quelle est la superficie affectée à chaque culture?) a. Maize (Mais)………..ha  b. Millet (Mil)………..ha  c. Sorghum (Sorgho)…………..ha  d. Rice
14. Do you engage in any off-farm work? (Êtes-vous engagé dans des activités non agricoles?)
a. Yes (Oui) [  ]
b. No (Non) [  ]; **If No, skip to question 17 (Si non, aller à la question 17)**

15. In which off-farm work are you engaged in? (Dans quelle activité non agricole êtes-vous engage?)
   a. Mason, construction work, etc (Maçon, construction, etc.) [  ]
   b. Pottery (Poterie) [  ]
   c. Mining (quarrying, gold winning, etc) (Mines) [  ]
   d. Charcoal/firewood selling (Vente de charbon et de bois de chauffe) [  ]
   e. Artisan (blacksmith, carpentry, tailoring) (Artisan: forgeron, menuisier, tailleur) [  ]
   f. Salaried employee (Employé salarial) [  ]
   g. General trade in agricultural goods (Commerce general de produits agricoles) [  ]
   h. General trade in non-agricultural goods (Commerce general de produits non agricoles) [  ]
   i. Traditional healer (Guérisseur traditionnel) [  ]
   r. Other (Autre) [  ], specify (Spécifier)………………………………………………………………………………

16. How many months per year are you engaged in off farm activities and how much do you earn from such off-farm activities in a month? (Pendant combien de mois dans l’année êtes-vous engagé dans les activités non agricoles et combien gagnez-vous de ces activités en un mois?)

17. Do you belong to any Farmer Based Organization (FBO)? (Appartenez-vous à une organisation paysanne?)
a. Yes (Oui) [  ]
b. No (Non) [  ]
18. How often do you meet as an association to discuss issues concerning production? (Combien de fois vous vous rencontrez en association pour discuter des problèmes de production ?)  

- a. Weekly (Hebdomadaire) [ ]
- b. Monthly (Mensuel) [ ]
- c. Quarterly (Trimestriel) [ ]
- d. Yearly (Annuel) [ ]

19. If Yes to Q17, what benefits did you derive from membership in this FBO? (Multiple Responses) (Si oui à la question 17, quels sont les bénéfices liés à l’appartenance à une organisation paysanne? (Réponses multiples possibles))

- a. Inputs procurement (Approvisionnement en intrants) [ ]
- b. Marketing (Commercialisation) [ ]
- c. Agro processing (Transformation agricole) [ ]
- d. Production (Production) [ ]
- e. Internal credit schemes (Systèmes de crédit à l’interne) [ ]
- f. Welfare services [ ] (Prestations sociales)
- g. Mutual labour support (Soutien mutuel en main d’œuvre) [ ]
- h. Other (Autre) [ ], specify (Spécifier)…………………………

SECTION II: ATTITUDE OF FARMERS TOWARDS EXTENSION SERVICES (ATTITUDE DES PRODUCTEURS VIS-À-VIS DES SERVICES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES)

20. Do you receive any support in access to credit? (Recevez-vous un quelconque soutien dans l’accès au crédit ?)  

- a. Yes (Oui) [ ]
- b. No (Non) [ ]

If No, skip to question 24 (Si non, passer à la question 24),
21. What is the nature of the support? (Quelle est la nature du soutien?) .................................................................

22. Where do you borrow the credit from? (D’où vient le crédit que vous empruntez?) .................................................................

23. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis), 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)

<table>
<thead>
<tr>
<th>Quality attributes (Attributs de qualité)</th>
<th>Select from 1 to 5 (Sélectionner de 1 à 5)</th>
<th>Reasons for your answer (Justifications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The service is relevant for your operation (Le service est approprié (pertinent) pour votre operation)</td>
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<td></td>
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<tr>
<td>B. The service is available (Le service est disponible)</td>
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<tr>
<td>C. Provision of the service is timely (Le service est fourni en temps opportune)</td>
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<tr>
<td>D. The cost of the service is affordable/reasonable (Le coût du service est abordable/raisonnable)</td>
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<td></td>
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<tr>
<td>E. The service is accurate (Le service est précis)</td>
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24. Are you supplied with input by the organization? (Etes-vous approvisionnés en intrants par l’organisation?) a. Yes (Oui) [ ] b. No (Non) [ ]; If No, skip to question 28 (Si non, passer à la question 28)

25. Which input are you supplied with? (Quels sont les intrants qui font l’objet d’approvisionnement?) a. Fertilizer (Engrais) [ ], specify (Spécifier)………. b.
Insecticide (Insecticide) [ ], specify (Spécifier)…… c. Seed (Semences) [ ], specify (Spécifier)……

26. Which quantity of input did you apply on your farm? (Quelle quantité d’intrants avez-vous appliquée sur votre superficie?) a. Fertilizer………... b. Insecticide………... c. Seed………...

27. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis). 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)

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<td>E. The service is accurate (Le service est précis)</td>
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28. Do you receive any technical training from the organization? (Recevez-vous un appui technique de la part de l’organisation?) a. Yes (Oui) [ ] b. No (Non) [ ];

If No, skip to question 31, (Si non, passer à la question 31)

29. What types of training did you receive? (Quels types d’appui technique recevez-vous?)………………………………………………
30. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis), 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)

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<tr>
<td>E. The service is accurate (Le service est précis)</td>
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31. Do you receive any support to access markets? (Recevez-vous un quelconque soutien dans l’accès au marché?) a. Yes (Oui) [ ]  b. No (Non) [ ]; If No, skip to section III, (Si non, passer à la section III)

32. Which types of support do you receive? (Quels types de soutien recevez-vous?) ........................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................

33. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis), 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)
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<tr>
<td>E. The service is accurate (Le service est précis)</td>
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**SECTION III: WILLINGNESS TO BE SERVED AND TO PAY FOR EXTENSION SERVICES (DISPOSITION À ETRE SERVI ET A PAYER POUR REVOIR DES SERVICES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES)**

34. Let us suppose that services can be designed and supplied to you by private enterprises which will charge the economic cost to you. Would you agree to be served? (Supposons que des services peuvent être conçus et fournis par des entreprises privées qui vont vous fixer un prix économique. Accepteriez-vous d’être servis?) **If No to one of the answer, skip to question 39 (Si non, passer à la question 39)**

<table>
<thead>
<tr>
<th>Facilitation of access to credit (Facilitation de l’accès au crédit)</th>
<th>Input supply (Fourniture d’intrants)</th>
<th>Technical Training (Appui technique)</th>
<th>Facilitation of access to market (Facilitation de l’accès au marché)</th>
</tr>
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<tbody>
<tr>
<td>a. Yes (Oui) [ ]</td>
<td>a. Yes (Oui) [ ]</td>
<td>a. Yes (Oui) [ ]</td>
<td>a. Yes (Oui) [ ]</td>
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<tr>
<td>b. No (Non) [ ]</td>
<td>b. No (Non) [ ]</td>
<td>b. No (Non) [ ]</td>
<td>b. No (Non) [ ]</td>
</tr>
</tbody>
</table>
35. For you to be facilitated in access to credit, how much are you willing to pay per month? For each following amount, indicate the level of your willingness to pay (Pour être facilité dans l’accès au crédit, combien êtes-vous disposés à payer? Pour les montants suivants, indiquez le niveau de votre disposition à payer.)

<table>
<thead>
<tr>
<th>Amount</th>
<th>a. Definitely Yes (Définitivement Oui)</th>
<th>b. Probably Yes (Probablement Oui)</th>
<th>c. Not Sure (Pas sûr)</th>
<th>d. Probably No (Probablement Non)</th>
<th>e. Definitely No (Définitivement Non)</th>
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<tbody>
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<td>i) 175 FCFA</td>
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<td>ii) 200 FCFA</td>
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<td>iii) 225 FCFA</td>
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<td>iv) 250 FCFA</td>
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<td>v) 275 FCFA</td>
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<tr>
<td>vi) 300 FCFA</td>
<td>[ ]</td>
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</tr>
</tbody>
</table>
vii) 325 FCFA  
  a. Definitely Yes (Définitivement Oui) [ ]  
  b. Probably Yes (Probablement Oui) [ ]  
  c. Not Sure (Pas sûr) [ ]  
  d. Probably No (Probablement Non) [ ]  
  e. Definitely No (Définitivement Non) [ ]

36. For you to be adequately supplied with input, how much are you willing to pay per month? For each following amount, indicate the level of your willingness to pay. (Pour être approvisionné de façon adéquate en intrants agricoles, combien êtes-vous disposés à payer? Pour les montants suivants, indiquez le niveau de votre disposition à payer.)

i) 210 FCFA  
  a. Definitely Yes (Définitivement Oui) [ ]  
  b. Probably Yes (Probablement Oui) [ ]  
  c. Not Sure (Pas sûr) [ ]  
  d. Probably No (Probablement Non) [ ]  
  e. Definitely No (Définitivement Non) [ ]

ii) 240 FCFA  
  a. Definitely Yes (Définitivement Oui) [ ]  
  b. Probably Yes (Probablement Oui) [ ]  
  c. Not Sure (Pas sûr) [ ]  
  d. Probably No (Probablement Non) [ ]  
  e. Definitely No (Définitivement Non) [ ]

iii) 270 FCFA  
  a. Definitely Yes (Définitivement Oui) [ ]  
  b. Probably Yes (Probablement Oui) [ ]  
  c. Not Sure (Pas sûr) [ ]  
  d. Probably No (Probablement Non) [ ]  
  e. Definitely No (Définitivement Non) [ ]

iv) 300 FCFA  
  a. Definitely Yes (Définitivement Oui) [ ]  
  b. Probably Yes (Probablement Oui) [ ]  
  c. Not Sure (Pas sûr) [ ]  
  d. Probably No (Probablement Non) [ ]  
  e. Definitely No (Définitivement Non) [ ]

v) 330 FCFA  
  a. Definitely Yes (Définitivement Oui) [ ]  
  b. Probably Yes (Probablement Oui) [ ]  
  c. Not Sure (Pas sûr) [ ]  
  d. Probably No (Probablement Non) [ ]  
  e. Definitely No (Définitivement Non) [ ]
37. For you to be regularly trained in agricultural techniques, how much are you willing to pay per month? For each following amount, indicate the level of your willingness to pay. (Pour être régulièrement formé aux techniques agricoles, combien êtes-vous disposés à payer? Pour les montants suivants, indiquez le niveau de votre disposition à payer.)

vi) 360 FCFA  a. Definitely Yes (Définitivement Oui) [ ]  b. Probably Yes (Probablement Oui) [ ]  c. Not Sure (Pas sûr) [ ]  d. Probably No (Probablement Non) [ ]  e. Definitely No (Définitivement Non) [ ]

vii) 390 FCFA  a. Definitely Yes (Définitivement Oui) [ ]  b. Probably Yes (Probablement Oui) [ ]  c. Not Sure (Pas sûr) [ ]  d. Probably No (Probablement Non) [ ]  e. Definitely No (Définitivement Non) [ ]
38. For you to be facilitated to access market, how much are you willing to pay per month? For each following amount, indicate the level of your willingness to pay.

