INDIGENOUS KNOWLEDGE SYSTEMS AND AGRICULTURAL EXTENSION AMONG FARMERS IN THE SISSALA AREA OF GHANA

BY

NAAMWINTOME ALFRED BEYUO

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ABSTRACT

Smallholders’ knowledge exists and this has sustained their operations since time immemorial. Agricultural development efforts, in terms of technology development and introduction, had not been within the reach of the farmer, resulting in the poor adoption rate of borrowed or introduced technologies.

This report documents a survey, which entailed the use of questionnaires at individual levels and group discussions, to examine the interplay of indigenous knowledge (IK) and “modernized” technologies in the agricultural extension services and agronomic practices of peasant farmers (majority of who were very active youth and women) in the Sissala area of Ghana. The study revealed extensive IK in both crop and animal production among the farmers, widespread extension support by the Ministry of Food and Agriculture (MOFA) in the area and great potential for blending the two for poverty reduction among farmers. It however found that MOFA has not been able to tap on this potential, resulting in gaps in its extension services to farmers in the area.

Indigenous knowledge systems exist in Sissala among farmers and this has been amply demonstrated by farmers from this study. Modern agricultural extension is prevalent in the Sissala districts and its existence has been demonstrated by the introduction of technologies. These introduced technologies are poorly adopted; those that are adopted are completely transformed to suit the farmer’s local conditions. Even though farmers acknowledge the benefits thereof in working with agricultural extension agents and desire working with them, this is not reflected in 100% adoption of introduced technologies.

Consequently, recommendations are made for the integration of efforts (that of the farmer and the agricultural officer) in the area of extension development and delivery methods. This will ensure that efforts are grounded in the indigenous knowledge of the farmer. This synergy building will recognize or reflect the potential of the smallholder. In involving him/her in the knowledge generation and exchange, adoption could be enhanced and thus increased productivity of the farmer.
DECLARATION

I, Beyuo Alfred Naamwintome, author of this study, do hereby declare that the work presented in this thesis entitled:

INDIGENOUS KNOWLEDGE AND AGRICULTURAL EXTENSION AMONG FARMERS IN THE SISSALA AREA OF GHANA,

was done entirely by me, for the award of a Master of Philosophy (M.Phil.) in Development studies, University for Development Studies, Tamale. This work has never been presented in whole or in part for any other degree of the university or elsewhere. Due recognition has been given to cited works. I accept full responsibility for any lapses in this work.

Signature.................................................. Signature..................................................
Beyuo A. Naamwintome Dr. A A Apusigah
(STUDENT) (SUPERVISOR)
DEDICATION

This document is dedicated sincerely to my mum, Kog who, with the support of the family, especially my late Dad, gave me life. It is also dedicated to my son, Naamwintome Nuo Ebenezer, and the mother, Georgina Nen-Nome.
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My first word of thanks goes to the Almighty God for giving me life and good health to pursue education this far.

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ACRONYMS

COMPAS...........Comparing and Supporting Endogenous Development
UDS................University for Development Studies
ODI................Overseas Development Institute
GR..................Green Revolution
FASCOM............Farmers Services Company (of Upper Regions) ltd
URADEP............Upper Regional Agricultural Development Programme
SAP.................Structural Adjustment Programme
FAO................Food and Agricultural Organization
IFAD................International Fund for Agricultural Development
LACOSREP........Land Conservation and Smallholder Rehabilitation Programme
MOFA..............Ministry Of Food and Agriculture
NGO...............Non-Governmental Organization
GDP...............Gross Domestic Product
GPRS II...........Growth and Poverty Reduction Strategy II
SDMTDP...........Sissala District Medium Term Development Plan
TUDRIDEP.........Tumu Deanery Rural Integrated Development Programme
AAIG...............Action Aid International Ghana
FFS.................Farmer Field School
IKS................Indigenous Knowledge System
UNPCD.............Union Nationale des Producteurs de Cotton du Burkina
AOPP...............Association des Organization Professionelle Paysannes
T&V................Training and Visit
MTADP.............Medium Term Agricultural Development Plan
AAGDS.............Accelerated Agricultural Growth and Development Strategy
FASDEP............Food and Agricultural Sector Development Policy
UNESCO...........United Nations, Educational, Scientific and Cultural Organization
ILEIA...............Internal Low External Input Agriculture
LEISA...............Low External Input and Sustainable Agriculture
Agriculture is an essential industry for many nations. In developing countries, where more than 60% of the population is engaged in some form of agricultural activity, costly public policy and expenditure mistakes have been committed (World Bank, 1992). Effective investment in agricultural extension contributes directly to national wealth through increased agricultural production and enhanced national food security. According to Mensah (1994:55) “the rate of profitability of agricultural extension in Africa, Asia and Latin America is estimated at between 34% and 80%, which is far from the rate of 100% achieved in the United States.” In spite of this, there is increasing resistance expressed during international conferences and conventions by multi/national agencies to the western position on agriculture (COMPAS, 1998). Reconciliation between agriculture and natural resource conservation on which farmers are most grounded for a high quality environment is advocated. This situation makes the maintenance of ecosystems and ecological processes imperative (GoG/NDPC, 2005; Amoako-Nuama, 1997).

Focus on modern practices has dominated Africa’s agricultural extension since independence to the neglect of the worldview of smallholders, which influences their potentials (Moris, 1991). Optimal integration of farmers’ worldview in agricultural extension will enhance the adoption of borrowed or transferred technologies and hence productivity of smallholders. Technology development and transfer systems often under-utilize the potentials of smallholders (Titilola, 1994) who have intimate understanding of the agro-environment as a delicately structured ecosystem and whose survival depends on minimal disturbance of it (Gyasi, 1997).

The poverty profile of developing nations, especially Ghana, reflects a largely rural and agriculture-based economics. Fifty-five percent (55%) of those who live in poverty are subsistent crop farmers. According to Odi and UDS (2002), this problem stemmed from the colonial era up to the early independence period when agricultural production had focused
largely on lucrative export crops. Projects such as irrigation schemes largely failed to address the problem of food security because the crops cultivated were largely intended for the market and not staples for the local inhabitants. High input agriculture was also adopted in an effort to promote economic development. In line with this, policies, mechanics and agronomics, which accompanied it, were not only irrelevant but undermined the local indigenous practices. Increasingly, case studies have demonstrated that farmers are far from passive actors on issues that concern them (Odi, and UDS 2002). This has called for participatory and process-based interventions, instead of the “transfer of technology” approach to agricultural development. The basis is that the “instructions and blueprint solutions” have not worked. Rural communities are capable of setting and fulfilling their agricultural development goals. About 60% of the world’s cultivated land is farmed through traditional or subsistent methods by peasants who are over a quarter of the human race (Beets, 1994), and have developed their own forms of farming to survive (Alteri, 1987). Three-fourths of all farm families are within the peasant bracket (Carlier, 1987). Hence, it is logical to ground agriculture interventions in the local and existing knowledge and experiences, if development initiatives and benefits are to be optimized.

Agriculture is the basic sector of Africa’s economy on which majority of the people depend for their livelihood. This makes sustainable agricultural development, the degradation of the resource production base, population growth and the consumption of the resources issues of concern for international and local/national institutions and farmers. However, population growth stimulates new innovations for technological development. According to Gyasi (1997) rapid population growth in Kenya forced farmers to introduce improved practices and new techniques and thus prevented erosion and maintained soil fertility for sustained food production in the area. In Sub-Saharan Africa, the population is predominantly rural and agriculture remains the main occupation. The soils have aged and tend to be poor, and with the harsh climatic conditions, agriculture is a difficult and low productive activity (Haverkort et. al., 2003; Titilola, 1994). This makes conscious effort in agricultural development through extension by developing countries and development agencies imperative.
External donors have supported agricultural development in the area of extension even though this support is fading (Spore, 2004). These efforts, however, hardly consider the worldviews and belief systems of the rural people. These efforts, according to Moris (1991), were geared towards knowledge transfer (information delivery to farmers, a kind of transfer which involved officially sponsored technologies rather than knowledge generation with rural people).

In developed countries, commercial agriculture is dominant and the focus of national reforms in agricultural extension is on economic efficiency, cost-recovery and demand-driven supply via privatization. In such countries, the subsistence system dominates and fiscal constraints become a challenge due to major changes in the larger environment. Policies of major funding agencies are reformulated towards the removal of the burden on the public sector and reduction of expenses on the public budget (Moris, 1991). From this perspective, a challenge emerges regarding who counts - "we" the interventionist/powerful/first or "them" the targeted/weak/last? The last counts and it is through changes in us that change is feasible (Chambers, 2003).

In Ghana, official efforts to develop agriculture dates back to the early 1900s when policies pursued were designed to make the then Gold Coast a source of raw materials (Bekye, 1998) and a protected market for the colonial manufacturers and farmers. Farmers were taught and assisted by the state under many loan-financed development projects (Moris, 1991) to produce export crops at the expense of food crops. The performance of technical packages which were supposed to generate agricultural growth and higher standard of living became poor. This led to the low contribution to food production in the market sector by local agriculture. It also led, in part, to the increasing quantities of wheat, corn, rice and other foodstuffs imports to the extent that “Operation Feed Yourself” programme was instituted by the government in the 1970s (Okonjo, 1986).