(Pour être facilité dans l’accès au marché, combien êtes-vous disposés à payer?)

i) 210 FCFA  a. Definitely Yes (Définitivement Oui) [ ]  b. Probably Yes (Probablement Oui) [ ]
   c. Not Sure (Pas sûr) [ ]  d. Probably No (Probablement Non) [ ]  e. Definitely No (Définitivement Non) [ ]

ii) 240 FCFA  a. Definitely Yes (Définitivement Oui) [ ]  b. Probably Yes (Probablement Oui) [ ]
   c. Not Sure (Pas sûr) [ ]  d. Probably No (Probablement Non) [ ]  e. Definitely No (Définitivement Non) [ ]

iii) 270 FCFA  a. Definitely Yes (Définitivement Oui) [ ]  b. Probably Yes (Probablement Oui) [ ]
   c. Not Sure (Pas sûr) [ ]  d. Probably No (Probablement Non) [ ]  e. Definitely No (Définitivement Non) [ ]
iv) 300 FCFA  
   a. Definitely Yes (Définitivement Oui) [ ]  
   b. Probably Yes (Probablement Oui) [ ]  
   c. Not Sure (Pas sûr) [ ]  
   d. Probably No (Probablement Non) [ ]  
   e. Definitely No (Définitivement Non) [ ]

v) 330 FCFA  
   a. Definitely Yes (Définitivement Oui) [ ]  
   b. Probably Yes (Probablement Oui) [ ]  
   c. Not Sure (Pas sûr) [ ]  
   d. Probably No (Probablement Non) [ ]  
   e. Definitely No (Définitivement Non) [ ]

vi) 360 FCFA  
   a. Definitely Yes (Définitivement Oui) [ ]  
   b. Probably Yes (Probablement Oui) [ ]  
   c. Not Sure (Pas sûr) [ ]  
   d. Probably No (Probablement Non) [ ]  
   e. Definitely No (Définitivement Non) [ ]

vii) 390 FCFA  
   a. Definitely Yes (Définitivement Oui) [ ]  
   b. Probably Yes (Probablement Oui) [ ]  
   c. Not Sure (Pas sûr) [ ]  
   d. Probably No (Probablement Non) [ ]  
   e. Definitely No (Définitivement Non) [ ]

39. Why are you not willing to be provided in the service (s)? (Pourquoi n’êtes-vous pas dispose à recevoir ces services du privé?)

i) Facilitation of access to credit (Facilitation de l’accès au crédit).................................................................................................................................
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ii) Input Supply (Approvisionnement en intrants agricoles).................................................................................................................................
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iii) Training (Formation aux techniques agricoles)…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………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<th>Crop 1</th>
<th>Crop 2</th>
<th>Crop 3</th>
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<tbody>
<tr>
<td>Farm size</td>
<td>Farm ownership</td>
<td>Rental cost</td>
</tr>
</tbody>
</table>

**Farm ownership (propriété foncière):**
1. Family property (propriété familiale);
2. Personal property (propriété personnelle);
3. Lease (Bail),
4. Sharecropping (Association de culture)

**Type of labour (type de maind’œuvre utilisée):**
1. Hired labour (Main d’œuvre louée)
2. Family labour (Main d’œuvre familiale)
3. Both (Main d’œuvre familiale et main d’œuvre louée);

**Type of fertilizer (Type d’engrais):**
1. Organic (Organic);
2. Inorganic (Inorganic)

42. What are the prices of the various input and output? (Quels sont les prix des intrants et de la production?)
<table>
<thead>
<tr>
<th>Inputs</th>
<th>Crop 1</th>
<th>Crop 2</th>
<th>Crop 3</th>
<th>Price of output at the end of the season (FCFA/Kg)</th>
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<tbody>
<tr>
<td></td>
<td>Inorganic Fertilizer (FCFA/Kg)</td>
<td>Pesticides (FCFA/Litres)</td>
<td>Seed (FCFA/Kg)</td>
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43. What are the family and hired labour used on the first crop\textsuperscript{14}

\textsuperscript{14} The same table was used for the three major crops
<table>
<thead>
<tr>
<th>Farm Activity</th>
<th>Hired labour</th>
<th>Family labour</th>
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<table>
<thead>
<tr>
<th>Crop</th>
<th>No. of days</th>
<th>No. of persons</th>
<th>Wages/ day</th>
<th>If contract indicate the amount</th>
<th>Cost of food if any</th>
<th>No. of Days</th>
<th>No. of persons</th>
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</thead>
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<td>Female</td>
<td>Children</td>
<td>Male</td>
<td>Female</td>
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<td>Farm Activity</td>
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<td>Harvesting</td>
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<td>Bagging</td>
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<td>Transportation</td>
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</tbody>
</table>
44. What are the family and hired labour used on the third crop? (Quels sont les mains d’œuvre familiale et louée pour la troisième culture?)

SECTION V: EVALUATING THE BENEFITS OF EXTENSION PROGRAMMES ((EVALUATION DES BENEFICES DES PROGRAMMES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES)

45. What is the actual (or potential) amount of money saved as a result of changing behavior or adopting new practices? (Quel est le montant actuel (ou potentiel) d’argent économisé du fait de l’adoption de nouvelles pratiques?)............................................................................................................
.............................................................................................................FCFA

46. What is the revenue you will be able to obtain from a similar service or product? (Quel est le revenu que vous serez capables d’obtenir d’un service similaire?).............................................................................................................................FCFA

47. What is the incremental amount of money received as a result of increased production or quality of product? (Quel est le revenu additionnel reçu du fait de l’augmentation du niveau de production ou de la qualité du produit?).............................................................FCFA
1.2. Questionnaire addressed to farmers under private extension services

DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGribusiness

UNIVERSITY OF GHANA, LEGON

COMPARATIVE ANALYSIS OF ECONOMIC PERFORMANCE AND QUALITY OF PUBLIC VERSUS PRIVATE EXTENSION SERVICES IN BURKINA FASO

(ANALYSE COMPARATIVE DE LA PERFORMANCE ECONOMIQUE ET DE LA QUALITE DES SERVICES PUBLICS ET PRIVES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES AU BURKINA FASO)

QUESTIONNAIRE FOR THE SURVEY (ADDRESSED TO FARMERS UNDER OCADES EXTENSION

QUESTIONNAIRE D’ENQUETE ADRESSE AUX PRODUCTEURS COUVERTS PAR L’OCADES

This survey is being out by Ahmed Yves Sylla for his PhD research. The objective of the survey is to compare public and private extension services in terms of economic performance and quality. All the information gathered will be treated with much confidentiality and would be solely for this academic purpose. Your support and contribution would be very much appreciated. For further enquiries, please contact him on syllayves@gmail.com or Tel: (+226) 70377114/ (+233) 268691144.

(Cette enquête est entreprise par Ahmed Yves Sylla dans le cadre de la préparation d’un PhD en Economie et Politiques agricoles. L’objectif de l’enquête est de comparer les services publics et privés de vulgarisation et d’appui-conseil agricoles en termes de performance économique et de qualité. Toutes les informations collectées seront traitées avec confidentialité et utilisées uniquement dans un cadre académique. Votre
soutien et votre contribution seront très appréciés. Pour plus d’information, vous pouvez contacter l’intéressé à syllayves@gmail.com ou aux numéros suivants : (+226) 70377114/ (+233) 268691144.

INTRODUCTION (INTRODUCTION)

<table>
<thead>
<tr>
<th>No</th>
<th>Items</th>
<th>Name</th>
<th>Code</th>
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<tr>
<td>2</td>
<td>Province</td>
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</tr>
<tr>
<td>3</td>
<td>Department</td>
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<td>6</td>
<td>Phone contact of</td>
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</table>

SECTION I: SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENT (CARACTERISTIQUES SOCIO-ECONOMIQUES DU REPONDANT)

1. Gender (Genre): a. Male (Masculin) [ ]  b. Female (Féminin) [ ]

Age of respondent (Age du répondant) ………………………….completed years (années révolues)

2. Marital status (Statut matrimonial): a. Single (Célibataire) [ ]  b. Married (Marié)[ ]  c. Divorced (Divorcé) [ ]  d. Separated (Séparé) [ ]  e. Widowed (Veuf ou veuve) [ ]  f. Other (Autre) [ ], specify (spécifier), ……………………..
3. Religion (Religion):  
   a. Catholic (Catholique) [ ]  
   b. Protestant (Protestant) [ ]  
   c. Moslem (Musulman) [ ]  
   d. Traditional (Traditionnel) [ ]  
   e. Christian and Traditional (Chrétien et Traditionnel) [ ]  
   f. Moslem and traditional (Musulman et Traditionnel) [ ]  
   g. atheist (Athée) [ ]  
   h. Other (Autre) [ ]
specify (Spécifier),…………………………

4. Level of Education (Niveau d’éducation):  
   a. No schooling (Non scolarisé) [ ]  
   b. Primary school (Ecole primaire) [ ]  
   c. JHS (1er cycle de l’enseignement secondaire) [ ]  
   d. SHS (2nd cycle de l’enseignement secondaire) [ ]  
   e. Tertiary (enseignement tertiaire) [ ]  
   f. Other (Autre) [ ], specify,…………………………

5. Number of years spent to attain this level of education (Nombre d’années passées pour atteindre ce niveau)……………………………………………………………………years

6. i) Do you own a mobile phone? (Possédez-vous un téléphone portable ?)  
   a. Yes (Oui) [ ]  
   b. No (Non) [ ];  
   ii) If yes, How long (Si oui, depuis quand vous le possédez?)…………………………years (années)

7. i) Do you own a radio? (Possédez-vous un poste radio?)  
   a. Yes (Oui) [ ]  
   b. No (Non) [ ];  
   ii) If yes, How long (Si oui, depuis quand vous le possédez?)…………………………years (années)

8. i) Do you own a Television? Possédez-vous une télévision?)  
   a. Yes (Oui) [ ]  
   b. No (Non) [ ];  
   ii) If yes, How long (Si oui, depuis quand vous le possédez?)…………………………years (années)

9. Do you have access to newspapers (Avez-vous accès aux journaux)  
   a. Yes (Oui) [ ]  
   b. No (Non) [ ];  
   ii) If yes, How long (Si oui, depuis quand vous le possédez?)…………………………years (années)
10. What is the size of your household (including yourself)? ...........person(s).
   