Earlier on, from 1951-1966, aggressive agricultural development policies were pursued, resulting among others, in the establishment of large state farms to combat urban unemployment and promote import substitution. The government also established
agricultural development corporations for the implementation of policies in an effort to train farmers to become entrepreneurs, a basis of knowledge transfer from the West to Africa (Dittoh & Millar, 2004). The promoted agricultural policies favoured industrialization or the Green Revolution (GR), which sought to boost food production so as to meet the demands of an increased population. Earlier packages of cocoa production, chemical fertilizer use and tractorization in Ghana are examples of GR as a strategy in agricultural development (Millar, 1992). Technologies from international research organizations had been promoted in the West and in some Third World countries in Asia with varying levels of success. In spite of its positive contribution, the entire GR promoted technologies such as high-yielding varieties of crops which have been less resistant to pests and diseases than the local crops, and these technologies caused adverse environmental conditions and thus, unsuitable for the traditional resource-poor farmer (Beets, 1990). The dramatic yield increases that were possible in well-endowed areas have not been repeated in more risk-prone or marginal areas which characterize the smallholder farming system (Shepherd, 1998).

The national government’s intervention in agricultural development has concentrated on adapting farming practices to global markets and technology; promoting transfer of technologies which are of GR types. In the Philippines, farmers discovered, via informal testing, that the ‘binag-o’ crop variety, a GR technology, which was promoted by extension agents in the 1970s and the 1980s, never reaches the flowering stage during a relatively dry growing season, but shrinks under the heat of the sun. This produced a negative attitude among local farmers (Go & Go, 1993). Under the Training and Visits (TV) system of extension, fertilizers and high-yielding seed varieties were, and are still, being promoted. Farmers Services Company (FASCOM) and Upper Regional Agricultural Development Programme (URADEP) and the Integrated Rural Development Projects, actively supplied fertilizers and practiced the TV system of extension respectively, but chalked very limited successes due to the unilateral analysis of farmers’ situation (Millar, 1992). Between 1981 and 1992, the Government of Ghana embarked on a World Bank-led Structural Adjustment Programme (SAP) which sought, among others, to create an environment conducive for the promotion of agricultural growth and development (FAO, 1994). This marked the beginning of a shift towards the small-scale farmer and the indigenous practices. In line with this, the
International Fund for Agricultural Development (IFAD) between 1992 and 2005 channeled resources to rural populations who were engaged in subsistence agriculture, via the Land Conservation and Smallholder Rehabilitation Project (LACOSREP). This project sought to build the capacity of farmers and improve the income generating activities of these target beneficiaries. This proved impressive (Alexis, 2005).

From this historical transformation, export agriculture has been sought with no attention paid to the small-scale farmer, even though agriculture is predominantly smallholder-based and core to rural development in a developing country like Ghana. Formulating Western models among peasant communities had proven inappropriate since it failed to recognize and formalize complex relationships implicit in traditional farm systems (Millar, 1992; Altieri, 1987). The hunger and malnutrition associated with underdevelopment in agriculture is not due to the incapacity of the peasant farmers but rather the failure to recognize the potential of the small scale farmer by interventionists. Interventionists had failed to “walk with” peasant farmers and hence the limited success. The peasant farmer is a store of knowledge inherited through informal experimentation. The understanding and internalization of this knowledge has been obstructed even in the post-colonial era by planners, developers and promoters on the basis of ignorance, arrogance and patronage (Jodha & Partap, 1993).

1.2 RATIONALE FOR THE STUDY

Interventions by governments of Ghana in agricultural development have concentrated, among others, on promoting transfer of technologies (Millar, 1992). The emphasis on technology transfer suggests a lack in knowledge and skills on the part of the targeted, in this case the farmers. In agriculture, where such transfer has occurred in the form of extension services, farmers have often been treated as passive recipients of imported technologies intended to modernize and improve production. In practice, however, one finds that such efforts have been unsuitable and increasingly inappropriate (Dittoh & Millar, 2003; Millar, 1992). This situation has resulted from the inability of farmers to apply the technologies to local conditions, lack of requisite insights, lack of the full complements of resources, and inadequacy of the skills and knowledge to be transferred. This situation is said to contribute
in part to the decline of agricultural productivity of small scale farmers (Durno, 1989) even though these farmers are highly knowledgeable in their fields of operation (Spore, 2003).

Studies reveal that from generation to generation, farmers have evolved local knowledges and agricultural technologies for production. This makes them (farmers) researchers (Pottier, 1994; Mazur & Titiola 1992). Yet the potentials of these farmers have not been optimally utilized in agricultural extension development. Development in general has tilted so much to globalization in line with western concepts and values, with disregard for indigenous knowledge and practices. Introduction of technologies such as tractorization, sowing in lines, new or hybrid varieties or genetically modified seeds are seriously challenged by the indigenous practices of farmers. This is demonstrated in the rather low adoption of these technologies. Hoes and mixed cropping system are still embarked on by farmers to suit different geographical conditions and situations. This makes building on these indigenous knowledges and practices of these farmers, imperative, since this will enhance cultural diversity.

Farmers in many parts of the world are always seeking ways to improve their livelihoods through their farming systems and to adapt their practices to changing agro-ecological and socioeconomic conditions. They adopt, adapt and formulate new ideas and innovations that are tried out under different conditions, evaluated and assessed. Based on these, decisions are made on their potential value of the new ideas and innovations for improving their farming systems (Spore, 2004; Pottier, 1994; Mazur & Titiola, 1992). African countries see agricultural extension as an essential tool for promoting agricultural production as well as rural development. West Africa has a dominantly rural economy which is centred on agriculture. This rural economy is traditionally adapted to the dynamic biophysical environment of and by farmers (Gyasi, 1997). Unfortunately, this knowledge-base of these farmers has been overlooked by development actors. This has made it almost impossible to build on the indigenous practices of farmers which could have afforded sustainability or higher adoption rates than imported technologies. It is very possible to strengthen and improve cultural diversity in ways that are cognizant of local values, indigenous knowledge and practices and traditional institutions of rural communities.
The rapid growth of the world's population especially from the developing countries necessitates an equal growth in the food production to feed the growing population. While in the developed countries, less than 50% of the population is engaged in agriculture, the reverse is true in the developing countries. Agriculture in Ghana is predominantly smallholder-based. These smallholders or peasant farmers depend on their indigenous knowledge on agriculture and sometimes the facilities and services of research institutions, Ministries and/or Department of Agriculture (MOFA) and Non-Governmental Organizations (NGOs) for technologies (Spore, 2003; Warren, 1991) so as to augment production. Majority of these farmers, especially women (Nikoi, 1998) in the rural areas, have limited access to these facilities and services. This apart, the extension service does not incorporate or build on the indigenous knowledges, skills and technologies of the farmers. In this regard, production is not enhanced.

Smallholder farmers or peasants (who own small pieces of land for farming) have a mix of responses to environmental complexity and variability that are not confined to activities alone. The responses extend to external interventions as well. They adopt specific strategies or devices for minimizing and managing loss during adverse situations and these are closely linked to the overall harnessing of opportunities (Millar et al., 2004; World Bank, 1998; Jodha, 1990). Farming populations are heterogeneous in terms of the strategies they adopt for solving production problems (Long, 1994). Even though conditions differ and may shape the opportunities open to the farmer, it is s/he who must actively problematize situations, process information and bring together the elements necessary for the operation of the farming enterprise. It is s/he who takes a major role in constructing his or her farming world, even to the extent of internalizing external rationalities and as it were, appear to carry out the commands of outside agents be they government officials or researchers. Freedlander (2004) posits that people as agents, pursue their own goals which are driven by their thoughts, beliefs and desires. People do not act blindly, but follow a principle of rational action. For him, behaviour is usually motivated and the action is the result of desires. Thus, any external intervention is usually processed by farmers leading to either rejection, adoption of useful elements or modification which reflects their local conditions (Long, 1994) and this makes
the co-existence of indigenous knowledge, skills and practices of farmers and modern knowledge on farming imperative.

Ghana has a total land area of 238,537km\(^2\) and approximately a third of it is classified as suitable for cultivation (FAO, 1994). Agriculture is very vital for the economy of Ghana providing employment for over 60% of the population, the bulk of who are women who produce 60% to 80% of the food supply in Africa and Asia (Stapleton et. al., 1995). It remains the largest contributor to Gross Domestic Product (GDP) inspite of the stagnation of technologies (GPRS II, 2005). In localized districts of the forest, transitional and savannah zones, population pressure, reduced fallow periods, slash and burn system and poor weather conditions are leading to environmental degradation which includes reduced vegetation cover, loss of soil fertility and increasing soil erosion. These factors have resulted in decreased food productivity which is continuing to decline (Millar, 1992).

In the Sissala Districts of Northern Ghana, where 80% of the people depends on agriculture for livelihood on a 9,000km\(^2\) of land (Sissala District Medium-Term Development Plan SDMTDP, 1996-2000), high indigenous knowledge, skills and practices of farmers are still in use. A farmer, using a combination of millet husks and ash was able to store his yam. Another farmer using a particular stone was able to treat the infected eye of his animal (Personal communication). MOF A and Ghana Cotton Company in the districts are vehement in the introduction of modern knowledge on farming such as monocropping and new varieties. For instance, the 2006 national second best farmer is an indigene of the Sissala West district. Tumu Deanery Rural Integrated Development (TUDRIDEP), works for poverty reduction through an agricultural development programme, has also introduced animal traction in the area. This has been highly adapted by the targeted farmers in ways that suit their local situations. This strongly demonstrates the complementing roles indigenous knowledge and modern knowledge can play if farmer needs are to be met.

The purpose of this study was to examine the relationship between smallholder farmers' knowledge systems and agricultural extension education in the Sissala Districts of Northern Ghana where 80% of the people depends on agriculture for livelihood on a 9,000km\(^2\) of land
(Sissala District Assembly, 1996-2000). It identifies the knowledge basis of smallholders and its relevance to agricultural extension as well as makes recommendations for incorporating indigenous knowledge in agricultural extension. In addition, it explores the gaps emanating from current agricultural extension development and delivery and the practice of farmers, which is based on their indigenous knowledge systems. The outcome of this exploration will contribute to the agricultural development efforts through the development of an informed alternative mode of agricultural extension development and delivery which recognizes and incorporates rural peoples’ knowledge systems.

1.3 THE RESEARCH PROBLEM

Agricultural development through extension has been inadequate and inappropriate (Moris, 1991) even though majority of the world’s poorest people (located in rural areas) are engaged in it (World Bank, 1992). Self-sustaining development is dependent on agricultural sector, which is based in the rural area and has the potential of reducing poverty, if productivity is raised. The role of agriculture in economic development is not merely passive and supportive. The success of the development of Western Europe emanated from the exploitation of the agricultural potential of Africa and this demonstrates the importance of agriculture for the development of any third world country (Alexis 2005). The considerable neglect of the agricultural sector during the 1970s in Ghana, among others, led to the decline in output of food and cash crops at an average rate of about 0.3% per annum. The contribution to Gross Domestic Product (GDP) by agriculture also fell by 0.5% per annum (Millar, 2004). During this period, small holder farmers sustained agriculture using largely their local knowledge and skills. Agricultural productivity of small scale farmers is backed by their indigenous knowledge, skills and practices (Roling and Jiggins, 1994). In the absence of official support, these knowledge, skills and practices have not only fed the nation but also sustained the economy. The farmers had to design and adopt creative ways of compensating for the gaps in the agricultural extension created through the severely diminished state support in this regard. Yet, these creative skills and innovativeness of smallholders have been largely untapped and severely under-utilized during periods of improved government intervention (Titilola, 1994; Moris, 1991). Often agricultural
development programmes depend largely on external technologies and resources. This often results in the failure of such externally introduced development initiatives (Arun, 1995) due often to their inappropriateness but also their disconnection from the indigenous knowledge and skills of the farmers.

The efforts of the Ghana government to revolutionarize agriculture, through a Green Revolution (GR) have failed because this has depended solely on borrowed technologies. The Green Revolution that has been expected to solve the developing world’s food problems, concentrates on highly engineered breeding programmes, distribution of high levels of inputs as well as the implementation of technical innovations. Despite impressive increases in production, problems of equity, stability and sustainability, with regards to production were evident. According to Mazur and Titilola (1992), GR technology in Asia undermined culture and the environment with devastating effects.

In Northern Ghana, and especially in Tumu where land is perceived to be quite abundant for agricultural production, development actors such as Ministry Of Food and Agriculture (MOFA) and Non-Governmental Organizations (NGOs) such as TUDRIDEP, Plan Ghana and Action Aid International Ghana (AAIG) with well intentioned interventions, seek to enhance farmers’ production. Approaches, including Farmer Field School (FFS), which is an extension tool (Leeuwis, 2004) have been tried within the catchment areas of TUDRIDEP with dismal success, even though in Asia, it was tried and over two million rice farmers embraced it. This approach recorded increased yields and incomes, reduced pesticide use, and efficient use of inputs, in addition to knowledge and practical experiences being gained, which equipped them for managing agro-ecosystem sustainably (Ingevall et. al., 2003).
The Sissala East and Sissala West districts (Figure 1) were purposely chosen as they fall within the catchments area of TUDRIDEP and other collaborating partners in food security. The districts are bordered to the north by Burkina Faso, south by Nadowli and Wa East districts, east by Kasena-Nankana district and to the west by Jirapa-Lambussie district. The districts are sparsely populated. According to the 2000 Population census, the Districts population is at 85,441 with a growth rate of 2.4% per annum. The average density of the
The population of the District is 10 persons per square kilometer which is lower than the regional and national averages of 24 and 77 respectively. Patches of high densities are found in Tumu, Wallembelle, Gwollu, Fielmuo, Jeffisi and Sakai (SDMTDP, 2002-2004).

The land is vast and suitable for agricultural (livestock and crops) production. The people (76%), according to SDMTDP, 2002-2004), depend on agriculture for livelihood on a 9000km$^2$ of land. The study area falls within the Guinea Savanna Zone with natural vegetation being savanna woodland. Soil is savanna ochrosols, deficient in phosphorus and nitrogen. The topography is gently undulating and the climate is tropical continental. A target population is a unit for which information is required (Saunders et. al., 1997) and for this study, it consists of farmers in randomly selected communities.

The study area is about 39% of the total land mass of the Upper West Region. Majority of the settlements are rural and 76% of the population is engaged in agriculture which is the predominant economy activity of the districts (Sissala District Medium Term Development Plan, 2002 – 2004). The extension officers are inadequate given the extension officer to farmer ratio at 1:2000, which far exceeds the acceptable rate of 1:500. Even though research institutions operate in the districts with MOFA and NGOs that are in agriculture, most farmers do not accept new technologies; deforestation, soil erosion and extensive annual bushfires are highly prevalent in the districts (Sissala District Medium Term Development Plan, 2002 – 2004). This makes rooting introduced technologies on indigenous knowledge systems of farmers very important especially where the promoters (extension officers) are few.

Non-sowing in lines, especially for most crops is still very high. It is only maize that about 50% of the farmers sow in line. A farmer said, “We started sowing in lines before you people started talking about it”. When he was probed further, he said the mounds are usually in lines and thus sowing is done in lines. Further discussion made him to agree that even though both are sowing in lines, the plant population differs. Indigenous mode of arriving at a “good” animal for breeding is also highly prevalent. Seed production is purely by indigenous mode.
This component of the research has been informed by my need to participate in ongoing efforts at advocating for transformative processes in ways that appreciate and enhance the potential of peasant farmers as core actors in agricultural development. This section therefore, provides the methodological framework through which the research goals and objectives were achieved, discussion of relevant concepts and then an in-depth explanation of the research approach/strategy by focusing on research design, sampling methods, sources of data collection and techniques for analysis.

Farmers have their “old ways” of doing things, that is, practices which are handed down to them by their parents and other respected elders and these are distinguished from “new ways”, activities or approaches which are introduced (Go and Go, 1993). Rural peoples’ knowledge regarding traditional farming practices are losing their efficacy and feasibility in the face of changing institutions and technology despite their suitability and relevance. The rationale, of traditional technologies and practices of smallholders is relevant even today for they constitute potentially ideal input for agricultural development (Jodha and Partap, 1993) which is often disregarded.

Indigenous Knowledge Systems (IKS) have been explored in other places with much success (Gonese et. al., 2001; Gonese and Tivafiri, 2001). In Ghana, IKS exists as depicted in farmer experimentation (Millar, 1994). Smallholder farmers or peasants are key to agricultural extension development in terms of their knowledge. These are farmers who have small pieces of land on which they farm or cultivate as means for livelihood.

The underutilization of the indigenous knowledge systems of smallholders (or peasants) by the government and other agricultural extension services remains an issue resulting in a decrease in the acceptance rates of technologies so developed. While efforts at enhancing agricultural production are failing and farmers continue to practice their indigenous knowledge systems largely, there have not been consistent efforts to incorporate farmers’ indigenous knowledge system in agricultural extension.
1.4 MAIN RESEARCH OBJECTIVE

Development interventions for agricultural improvement have been several but have not yielded the desired results, especially in developing countries such as Ghana. Recognizing and integrating indigenous knowledge in rural development occurs infrequently, resulting in limited success levels of many agricultural projects. Knowledge is dynamic and thus reflects farmers’ reactions to changing circumstances (Warren, 1991).

It is in the light of this that this study investigated the technology development and transfer in agricultural extension in Ghana. The study examined the technology development, delivery mechanisms and strategies by Ministry Of Food and Agriculture (MOFA) to ascertain how much of it include indigenous knowledge systems in the Sissala area. The indigenous knowledge systems which is a resource base of the rural people is enormous and thus recommendations for the adoption of an alternative mode of agricultural extension, which recognizes the innovativeness or creative skills of farmers which stems from the indigenous knowledge systems of the people.

1.4.1 Specific objectives:

Specifically, the study sought to:

1. Investigate rural peoples’ knowledge processes and the role these can play in agricultural extension.
2. Identify and examine earlier intervention efforts for their effects on peasant agricultural productivity.
3. Identify areas for de-emphasis and those for reinforcement in the traditional modes of production for research and extension package production as policy-direction for increased agricultural productivity.
4. Make recommendations for integrating modernized agricultural extension and indigenous knowledge in agricultural extension.
1.5 RESEARCH QUESTIONS

Agricultural development through extension has often failed to utilize rural peoples’ knowledge efficiently (Titilola, 1994; Moris, 1991). This makes the following question very relevant for probing:

1.5.1 Main research question

In what ways might rural peoples’ knowledge systems become a part of, or be incorporated into, current agricultural extension systems to ensure optimal use for increased productivity?