   (Quelle est la taille de votre ménage (y compris vous) ? .............. personne(s))

<table>
<thead>
<tr>
<th>Number of adults (&gt;18 years) (Nombre d’adultes (&gt;18 ans))</th>
<th>Number of children &lt;18 (Nombre d’enfants (&lt;18 ans))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males (Hommes)</td>
<td>Females (Femmes)</td>
</tr>
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<td></td>
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</tr>
</tbody>
</table>

11. Number of years of experience in farming (Nombre d’années d’expériences dans l’agriculture) .......................................................... years (années)

12. Which crops do you cultivate? (Quels sont les produits que vous cultivez?) a. Maize (Mais) [ ] b. Millet (Mil) [ ] c. Sorghum (Sorgho) [ ] d. Rice (Riz) [ ] e. Cotton (Coton) [ ] f. Other (Autre) [ ], specify (Spécifier) ..................

13. What are the farm sizes associated with the crops grown? (Quelle est la superficie affectée à chaque culture?) a. Maize (Mais) ............ha b. Millet (Mil) ............ha c. Sorghum (Sorgho) ............ha d. Rice (Riz) ............ha e. Cotton (Coton) ............ha f. Other (Autre) (Specify) ............ha

14. Do you engage in any off-farm work? (Etes-vous engagé dans des activités non agricoles?) a. Yes (Oui) [ ] b. No (Non) [ ]; If No, skip to question 17 (Si non, aller à la question 17)

15. In which off-farm work are you engaged in? (Dans quelle activité non agricole êtes-vous engage?) a. Mason, construction work, etc (Maçon, construction, etc.) [ ] b. Pottery (Poterie) [ ] c. Mining (quarrying, gold winning, etc)
15. (Mines) [ ]

d. Charcoal/firewood selling (Vente de charbon et de bois de chauffe) [ ]
e. Artisan (blacksmith, carpentry, tailoring) (Artisan: forgeron, menuisier, tailleur) [ ]
f. Salaried employee (Employé salarial) [ ]
g. General trade in agricultural goods (Commerce general de produits agricoles) [ ]
h. General trade in non-agricultural goods (Commerce general de produits non agricoles) [ ]
i. Traditional healer (Guérisseur traditionnel) [ ]
r. Other (Autre) [ ], specify (Spécifier) .................................................................

16. How many months per year are you engaged in off farm activities and how much do you earn from such off-farm activities in a month? (Pendant combien de mois dans l’année êtes-vous engagé dans les activités non agricoles et combien gagnez-vous de ces activités en un mois?)

<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
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<td>Tick</td>
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</tbody>
</table>

17. Do you belong to any Farmer Based Organization (FBO)? (Appartenez-vous à une organisation paysanne?)

a. Yes (Oui) [ ]
b. No (Non) [ ]

18. How often do you meet as an association to discuss issues concerning production? (Combien de fois vous vous rendez en association pour discuter des problèmes de production?)

a. Weekly (Hebdomadaire) [ ]
b. 
19. If Yes to Q17, what benefits did you derive from membership in this FBO?

(Multiple Responses) (Si oui à la question 17, quels sont les bénéfices liés à l’appartenance à une organisation paysanne? (Réponses multiples possibles))
a. Inputs procurement (Approvisionnement en intrants) [ ]
   b. Marketing (Commercialisation) [ ]
c. Agro processing (Transformation agricole) [ ]
d. Production (Production) [ ]
e. Internal credit schemes (Systèmes de crédit à l’interne) [ ]
f. Welfare services [ ] (Prestations sociales)
g. Mutual labour support (Soutien mutuel en main d’œuvre) [ ]
h. Other (Autre) [ ], specify (Spécifier)………………………….

SECTION II: ATTITUDE OF FARMERS TOWARDS EXTENSION SERVICES

(ATTITUDE DES PRODUCTEURS VIS-À-VIS DES SERVICES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES)

20. Do you receive any support in access to credit? (Recevez-vous un quelconque soutien dans l’accès au crédit ?) a. Yes (Oui) [ ] b. No (Non) [ ]: If No, skip to question 24 (Si non, passer à la question 24).