1.5.2 Specific research questions:

1. What have been the trends in agricultural extension services delivered in the study area since 1970s?
   - Has it moved towards participation/involvement of the farmer as a partner in agricultural extension development?
   - Is the farmer recognized as a key player in agricultural extension development?
   - How have farmers responded to the interventions?

2. What role if any has the Indigenous knowledge of peasants played in the development of agricultural extension?
   - Is it a resource that can be optimized?
   - Has there been a policy framework backing on the use of IK in agricultural extension development efforts?
   - How have farmers been involved in the policy development and operation?

3. Has there been integration between agricultural extension development efforts and indigenous knowledge?
   - Has integration led to effectiveness?
1.6 OPERATIONALIZATION OF TERMS

Terms are used in this write-up which are worth operationalizing. These include farmer field school, farmer knowledge, indigenous knowledge systems, agricultural extension and intervention.

i) Farmer field school, according to Leeuwis (2004), is an extension tool. It is a school of farmers and agricultural officers without walls. It is a forum for learning by both the farmer and the agricultural officers.

ii) Farmer knowledge: According to ILEIA (1988), a farmer operates or owns a farm. One who keeps or raises livestock and crops. Knowledge is the general awareness or possession of information, facts, ideas, truths or principles. It is the understanding gained through experience or study. It is the perception, learning and reason (LEISA, 2006). Thus farmer knowledge is the information, facts, ideas, truths, principles or the entire understanding of his/her farm operation which has been gathered and/or gained over a period.

iii) Indigenous knowledge systems: According to Coen et. al (1995), indigenous is belonging to a place or natural, knowledge is understanding gained through experience. It is employed by farmers and tuned to its ecological, economic, socio-cultural and political environment. A system is complex whole formed from related parts. Indigenous knowledge systems (IKS) are thus the understandings gained through experience and this is peculiar to a place and also affords the complete functioning or survival of the people of the place.

iv) Agricultural extension: According to Coen et. al (1995), agriculture is a struggle for survival by the rural people; producing enough food for the family and to maintain the productive capacity of the land. It is farming centred. Extension on other side is the act or the process of increasing the size, range, scope or application of something or the fact of being increased in size, scope, range or
application. Thus agricultural extension is the act or process of extending the knowledge on farming. It is the act or process of providing information about agriculture.

v) Intervention is a deliberate entry into a situation in order to influence events or prevent undesirable consequences. It is a conscious work toward improving a situation (LEISA; 2006). It is thus an act designed to counter a situation or trend for a desired purpose.

vi) Change trend: According to Lundy (2006) change is a better way to do something. It is to make or become different. Trend is a general tendency, movement or direction. Thus change trend is a general tendency of making something different.

1.7 ORGANIZATION OF THE THESIS

The thesis is composed of five chapters. The first chapter, the introduction, looks at the research problem, the objectives and intended benefits/justification for action. The second chapter focuses on empirical reviews. The third chapter focuses on the data collection and analysis. The fourth chapter displayed the findings and discussions. The fifth chapter drew the conclusions and gave recommendations.

In chapter one, the background provides related information that shapes the work while the rationale highlighted the reasoning or the principle under which the work is based. This is followed by the issue at stake (problem statement) and then the objectives which set how the issue is addressed. In this chapter also, terms used are contextualized or operationalized and this is followed by how the work has been organized.

The second chapter is focused on related literature, relevant earlier writings on the work. It highlights varying concepts of agricultural extension and trends of agricultural extension in terms of the approaches and the delivery mechanism. It also looks at agricultural policies, indigenous knowledge systems, traditional institutions and the relevance of indigenous knowledge system to the study.
The third chapter is centred on the methodology which highlights ethical concerns of the research. The use of instruments for the attainment of valid and reliable research is also dealt with. The chapter also provides the underlying sets of ideas or principles of the research as well as the area of the study. It also talks of the plan of action as well as the form or structure of the research. The modes of data collection and instruments to be used are also discussed. The chapter ends with close examination of collected data using various tools/techniques.

The fourth chapter deals with findings of the study and discussions. The discussions dwell on the socio-demographic aspect of the study area, the modern agricultural extension services, the existing indigenous agricultural extension practices and effects of earlier intervention efforts of peasants’ agricultural productivity.

The fifth chapter concludes on the findings of the study and recommends an alternative agricultural extension to reflect the indigenous knowledge of rural people and the potential of the peasants in this effort.
CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

As a mainstay of developing and even developed economies, agriculture has been a well researched area. Its contribution to various countries remains very substantial. Studies have been conducted on agricultural production and related services provisions. Indigenous knowledge (IK), however, is a relatively new area of study. In recent time major, critical and substantial research has been focused on IK (Rajasekaran, 1993). Such studies have been targeted at revitalizing IK and advocating for its incorporation into development efforts since it is a resource that can enhance (agricultural) production. However, very scanty studies or research, if any at all, connects agricultural extension to IK (Hounkonnou, 2001). This is indicative that local initiatives are still being bypassed; relevant support resources are not linked to or supportive of grassroots efforts.

In this chapter Agricultural development, through agricultural extension, will be examined as a broad concept. Under agricultural extension, other concepts on agricultural extension strategies and agricultural extension delivery mechanisms will be discussed. Policy on Agricultural extension, indigenous knowledge systems and its relevance to agricultural extension will also be discussed.

2.2 TRENDS IN AGRICULTURAL EXTENSION SINCE THE 1970s

This section examines some varying concepts of agricultural extension and then the trends of agricultural extension as technology development. The trends dealt with are the agricultural extension approaches and delivery mechanisms. The analysis reveals a tendency for agricultural extension interventions to focus on information provision about agriculture.
2.2.1 Agricultural extension as an intervention

Agricultural extension is an approach to agricultural development (Roling, 1990). It is an intervention for agricultural development. It is an instrument for achieving policy goals. "Intervention" in this context means an ongoing, socially-constructed and negotiated process. Thus, it is the extension of knowledge on agriculture for development. Also "Agriculture" in this context means the raising of livestock and/or production of crops. Extension originally came from the academia during the 1840s and the early 1900s in the West and connotes teacher and student relationship (Leeuwis, 2004). It depicts a top-down approach to problem-solving; inducing change in voluntary behaviours. Thus, agricultural extension depicts more of a teaching situation. The extension agent transfers knowledge. The extension agent, having been trained, assumes the position of an expert who transmits information to the farmer who listens, receives and responds accordingly, else, the farmer is at fault. This notion of extension is linear and fits best in the hard system model of thinking. Agricultural extension is a system since it requires both the extension agent and the farmer (who are elements of the system) to interact dynamically and organize as a whole (Roling, 1995) to achieve a goal. This model of extension was adopted and emphasized by the World Bank in the mid-1970s and funded in forty countries and the results proved impressive (Benor and Baxter, 1984).

This connotation or model of extension does not reflect the real situation, however, since the farmer is an ‘expert’ in his/her own right, just like the extension agent. The farmer is born into farming and thus schooled in it. “Children begin learning the essentials of farming by following their parents to the fields” (Spore 2004:1). This makes them active researchers and experimenters for various reasons and not, passive receivers of ideas of scientists (Roling, 1995; Millar, 1994). With this in view, systems’ thinking is still relevant. However, in terms of appropriateness, soft systems model and thinking ranks first. The potential of a farmer is worth recognizing since s/he is a store of knowledge on farming (Roling & Jiggins 1994; Ison, 1990), working to enhance his/her socio-economic situation in the development of his/her professional capacities (Spore, 2004). It is thus inappropriate to see farmers as requiring instructions on how to produce crops and livestock. Their traditional knowledge
and values, skills, social and spiritual dispositions need to be recognized and accepted (Millar et. al., 2004).

2.2.2 Agricultural extension as a service

Agricultural extension is a service and deserves a desired outcome. In the light of this, the interests of the recipient, as well as the sender’s or deliverer of the service, are vital. Where there is overlap of these interests, the desired outcome can be automatic, else the recipients are persuaded or forced to do so or act accordingly. Under such circumstances of persuasion or force which characterize the connotation, the end is usually the focus, to the neglect of non-desired outcomes that are sources of learning and equally important. The human context is crucial to development and thus, the individual must not be ignored in the haste to develop (Awedoba, 2002). Intervention in rural life is justified on the basis of service to the rural communities through acts that are in their interest.

With this mandate, feedback on findings to the local level is relevant. The farmer is not a mere recipient but an expert as well (Titilola, 1994; World Bank, 1998). Often, farmers pretend to think and act in line with the interventionist, whereas in reality and to a large extent, follow their own internal logic; maintain their cosmovision and have their own values. Farmers in many parts of the world are always seeking ways to improve their farming systems and to adapt their practices to changing agro-ecological and socioeconomic conditions. Farmers adopt, adapt and formulate new ideas and innovations that are tried out in different settings, evaluated and assessed the results of which are basis for decisions making for improved farming.

The circumstances under which farmers’ experiences are developed and accumulated over generations, changed considerably due to technological changes, public interventions, rapid population growth and increased role of the market forces. These factors, with the exception of population growth, have made traditional adaptation and adjustment mechanisms unfeasible and ineffective (Jodha, 1990). Agricultural development programmes underestimated the expertise of farmers. This could be attributed to lack of process-thinking
and this has contributed to poor technology utilization (Ison, 1990). Process-thinking has the potential of drawing on the experiences of farmers (Spore 2004) as well as easing the overlap of interests. As a process, recognizing the interconnectedness of all elements involved and coordinating them is very relevant. This borders on communication, considering the actors involved, who in this case are the farmer and the extension agent. These actors are supposed to have a common interest which is the promotion of agricultural development.

2.2.3 Agricultural extension as knowledge-generation and exchange

The extension as an intervention has been the ideal-typical construction. It has been “measurable outcome-focused” to the neglect of the intervention process—“walking with” the peasant farmer. This focus allows no space for emergent issues and new twists and turns that characterize human affairs. “Walking with” the smallholder allows one to take into account the emergent forms of interaction, procedures and practical strategies, as they evolve and are shaped by the struggles between the various participants (Long & van der Ploeg, 1989). The indigenous knowledge of smallholders was not valued and hence not incorporated in this development effort. This has led to the poor adoption of introduced technologies. Thus, agricultural extension is best termed knowledge-generation and exchange. For effectiveness, it borders on all elements/actors, improving the workings of the system. As knowledge-generation and exchange (rethinking and reflecting on the interactive process), both the end and the process are relevant and should be emphasized.

Agricultural development through extension started a long time ago and took different forms or approaches; from the centralized top-down (Spore, 2003) to that of participation. There have been public and private sector efforts to improve the lot of farmers and attain national food self-sufficiency (Warren, 1991). Farmers were not involved in this extension development process until the 1980s even though farmers know a great deal about their farming situation and needs than anyone else (Spore, 2003; Warren, 1991). These extension approaches or modes include the scheme, technical change, target category, functional group and institution-building. The delivery mechanisms are the Training and Visit (T&V), contract farming, farmer-field-school (FFS) and farmer-to-farmer extension.
2.3 THE CONTRACT FARMING SCHEME AS DELIVERY MECHANISM

Having developed an agricultural extension technology, mechanisms are devised to deliver the technology to the target group who are farmers in this case. These are the contract farming, technical change, target category, functional group and institutional building.

The contract farming scheme is a systematic plan of action, an approach which seeks to control the production environment of the farmer. It is currently being practiced in Ghana especially by the cotton companies and market access programmes which the church-based NGOs are running currently. It provides a range of inputs and services to the farmers within the scheme. The authorities and officers have regulatory and control functions. The advisory and supporting services are client-oriented only so far as the farmers grow the crops of the scheme’s choice. It is possible in a well-managed scheme with a profitable cash crop. Agribusiness marketing and/or processing firms contract landowners or tenants specifying prices, timing, quality and quantity /acreage of the produce to be delivered. The arrangements may include the supply of innovation from the extension organization with guidelines and inputs by the agribusiness firm, who may even control and supervise the farming operation in some situation. The firms also advance capital to the farmers and thus link markets for output and credits (Singh, 2003).

Farmers suffer since cost and inefficiencies are covered through lower farm gate prices or other manipulation against which farmers have no voice for fear of losing access to productive resources. Under such circumstances, farmers are not only captured labour force by the scheme, but opportunities for self-managed development are limited. Agricultural extension under the scheme approach is confined to supervision, inspection, regulation, record-keeping and instruction. The indigenous knowledge of the smallholder which has supported him/her for years is completely absent. The smallholder does not deal solely in cash crop which is most profitable under the scheme. Thus the potential of the farmer is not tapped and there is no knowledge generation and exchange since s/he is merely taught.
2.3.1 Technical change

This is change or being different with regards to a specialized area. It is an act or mode that elicits desirable change in target beneficiaries as in for instance the best-farmer-awards. Tudridep used to award farmers who best keep their traction bullocks. It elicits desirable change in farmers through incentives which relate usually to the introduction of innovations that increase production, reduce cost and generate income. The technical change approach relies on a spontaneous social process called the ‘diffusion process.’ It suggests that diffusion takes place when a novel idea or innovation is introduced into a social system such as a rural community yielding outcomes to its end user and others become attracted and seek to adopt it (Jiggins & Rolings, 1982). Adoption indeed occurs according to the way farmers see and understand clearly the advantages of the technologies according to their own value system and this has a place or location specific underpinning. These advantages stimulate farmers’ enthusiasm and serve as driving force for future innovations (Bunch, 1990).

In a community setting, not all people are equally privileged and quick to adopt innovations which are dependent on variables such as farm size, education, leadership and contact with extension among others. Those that are adventurous, enterprising and associated with these variables are easily motivated to adopt. The social system into which an innovation is introduced is never homogeneous; disparity exists influencing access to resources or variables and hence adoption and diffusion. This is well understood if the indigenous knowledge system of the area is clearly mastered. This having been understood, the technical change had been depended on as wholesale ‘promoter’ of or enhancing production in the face of heterogeneous society which never fared well. It does not take into consideration the smallholder situation which predominates and the determinant of the adoption or diffusion.

2.3.2 Target category

This is also an extension mode or tool that recognizes the heterogeneity and disparities that permeate the social system of the smallholder farming system. It seeks to redirect agricultural extension strategies, delivery mechanisms and fashions them to cater for the heterogeneity or
disparities that can be encountered in the social system or characterize the smallholder farming system. Target categorization maximizes homogeneity within target categories and heterogeneity between them and this has been in practice since colonial period even though the attention given to the categories are not the same (Jiggins & Rolings, 1982). Between 1900 and 1950, according to Millar (2004), the Department of Agriculture (Ghana) advised and assisted farmers to produce crops for export to the total neglect of the food crops. Target-oriented extension creates special opportunities for the target to adopt and this works best if the target is small in terms of numbers.

Scaling up this approach especially within the general agricultural extension system of Ghana is quite limiting. It requires categorization in the first place; greater involvement of smallholders and then the development of access mechanisms to services and resources. These farmers who are over 50% of the farming population in Ghana are the majority. On individual basis, it is most difficult to tap the skills or creativity of these farmers in development effort. Facilitating conducive atmosphere through the reduction of illiteracy among farmers and enhancing education on group dynamics which is informed by the indigenous knowledge systems of the area will not only ease the development effort. It will also make target category a functional approach for accessing services and resources from service providers.

2.3.3 Functional group

This is another extension approach which uses groups. It strengthens farmers’ capacity to demand services and resources appropriate to their needs through the countervailing power. It empowers or supports small-scale farmers to exercise some real control of development efforts such that they respond to their own definition of development or of their own interests (Jiggins & Rolings, 1982). This is not very prominent except lately where cotton farmers in the Sissala area teamed up and demanded fair prices and treatment among others from the cotton company and these were granted them. In Burkina Faso and Mali, such functional groups as Union Nationale des Producteurs de cotton du Burkina-UNPCD and Association
des Organizations Professionelles Paysannes-AOPP respectively exist which intercede with government to protect farmers’ interest (Spore, 2004).

This approach seeks to promote better relationship between internal (small-scale farmers or smallholders) and external supporters of development which is a shift from the traditional development trend where there exists power imbalance. The ability of a group to perform can not be underestimated and this is why most projects advocate working with groups. Unfortunately, these groups had never originated from traditional or indigenous groupings and hence the poor performance of these groups. According to Hounkonnou (2001), indigenous groupings have the potential of growing to a status that meet the productivity, well-being and empowerment concern of the rural people. It requires some conscious efforts to deal with or arrive at groups that are grounded by the indigenous knowledge systems of the location. It is only such groups that are creditable and can greatly influence development.

2.3.4 Institution-building

This is another approach of extension services where staff and programmes accountability to small-scale farmers are ensured through the support of small-scale farmers’ organizations. Participation of farmers and their influence over programme design and implementation is highest here (Jiggins & Rolings, 1982).

Accountability to (farmers) and influence over programme design and implementation are not very prominent features of the traditional trend of (agricultural) development in Ghana. Lately, however, some NGOs are trying to account financially to their target beneficiaries through the display of cost/activity/report on sign boards in the communities.

It requires some amount of conscious effort on the part of development actors, especially agricultural officers, in this case, to make the small-scale farmer a “better player in the game”. The recognition of the indigenous knowledge system as well as paying attention to the local dynamics of the smallholder will promote the participation and influence and hence adoption of technologies.
2.4 TRAINING AND VISIT (T&V) EXTENSION APPROACH

Developed agricultural extension technologies had been delivered through strategies. These are carefully devised plan of action for achieving goals. Technical information on agriculture is imparted or given to farmers through strategies and these include T&V, Farmer Field School (FFS) and farmer to farmer extension.

T&V is a strategy via which technical information on agriculture is imparted or given to farmers. The technical information or technology is usually generated through scientific means at the agricultural research stations and this technology is transferred to farmers who are perceived as recipients and should be taught relevant technical advice through the extension agents who have been empowered with this technology. Thus, it creates an information-flow between the research stations, subject matter specialists, extension agents, contact farmers and followers. T&V has been widely adopted due to its impressive results (Benor & Barter, 1984). In Ghana, T&V was intensively practiced in the days of FASCOM and URADEP but very limited successes were chalked due to the unilateral analysis of farmers’ situation (Millar, 1992). As an extension delivery tool, it is designed to achieve rapid results and attracts as little cost as possible.

This technology generation process never involves the farmer who is an active participant in the farming process. The indigenous knowledge system of the smallholder was never considered or given a value and hence the limited successes. Under such circumstances, the technology which is meant for the farmer may be resisted or rejected after the farmer has taken it through a ‘process’. The ‘transfer’ which also depicts giver and receiver scenario falls short of the real life situation of the farmer.