21. What is the nature of the support? (Quelle est la nature du soutien ?)………………………………………………………………………………………………………………………………………………

22. Where do you borrow the credit from? (D’où vient le crédit que vous empruntez?)………………………………………………………………………………………………………………
23. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis) 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)

<table>
<thead>
<tr>
<th>Quality attributes (Attributs de qualité)</th>
<th>Select from 1 to 5 (Sélectionner de 1 à 5)</th>
<th>Reasons for your answer (Justifications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The service is relevant for your operation (Le service est approprié (pertinent) pour votre operation)</td>
<td></td>
<td></td>
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<tr>
<td>B. The service is available (Le service est disponible)</td>
<td></td>
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<tr>
<td>C. Provision of the service is timely (Le service est fourni en temps opportun)</td>
<td></td>
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<tr>
<td>D. The cost of the service is affordable/reasonable (Le coût du service est abordable/raisonnable)</td>
<td></td>
<td></td>
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<tr>
<td>E. The service is accurate (Le service est précis)</td>
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</tbody>
</table>

24. Are you supplied with input by the organization? (Etes-vous approvisionnés en intrants par l’organisation?) a. Yes (Oui) [ ] b. No (Non) [ ]; **If No, skip to question 28 (Si non, passer à la question 28)**

25. Which input are you supplied with? (Quels sont les intrants qui font l’objet d’approvisionnement?) a. Fertilizer (Engrais) [ ], specify (Spécifier)……… b. Insecticide (Insecticide) [ ], specify (Spécifier)……… c. Seed (Semences) [ ], specify (Spécifier)………

26. Which quantity of input did you apply on your farm? (Quelle quantité d’intrants avez-vous appliquée sur votre superficie?) a. Fertilizer…………… b. Insecticide……… c. Seed………
27. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis) 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)

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<tr>
<th>Quality attributes (Attributs de qualité)</th>
<th>Select from 1 to 5 (Sélectionner de 1 à 5)</th>
<th>Reasons for your answer (Justifications)</th>
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<tbody>
<tr>
<td>A. The service is relevant for your operation (Le service est approprié (pertinent) pour votre operation)</td>
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<tr>
<td>C. Provision of the service is timely (Le service est fourni en temps opportun)</td>
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<tr>
<td>D. The cost of the service is affordable/reasonable (Le coût du service est abordable/raisonnable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. The service is accurate (Le service est précis)</td>
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</tbody>
</table>

28. Do you receive any technical training from the organization? (Recevez-vous un appui technique de la part de l’organisation?) a. Yes (Oui) [ ] b. No (Non) [ ]; If No, skip to question 31, (Si non, passer à la question 31)

29. What types of training did you receive? (Quels types d’appui technique recevez-vous?)…………………………………………………………..

30. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis) 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)
31. Do you receive any support to access markets? (Recevez-vous un quelconque soutien dans l’accès au marché?) a. Yes (Oui) [ ] b. No (Non) [ ]; If No, skip to section III. (Si non, passer à la section III)

32. Which types of support do you receive? (Quels types de soutien recevez-vous?) ..........................................................

33. What are your feelings about the quality of that service according to the following attributes? (Comment appréciez-vous la qualité de ce service selon les attributs suivants?) Choose among (Choisir parmi) 1. Very Satisfied (Très satisfait), 2. Satisfied (Satisfait), 3. Undecided (Indécis) 4. Dissatisfied (Insatisfait), 5. Very Dissatisfied (Très insatisfait)

SECTION III: WILLINGNESS TO BE SERVED AND TO PAY FOR EXTENSION SERVICES (DISPOSITION A PAYER POUR LES SERVICES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES)
34. Let us suppose that the amount of money you pay is not sufficient to make the service delivery sustainable. Would you be willing to pay more for the services delivery to be sustainable and the services to be improved? (Supposons que le montant que vous payez déjà n’est pas suffisant pour que la fourniture du service soit soutenable. Seriez-vous prêt à payer plus pour le service puisse être amélioré et délivré de façon durable?) **If No to one of the answer, skip to question 39 (Si non à l’une de ces réponses, passer à la question 39)**

<table>
<thead>
<tr>
<th>Quality attributes (Attributs de qualité)</th>
<th>Select from 1 to 5 (Sélectionner de 1 à 5)</th>
<th>Reasons for your answer (Justifications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The service is relevant for your operation (Le service est approprié (pertinent) pour votre operation)</td>
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<td></td>
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<tr>
<td>B. The service is available (Le service est disponible)</td>
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<tr>
<td>C. Provision of the service is timely (Le service est fourni en temps opportun)</td>
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<tr>
<td>D. The cost of the service is affordable/reasonable (Le coût du service est abordable/raisonnable)</td>
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<tr>
<td>E. The service is accurate (Le service est précis)</td>
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</tbody>
</table>

35. For you to be more facilitated in access to credit, how much are you willing to pay? (Pour faciliter votre accès au crédit, combien êtes-vous prêts à payer ?) .......................................................... FCFA

36. For you to be more adequately supplied with input, how much are you willing to pay? (Pour être approvisionné de façon adéquate en intrants, combien êtes-vous prêts à payer ?) .......................................................... FCFA
37. For you to be more regularly trained in agricultural techniques, how much are you willing to pay? (Pour être régulièrement formé aux techniques agricoles, combien êtes-vous prêts à payer ?)………………………………………………FCFA

38. For you to be more facilitated to access market, how much are you willing to pay? (Pour faciliter votre accès au marché, combine êtes-vous prêts à payer ?)…………………………………………………………………………………………FCFA

39. Why are you not willing to pay more? (Pourquoi n’êtes-vous pas prêts à payer plus?)

i) Facilitation of access to credit (Facilitation de l’accès au credit)………………………………………………………………………………………………………………………………………………………………………

ii) Input Supply (Approvisionnement en intrants)………………………………………………………………………………………………………………………………………………………………………………………………………………

iii) Training (Formation aux techniques agricoles)………………………………………………………………………………………………………………………………………………………………………………………………………………

iv) Facilitation of access to market (Facilitation de l’accès au marché)…………………………………………………………………………………………………………………………………………………………………………………………
SECTION IV: TECHNICAL EFFICIENCY OF FARM PRODUCTION
(EFFICACITE TECHNIQUE DE LA PRODUCTION)

40. What are the three major crops cultivated? (Quelles sont les trois principaux produits que vous cultivez?) 1……………. 2……………. 3………………

41. What are the plot characteristics associated to each crop indicated? (Quelles sont les caractéristiques des parcelles associées à chaque culture?