2.4.1 Farmer-Field-School (FFS)

It is another form of extension delivery mechanism through which technical information or technology is passed on or imparted to farmers. It originated from Asia in the late 1980s stemming from the fact that inputs are grossly abused and an informed decision needs to be
taken in this regards. It is a school without walls, situation on and by farmers in a field where farmers meet regularly to:

- Learn and share experiences.
- Learn and develop agro-skills and farm management tools, and
- Implement the 4 key principles of FFS i.e grow a healthy crop season-long, monitoring the field regularly, conserving beneficiais and farmers becoming experts in their own fields (Gallagher, 2003).

The farmers and the agricultural officials learn together during the process. It deals with groups that have a common interest who meet regularly to study or learn a particular topic. The learning is based on experiential, participatory and hands-on-work (Ingevall et. al., 2003). According to Pimbert (2003), FFS is a form of social learning, negotiation and effective collective action by and for farmers and their communities, focusing on society’s relationship with nature and assuming that all rural people, even the poor, have assets. It is a platform for both learning and empowerment (CIP-UPWARD, 2003). Learning is a consequence of experience and people only become responsible when they have assumed responsibility and experience success (Pretty, 2002).

Farmer field school is composite since it promotes technology generation or development, adoption and diffusion. It does meet the real needs or life situations of farmers especially those with limited access to external inputs for increased production. It draws on farmers’ own knowledge and innovativeness and has the potential of bringing farmers and outsiders together in a common research process, building on farmers’ own capacity to generate technologies and modify practices and complementing conventional scientific forms of experimentation (Coleman, 1990). It has proven an effective tool/mechanism for cultivating farmer learning and empowerment since farmers are encouraged to develop their critical thinking leading to greater self-sufficiency. It could also facilitate the formation of community-based organizations. Notwithstanding, maintaining the quality in their implementation and also ensuring that the core principles of the approach continue to reflect are challenging (Ingevall et. al., 2003). In the experience of Ghana, the interest of farmers has been high and evaluation indicated that participants (farmers and agricultural officers) learnt a lot. But this failed to reflect in the results; no scaling up of the successful experiences. This
is a reflection of inappropriateness or its not being grounded in the indigenous knowledge system of the smallholder and hence the non-adoption (Kipo, 1990).

In FFS, the involvement of the farmer is supposed to be quite high and accords him or her, the position to deliver his or her skills as in farmer-to-farmer extension.

2.4.2 Farmer-to-farmer extension

This is another extension delivery mechanism but between farmers (in the context of a farmer-environment). The extension of the technologies is usually done by the farmers who are village extensionists in the village.

No one else could ever display as much enthusiasm for the technology as a farmer who has just tripled his or her yields by using it. One will never know a village farmer’s way of thinking, or his or her priorities and value system, quite like a neighboring farmer. Also, one from the outside can not understand what will motivate a farmer to change better than a neighboring farmer who has just made some major changes. Nor will any professional ever have as much credibility with poor farmers as a neighbor who can show them his or her fields with their greatly improved yields (Bunch, 1990).

This delivery mechanism, very frequently requires absolutely no cash expense and development agencies are using village agricultural extensionists (Bunch, 1990). MOFA recruited farmers as village extensionists, provided them with bicycles and their performance is not impressive. As much as the proximity of these recruited extensionists to the targets is quite high, the performance will also be influenced by their status in the community. Thus the recruitment has to be influenced by the indigenous knowledge system of the area for an enhanced performance.

The flow of farmers’ findings tends to be slow, especially when there are limited means to bring farmers together even though the more appropriate the innovation for a wider spectrum of farmers, the quicker the news of it seems to spread from farmer to farmer (Muleume,
1994). Also, building of the facilitation skills is imperative since it greatly influences the outcome of the delivery mechanism as well as individuals' relationships. The next is the consideration of policy on agricultural extension.

2.5 POLICY ON AGRICULTURAL EXTENSION

Policy, according to Encarta dictionary (2007), is a “course of action, a program of action adopted by a person, group, or government, or the set of principles on which they are based”. Thus, policy on agricultural extension is a framework or principles under which its operation is based. Policies are very important in all sectors of development endeavour. It is these policies that direct the development efforts. The agricultural sector in Ghana has not been an exception right from colonial rule up to self rule.

The agricultural policy pursued during the colonial period was aimed at advising and assisting farmers to produce crops for export, to the neglect of food crops or non-export crops. According to Millar (2004), sufficient revenue was generated which addressed basic food requirements in the urban and cash crops production areas through the importation of staples from external markets. The foreign earnings from the export-crops could have been used for something other than importation of staples if equal attention was given to the home agricultural sector for the production of staples. The policy of the Convention People Party Government of the Dr. Kwame Nkrumah (1960-1966) had a different focus. It was directed at promoting rapid agricultural development through the establishment of state farms which used mechanized agricultural systems and agricultural development corporations (Millar, 2004). This policy demonstrated the power of government since urban unemployment was mitigated and the department of agriculture was abolished. The abolition of the extension service denied smallholders the service which could have promoted or augmented the production of food crops to sustain the country. Between the 1966 and 1982, the directions of policy pursued was also different. It was in favour of large scale production and industrialization based on imported raw materials rather than industrialization based on agricultural surpluses (home-agriculture) (Millar, 2004). This direction promoted production
and marketing of agricultural commodities but to the neglect of the smallholder, who form the majority in the agricultural sector.

All the policies discussed so far did not favour the smallholder except the one between 1981 and 1992 even though not completely. This policy sought to build a conducive and enabling environment which promotes agricultural growth and development in terms of promoting national food security, creating rural employment opportunities where the smallholder dominates, providing agricultural-industrial linkages and a balanced regional agricultural development with emphasis on indigenous practices and resources. Sustainability and indigenous practices were focused especially by the research and the extension department (Millar, 2004). Even with this, very limited practical demonstrations or opportunities existed for the smallholders to realize their potentials, which is crucial.

The goal of the Ministry of Food and Agriculture (MOFA) is to create an enabling environment for sustainable growth and development in the sector. In line with this goal, policies and programmes since the 1990s have been formulated and guided rigidly by the Medium Term Agricultural Development Programme (MTADP) which was geared towards institutional reforms. It aims at shifting attention to smallholders, with emphasis on indigenous practices and resources. Based on the MTADP, the Accelerated Agricultural Growth and Development Strategy (AAGDS) was formulated. The AAGDS has, however, been silent on the indigenous knowledge of farmers (Government Of Ghana/MOFA, 2002). The Food and Agricultural Sector Development Policy (FASDEP) in all recognizes donor conditionalities and the dwindling nature of external funding for agricultural programmes/projects and thus advocate for the effective and efficient utilization of available resources. It failed, however, to explicitly capture IK as a resource which is abundant in the smallholder. IK has not been captured in areas of intervention identified in FASDEP. Technology development is quite vivid in MOFA’s mission statement and the appropriateness of this developed technology should be vigorously pursued since it is key. Warren and Rajasekaran (1993:1) acknowledge this in their assertion that “Indigenous knowledge in Third World agriculture is considerable and too often overlooked”.

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The development efforts of governments of Ghana especially in the agricultural sector have been tremendous (FASDEP, 2002) but without much success (Millar, 1992). Effective and efficient utilization of available resources has been advocated. This calls for efficient collaboration of all stakeholders (policy makers, implementers and farmers). The potential or resourcefulness of each of these stakeholders should not be underestimated.

The developed technology would be appropriate and well fitting to the local conditions if it is grounded on indigenous knowledge systems. According to the World Forum on Food Sovereignty (Spore, 2007:1) “people have the right to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agricultural systems”. This is with particular reference to the smallholders who are endowed with indigenous knowledge.

2.6 INDIGENOUS KNOWLEDGE SYSTEMS

Indigenous knowledge, according to UNESCO (1999:10), refers to “‘traditional’ or ‘local’ knowledge, embedded in the community and is unique to a given culture, location or society”. Indigenous knowledge systems and practices form a large body of knowledge and skills. According to the Encarta dictionary, indigenous means “belonging to a place”, knowledge is “information of the mind, or specific information, or all that can be known, or learning through experience or study” while a system is “a complex whole formed from related parts”.

Indigenous or local, folk or vernacular knowledge systems are referred to as ‘other cultures’ with their technical and non-technical features (Marsden, 1994). Indigenous Knowledge System (I.K.S) is the complex set of knowledge and technologies existing and developed around specific conditions of populations and communities indigenous to a particular area. These systems respond creatively to challenges through local adaptation, experimentation, and innovation under diverse, heterogeneous conditions. Successful adaptations are preserved and passed on from one generation to another through oral and/or experimental means (Titilola, 1996).
Ways of experiencing, perceiving, understanding and defining reality are many and thus the knowledge of the elites is different from the peasants as that of women are different from men. This makes knowledge a key asset. I.K refers to ‘traditional’ or ‘local’ knowledge which is not simple and does not occur in a vacuum. It is embedded in the community and is unique to a given culture, location or society. It is a body of knowledge and skills that has been developed outside the formal educational system, and that enables communities to survive (Guchteneire et. al., 1999; Titilola, 1996; Puffer, 1995). It is derived from systems of production and consumption.