<table>
<thead>
<tr>
<th>Crop 1</th>
<th>Crop 2</th>
<th>Crop 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm size</td>
<td>Farm ownership</td>
<td>Rental cost</td>
</tr>
<tr>
<td>Type of labour</td>
<td>Number of family labour or hired labour</td>
<td>Quantity of seed used (Kg)</td>
</tr>
<tr>
<td>Type of fertilizer used</td>
<td>Quantity of fertilizer applied (Kg)</td>
<td>Quantity of pesticides (Litres)</td>
</tr>
<tr>
<td>Quantity produced (Kg)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Farm ownership (propriété foncière):**
1. Family property (propriété familiale);
2. Personal property (propriété personnelle);
3. Lease (Bail), 4. Sharecropping (association de culture)

**Type of labour (type de maind’oeuvre utilisée):**
1. Hired labour (Main d’œuvre louée) 2. Family labour (Main d’œuvre familiale) 3. Both (Main d’œuvre familiale et main d’œuvre louée);
Type of fertilizer (Type d’engrais): 1. Organic (Organic); 2. Inorganic (Inorganic)

42. What are the prices of the various input and output? (Quels sont les prix des intrants et de la production?)
<table>
<thead>
<tr>
<th>Inputs</th>
<th>Inorganic Fertilizer (FCFA/kg)</th>
<th>Pesticides (FCFA/Litres)</th>
<th>Seed (FCFA/Kg)</th>
<th>Organic fertilizer (FCFA/Kg)</th>
<th>Price of output at the end of the season (FCFA/Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop 1</td>
<td></td>
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<tr>
<td>Crop 3</td>
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</tbody>
</table>

43. What are the family and hired labour used on the three crops\textsuperscript{15}?  

\textsuperscript{15} The same table was used for each of the major crops
<table>
<thead>
<tr>
<th>Farm Activity</th>
<th>Hired labour</th>
<th>Family labour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop 1</td>
<td>No. of days</td>
<td>No. of persons</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

160
<table>
<thead>
<tr>
<th>Land Preparation</th>
<th>Male</th>
<th>Female</th>
<th>Children</th>
<th>Male</th>
<th>Female</th>
<th>Children</th>
<th>Male</th>
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<td>Planting</td>
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<td>Fist weeding</td>
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<td></td>
</tr>
<tr>
<td>Farm Activity</td>
<td>Hired labour</td>
<td>Family labour</td>
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<td>Second Weeding</td>
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<td>Fertilizer application</td>
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<td>Chemicals application</td>
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<td>Harvesting</td>
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<td>Bagging</td>
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<td>Transportation</td>
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</tbody>
</table>
SECTION V: EVALUATING THE BENEFITS OF EXTENSION PROGRAMMES (EVALUATION DES BENEFICES DES PROGRAMMES DE VULGARISATION ET D’APPUI-CONSEIL AGRICOLES)

44. What is the actual (or potential) amount of money saved as a result of changing behavior or adopting new practices? (Quel est le montant actuel (ou potentiel) d’argent économisé du fait de l’adoption de nouvelles pratiques?) .................................................................................................................
........................................................................................................................................................................ FCFA

45. What is the revenue you will be able to obtain from a similar service or product? (Quel est le revenu que vous serez capables d’obtenir d’un service similaire?) ....................................................................................................................................................... FCFA

46. What is the incremental amount of money received as a result of increased production or quality of product? (Quel est le revenu additionnel reçu du fait de l’augmentation du niveau de production ou de la qualité du produit?) ........................................................................................................ FCFA
2. Tests of difference between amounts farmers under public extension system are willing to pay for each service

2.1. Mean difference between bids for access to credit and input provision

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>wtp_es~e</td>
<td>133</td>
<td>302.0557</td>
<td>3.955</td>
<td>45.61</td>
<td>[294.23, 309.88]</td>
</tr>
<tr>
<td>wtpip_~e</td>
<td>133</td>
<td>456.4239</td>
<td>29.05</td>
<td>335.0</td>
<td>[398.95, 513.895]</td>
</tr>
<tr>
<td>diff</td>
<td>133</td>
<td>-154.3682</td>
<td>29.68</td>
<td>342.3</td>
<td>[-213.08, -95.655]</td>
</tr>
</tbody>
</table>

**mean(diff) = mean(wtp_estimate - wtpip_estimate)**

$t = -5.2008$

Ho: mean(diff) = 0

degrees of freedom = 132

Ha: mean(diff) < 0 \hspace{1cm} Pr(T < t) = 0.0000

Ha: mean(diff) != 0 \hspace{1cm} Pr(|T| > |t|) = 0.0000

Ha: mean(diff) > 0 \hspace{1cm} Pr(T > t) = 1.0000
2.2. Mean difference between bids for access to credit and technical support