Local forms of knowledge and worldviews exist (Millar et. al., 2004; Emery, 200; Titilola, 1994) among rural people that can be harnessed for effective and efficient implementation of development programmes (Berkes, 1993). This knowledge is a way of life and dates back thousands of years. According to Altieri (1991) cited in Titilola (1994:19), “it is the accumulated knowledge, skills and technology of local people, derived from the direct interaction of human beings and their environment”. It is the basis for local decision-making such as in agriculture and is embedded in community practices, institutions, relationships and rituals (World Bank, 1998; ILEIA, 1995).

Traditional modes of farming have different aspirations compared to the capitalist modes. In the former, home-fields and bush-fields are associated with feminine and masculine attributes respectively and one moves from the home-field to the bush-field. Everyone aspires to be an excellent farmer, a status which is achieved through a gradual process of recognition within the society, based on social and cultural mobility rather than on production aspects. The practitioners of the capitalist modes engage in cash crops production such as cotton, cashew and soybean. In addition to these, is another group that has a foot in both practices in an effort to become farmer entrepreneurs. Farmers here are fewer and accessible to the change agents of technology-transfer. These practitioners are a bit detached from the tradition and are being targeted as contact farmers (Dessein, 2005). Their small number as well as status in society makes them ill-suited as change agents since social structure has significant influence in rural people’s lives (Uquillas, 1993).
Indigenous knowledge is that knowledge which helps a society make decisions about activities that are acceptable to their life ways (Puffer, 1995). It is the local world and becomes co-extensive with the knowable and provides the basis via which the not yet known will come to be known in future thus the acceptance or rejection of innovation (Ruddle, 1993). Thus, it is a body of knowledge used and developed by a people. It is the result of traditional practices and is mostly combined with experiences and practices that are brought in from outside. Indigenous knowledge represents the successful ways in which people have dealt with their environments (Puffer, 1995). It is relevant and worth paying attention to since it dictates the acceptance or rejection of innovation/s. This has not been considered as a very important component in development efforts. Any innovation is judged by its compatibility to the indigenous knowledge systems of the place. The neglect of it has accounted for the poor adoption rate of introduced agricultural technologies. It involves components such as the traditional institutions, which influence the disposition of people/farmers to interventions (Dessein, 2005).

2.7 TRADITIONAL INSTITUTIONS

Traditional institution has been understood as local, collectively agreed upon social arrangements that govern the interactions among members of a given group (Bacho 2004). Traditional institutions evolve over time, and thus reflect the time, place and experiences of the group.

Religious consideration dominates the ordering of daily life in African societies. The belief in mystical powers exist (Haverkort et. al., 2003). This is reflected in the existence of institutions in the rural setting. These traditional institutions are structured and exist in every community. Building relationship with them leads to the establishment of a form of cooperation and respect (Haverkort and Millar, 1994). These are important gates or entry points to communities. These institutions which form part of the indigenous knowledge systems of a people are imperative for development since they influence the selection and integration of externalities into the local practices (Dessein, 2005). Until recently, this view
has been incapacitated by colonialists thus limiting the capacities of rural people to solve their own problems and developing technologies and skills that serve their own needs (Haverkort et al., 2003).

2.8 RELEVANCE OF INDIGENOUS KNOWLEDGE SYSTEMS

International development has been centred on issues such as poverty and hunger. It has depended on research for scientifically researched technical solutions to inform development. An interest in indigenous knowledge systems has the potential of informing and complementing this effort as it is being recognized as an important component of development (Sillitoe, 2000; Gerber, 1991). There is growing interest at both the national and international levels in the role that indigenous knowledge plays in development (Rajasekaran, 1993). In the past, such knowledge has been ignored and development initiatives have hardly stood the test of time, because they have not been economically feasible or culturally acceptable to the society being aided (Puffer, 1995).

A number of formally established indigenous knowledge resource centres show the relevance of indigenous knowledge for sustainable development (Warren et al., 1993). Development is about promoting the use of informed technologies to help improve the lives of the people. In the process of these technologies development, knowledge of indigenous livelihoods is an indispensable resource (Rajasekaran, 1993) and these appropriate technologies are important factors in developing countries' quests for food security.

In order to attack poverty and hunger which are major issues in development, it is critical to redirect resources to the farming and livelihood systems of poor rural communities, by building on their local knowledge and cultural practices. Building on local knowledge and cultural practices is cost-effective and enhances sustainability (Warren & Rajasekaran, 1993). Farmers have had tremendous improvement on their farming systems through innovation and an intricate knowledge about the ecology (Rajasekaran, 1993) even though these knowledge systems, and their capacity for innovation, have been downplayed and neglected by
scientists, especially since colonization. Thus, communities may be economically poor, but very rich in knowledge (indigenous knowledge) and it is this constantly evolving knowledge system which has helped people to survive for generations. Indigenous knowledge systems integrate several lives of the local communities and in view of this rural communities have developed profound and detailed knowledge of their ecosystems. Farmers had manipulated vegetation dynamics to improve soil fertility and also control weeds (Fairhead, 1998). This knowledge is acquired, stored and transmitted through direct and active participation within the environment as well as oral education and socio-cultural processes; it is process-oriented rather than results and adapted to individual needs and situations (Matowanyika, 1998; Caldas, 1993) and it is this that survived the smallholder up to date.

2.9 ACTOR-ORIENTED APPROACH

The situation under consideration involves social actors (farmers and interventionists) and thus analysis can not be based on external influences alone even though certain important changes results from the impact of it. All forms of external intervention enter the existing life-forms of the individuals and social groups and are mediated and transformed by these actors and structures. Large scale and remote social forces can alter life-chances and behaviour of individuals only through shaping directly and indirectly the everyday life experiences and perceptions of the individuals’ concerned and groups. This situation is about a social change and thus concerns the mutual interplay of internal and external factors and relationships, which recognizes the central role played by human action and consciousness (Long, 1994).

As far as this study is concerned, a number of actors were identified. These were the small-scale farmer, the community, family or village, the state or formal institutions and their relationship with farmers. Thus three actors were involved in the investigation at the community level. Having identified these actors as key, the smallholder and his/her environment (community, family or village) were directly interacted with as well as attention paid to the relationship between these actors and the state or formal institutions. Informal discussions, observations and existing literature were also employed.
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The first or primary actor was the average smallholder, practice mixed farming (i.e. keeping cattle, sheep, goats and poultry along side crop production), and spread risks by adopting mixed cropping, combining cereals with legumes, roots, tubers and vegetables (Millar, 1992). According to Bekye (1998:16), there is wisdom in mixed farming: “if one failed the others would not”. According to Millar (1990), the small-scale farmer belongs to organized and unorganized relationships, from which s/he derives support for production, consumption and general welfare.

These insights which formed the basis of the actor-oriented framework were used to guide the research process. The tools used were informed by some basic concepts; namely human agency, strategizing, interfaces and boundaries, social actors, struggle and power.

2.9.1 Human agency

Human agency is fundamental to social interaction. It is the idea that an individual’s actions are motivated by their own beliefs and desires. In social interaction, people as agents, pursue their own goals which are driven by their thoughts, beliefs and desires (Freedlander, 2004). People do not act blindly, but rather follow a principle of rational action. Behaviour is usually motivated and action is the result of desires.

Transformations or changes arising especially from globalization can not be said to have been simply imposed from outside but rather, and as far as possible, been negotiated. The different actors involved such as peasant farmers, agricultural bureaucrats and various agrarian organizations have struggled to advance their own particular interests and outcomes (Long, 1994). Farming populations were found to be heterogeneous in terms of the strategies that farmers adopted for solving production problems (Long 1994). Even though conditions differ and may shape the opportunities open to the farmer, it is s/he who must actively process information (study the situation) and bring together the elements necessary for the operation of the farming enterprise. During the data collection, it came up through informal discussion that farmers still store yam in holes using ash and millet husks. Accordingly, if the
quantity is large, millet is mixed with the spread tubers. This attracts ants, which check the invasion of termites. It is the termites and the millipedes that destroy tubers. Farmers, however, resort to the use of chemicals for the storage of large volumes of for instance beans. Thus, it is s/he who takes a major role in constructing his or her farming world, even to the extent of internalizing external rationalities and thus as it were appearing to carry out the commands of outside agents be that government officer or researcher.

This makes the smallholder, as human agency and the social system under which s/he operates, very relevant and indispensable for consideration if any intervention is to be of benefit to him/her.

2.9.2 Strategizing

Strategizing is a thinking process consisting of anticipation and preparation for the implications and consequences of contemporary actions. In acting as an individual, strategizing consists of recognizing one’s effect on others and coping with their responses among others. Thus, developing solutions requires prioritizing. As a societal leader or spokesman, it consists in considering the interests of all the stakeholders in a particular situation and seeking to protect systemic integrity (Sheridan, 1993). It applies to areas where implications and consequences are of concern to the participants.

Everyone does some amount of strategizing; informally or formally and plans and strategies are often beneficial. In strategizing, both extreme possibilities-well and worst outcomes are anticipated. This usually motivates alertness for information about how events are actually developing. Strong rationalization in strategizing makes behaviours inflexible (Starbuck, 1992).

Individuals and their households organize themselves individually or collectively in the face of planned interventions by government or other bodies and these devised strategies and the types of interactions that evolve between them and the intervening parties shape the nature and outcomes of the interventions (Long and Ploeg, 1989). Interventions enter the life-worlds
of the smallholder was never considered a resource and thus was not incorporated in the development effort.