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>wtp_es~e</td>
<td>132</td>
<td>301.4592</td>
<td>3.940007</td>
<td>45.26723</td>
<td>293.665  309.2535</td>
</tr>
<tr>
<td>wtpip_~e</td>
<td>132</td>
<td>398.7806</td>
<td>5.386375</td>
<td>61.88473</td>
<td>388.1251  409.4361</td>
</tr>
<tr>
<td>diff</td>
<td>132</td>
<td>-97.32137</td>
<td>2.991179</td>
<td>34.36603</td>
<td>-103.2386 -91.4041</td>
</tr>
</tbody>
</table>

mean(diff) = mean(wtp_estimate - wtpts_estimate)

t = -32.5361

Ho: mean(diff) = 0

degrees of freedom = 131

Ha: mean(diff) < 0  Pr(T < t) = 0.0000
Ha: mean(diff) != 0 Pr(|T| > |t|) = 0.0000
Ha: mean(diff) > 0  Pr(T > t) = 1.0000
2.3. Mean difference between bids for access to credit and access to market

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>95% Conf. Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>wtp_es~e</td>
<td>126</td>
<td>302.6019</td>
<td>4.110441</td>
<td>46.13959</td>
<td>[294.4669, 310.737]</td>
</tr>
<tr>
<td>wtpip~e</td>
<td>126</td>
<td>446.9122</td>
<td>16.74019</td>
<td>187.9081</td>
<td>[413.7813, 480.0431]</td>
</tr>
<tr>
<td>diff</td>
<td>126</td>
<td>-144.3102</td>
<td>15.93505</td>
<td>178.8704</td>
<td>[-175.8477, -112.7728]</td>
</tr>
</tbody>
</table>

\[
\text{mean(diff)} = \text{mean(wtp\_estimate - wtpam\_estimate)}
\]

\[ t = -9.0562 \]

Ho: mean(diff) = 0

degrees of freedom = 125

Ha: mean(diff) < 0  \( Pr(T < t) = 0.0000 \)

Ha: mean(diff) != 0  \( Pr(|T| > |t|) = 0.0000 \)

Ha: mean(diff) > 0  \( Pr(T > t) = 1.0000 \)
2.4. Mean difference between bids for input provision and technical support

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>wtp_es~e</td>
<td>134</td>
<td>454.5127</td>
<td>28.85268</td>
<td>333.9939</td>
<td>397.4433  511.5822</td>
</tr>
<tr>
<td>wtpip~e</td>
<td>134</td>
<td>398.413</td>
<td>5.313184</td>
<td>61.50455</td>
<td>387.9037  408.9222</td>
</tr>
<tr>
<td>diff</td>
<td>134</td>
<td>56.0979</td>
<td>27.69241</td>
<td>320.5628</td>
<td>1.32528   110.8743</td>
</tr>
</tbody>
</table>

\[ \text{mean(diff)} = \text{mean(wtpip\_estimate - wtpts\_estimate)} \]

\[ t = 2.0258 \]

\[ \text{Ho: mean(diff)} = 0 \]

\[ \text{degrees of freedom} = 133 \]

\[ \text{Ha: mean(diff)} < 0 \quad \text{Pr}(T < t) = 0.9776 \]

\[ \text{Ha: mean(diff)} !> 0 \quad \text{Pr}(|T| > |t|) = 0.0448 \]

\[ \text{Ha: mean(diff)} > 0 \quad \text{Pr}(T > t) = 0.0224 \]
2.5. Mean difference between bids for input provision and access to market

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>wtp_es~e</td>
<td>128</td>
<td>457.66</td>
<td>30.18304</td>
<td>341.4821</td>
<td>397.9332  517.3868</td>
</tr>
<tr>
<td>wtpip~e</td>
<td>128</td>
<td>446.1721</td>
<td>16.48649</td>
<td>186.5233</td>
<td>413.5483  478.7958</td>
</tr>
<tr>
<td>diff</td>
<td>128</td>
<td>11.48791</td>
<td>17.36448</td>
<td>196.4567</td>
<td>-22.87327  45.84909</td>
</tr>
</tbody>
</table>

mean(diff) = mean(wtpip_estimate - wtpam_estimate)

\[ t = 0.6616 \]

Ho: mean(diff) = 0

degrees of freedom = 127

Ha: mean(diff) < 0 \( Pr(T < t) = 0.7453 \)

Ha: mean(diff) != 0 \( Pr(|T| > |t|) = 0.5094 \)

Ha: mean(diff) > 0 \( Pr(T > t) = 0.2547 \)
2.6. Mean difference between bids for technical support and access to market

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Std. Dev.</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>wtp_es~e</td>
<td>127</td>
<td>398.7083</td>
<td>5.508174</td>
<td>62.07397</td>
<td>387.8078  409.6088</td>
</tr>
<tr>
<td>wtpip~e</td>
<td>127</td>
<td>445.0427</td>
<td>16.57778</td>
<td>186.8221</td>
<td>412.2358  477.8497</td>
</tr>
</tbody>
</table>

mean(diff) = mean(wtpts_estimate - wtpam_estimate)

\[ t = -3.3899 \]

Ho: mean(diff) = 0

degrees of freedom = 126

Ha: mean(diff) < 0 \( Pr(T < t) = 0.0005 \)

Ha: mean(diff) \( !=0 \) \( Pr(|T| > |t|) = 0.0009 \)

Ha: mean(diff) > 0 \( Pr(T > t) = 0.9995 \)