2.9.4 Social actors

Social actors are autonomous beings and are equally agents of transformation of their own environments and situations. Social actors are usually involved in social relations which are meaningful and take place within a social framework defined either as a social order, as a process of social change, or as both at once. These are never defined on their own, by their assertions, their representations or even their practices, but primarily through their relationships to other actors, whether different or similar, yet to whom these actors are connected by a specific relationship, in a field of action, which is studied (Touraine, 2000).

Peasants are social actors who are not disembodied categories or passive recipients of intervention but are active participants who process information and strategize in their dealings with various local actors as well as with outside institutions and personnel. They have the ability to construct and to justify behaviour that can not be reduced to the simple application of rules and norms (Touraine, 2000). Social actors have the cognitive power about things going on around and have the capability to resolve them. According to Villarreal (1990), peasants are actors, thinking agents, capable of strategizing and finding space for manoeuvre in the situations they face and manipulating resources and constraints within limited opportunities and creating space to realize their agendas. Economic and political considerations, as well as life experiences and particular everyday circumstances, are relevant to the way actors tie together, act upon, attribute meaning to and recreate different elements. The life worlds of farmers as social actors are not confined to spatial and strategic options alone that are usually promoted by policy makers and this has accounted for the failures of most projects.
2.9.5 Struggles and power

Action cannot often be explained in pure terms of individual interest, especially when it is collective as in the case of smallholders. In fact, the more an actor feels his or her self-esteem is threatened, the more norms and institutions appear to him or her unfair or illegitimate. S/he becomes convinced that social norms have not been created for the common good, but rather they are the expression of power which endangers freedom, responsibility and dignity of people (Touraine, 2000). The highest form of struggle usually and directly questions social organization. Thus, reconstruction of social processes, from established social norms to reformulation of different norms, modified forms of social organization, has the potential of making social change possible.

According to Long (1994), food chains contain within them many other arenas within which commodity and non-commodity values are contested, negotiated and realized. These arenas, although often remote from the site of production, are important for understanding farming styles, interface networks and agrarian structure. For instance, shifts in consumer tastes, technology development, and transnational or strategies set off a whole series of repercussions that can significantly affect farm decision-making. It is thus relevant for consideration not only the forms of organization that emerge from the struggles that take place between different interest groups within the regional setting, but also those ordering and organizing processes that arise from the ways in different farmers and other actors are bounded.

The trend of agricultural extension has hardly shifted to knowledge generation and exchange as testified in the reviewed literature. The smallholder who is core in the act or process had been neglected. There has been tendency to surrender local cultural and social values (which control the smallholder) to foreign or external models and policies of agricultural development (Hounkonnou, 2001). This situation has hardly enhanced production (Millar, 1992). Thus, this work seeks to explore the gaps that exist for the promotion of technologies that are grounded in the indigenous knowledge of the people (farmers).
CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

Research methodology is an important component of any study and provides the framework on which the whole process is based (Brown, 1996). It is vital that the methodology is sound and conducted thoroughly to produce accurate and precise data in order to achieve the research goals and objectives. The choice of a suitable research methodology is guided by the theoretical underpinnings of the study goal and objectives, nature of the research problem, the way data would be analyzed, interpreted and presented as well as definition scope of the study. Thus, in this research the choice of methodology is informed and shaped by the research goal of inviting and supporting the incorporation of indigenous knowledge systems in agricultural extension development. It seeks for transformation-from knowledge transfer to knowledge generation and exchange. It has been motivated by the efforts of earlier writers and the resourcefulness of farmers whose potentials in this area have not been tapped (Titilola, 1994; Rolings, 1990; Carlier, 1987).

3.2 ETHICAL CONCERNS

Ethical concerns do not only border on confidentiality and anonymity but also researcher’s location and bias (Apusigah, 2002). Appropriate consent and the protection of the informant are research ethics. The study ensured that the purpose of the interaction was well explained to respondents. The study also assured the informants that under no circumstance will the findings/revelations be pinned to the source. It also sought permission or consent prior to the commencement of the interaction, and respondents were given the option to answer a question of not. As much as questions were asked, it ensured that personal preconceptions, prejudice, or desire did not colour the observed facts or influence the interpretation of those facts.
These research ideals challenge my own self and location. According to Spore (2004) children learn the essentials of farming from their parents in the fields. Having been born into and brought up in a farm family, the researcher shares the membership of the respondents (researchee) but had to act as an outsider (as a researcher) from within. There were instances the researcher tempted to speak like a respondent. But having known my location the researcher was challenged to accept limited and incomplete knowledge and understanding but facilitated the research process so as not to bias the outcomes.

3.3 VALIDITY AND RELIABILITY

The researcher repeated a number of questions at different sessions under instrumentation as a means to determine the consistency of respondents with their responses. In ensuring that questions are unambiguous, the validity and reliability of the data had to be improved. According to Kumar (1996), the ability of an instrument to measure what it is designed to measure in a consistent, stable, predictable and accurate manner is important. Reliability is the consistency of a measurement, or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects; the repeatability of a measurement. A measure is considered reliable if a person's score on the same test remains the same at all times. Initially, the researcher intended to capture the name of the respondent so as to create an atmosphere of openness and/or demonstrate the importance of the interaction. But during the pre-testing it was noticed that respondents were hesitant, inspite of assurance of anonymity. At Kupulima, two respondents’ names were informally sought from community members and they were very different from those given by the respondents themselves. With this experience, respondents’ names were still sought but informally and also not written down. This worked very well.

Validity lies on the strength of my conclusions, inferences or propositions. More formally, it is defined as the "best available approximation to the truth or falsity of a given inference, proposition or conclusion." During the group discussion at Bullu, it was observed that respondents attempted to hold back information. This was overcome by making the
discussion as informal as possible. Also, writing very little was embarked on as the discussion progressed and this changed the output of respondents. The real difference between reliability and validity is mostly a matter of definition. Reliability estimates the consistency of a measurement, or more simply the degree to which an instrument measures the same way each time it is used under the same conditions with the same subjects. Validity, on the other hand, involves the degree to which you are measuring what you are supposed to measure or more simply, the accuracy of the measurement. The researcher depended on validity more than reliability since the former reflects accuracy and the latter consistency.

3.4 METHODOLOGICAL FRAMEWORK

This section deals with theory (actor-oriented approach) that is relevant to the subject matter. The purpose of this is to provide a framework for the issues of concern to the study.

Diversity in agriculture, between and especially within, is considerable since the 1950s (Ploeg, 1990). This high heterogeneity (difference in social backgrounds, groupings and in strategies) is recognized in both the advanced agriculture in the developed world and in the developing countries. The homogeneity in advanced agriculture has elements of differentiation and thus not that homogenous (Long, 1994). Local farming systems of most rain-fed agriculture in Africa are complex and diverse and have been developed to provide livelihoods amidst the highly variable conditions which characterized the system (Rolings, 1995).

In developing countries, tremendous efforts in terms of projects had been put in place to deal with diversities among farmers and thus promote agricultural development even though with limited success (Millar, 1992) and this proved differently in the developed agriculture (Mensah, 1994). This difference in outcomes of the same group of people (farmers) forms the basis for the conceptual framework and methodologies with the employment of "actor-
oriented approach” as an analytical tool. The ‘Actor-oriented approach theory’ adopted as an analytical tool, helped in the understanding of how actors operate (in) and the dynamics of a system and the imperative for integration.

### 3.5 THE RESEARCH STRATEGY

The study combined qualitative and quantitative approaches in data collection and analysis (see sampling, data collection and analysis). Most methodological commentators (Twumasi 2001; Brown 1996; Brannen, 1992; Strauss and Corbin, 1990) seem to agree that, in so far, two distinct approaches (qualitative and quantitative) can be said to exist but the most important difference is the way in which each tradition treats data. The central issue that faces social science research is the choice of the appropriate research approach or strategy and method to investigate the specific problem (Bacho, 2001).

Proponents of the quantitative approach contend that human behaviour in the social sciences, just as physical phenomena in the natural sciences, is quantifiable in attributes and subject to generalization that have universal applicability (Bacho, 2001). According to Brown (1996), where the research issue is clearly defined and the questions require unambiguous answers, a quantitative approach may be appropriate.

On the other hand, where the research issue is less clear-cut and the questions to respondents are likely to result in complex, discursive replies, qualitative methods are appropriate. The question therefore, is whether there are ideal or pure situation of exclusively “qualitative” and “quantitative” data. One might use qualitative data to illustrate or clarify quantitatively derived findings; or, one could quantify, demographic findings or, use some form of quantitative data to partially validate one’s qualitative analysis (Strauss & Corbin, 1990).

Therefore, in the light of the above arguments, perhaps, it is safer to argue for research situation that could combine the two approaches without ignoring completely the other. In view of the above, a combined strategy was adopted to facilitate the use of mixed methods and the use of quantitative and qualitative techniques.
The selection of this methodology is motivated by the efforts put into agricultural development by nations and donors alike in developing countries with little if there is success at all. This concern arose from my personal need to challenge the present trend of extension approach and delivery system that has neglected the linkage or connection that ought to exist between it and the indigenous knowledge of smallholder for enhanced production. This transformation (of agricultural extension) is sought. Agricultural extension methods have been based on wholesale importation of technologies with very low impact (Millar, 1993). Integration or incorporation of rural peoples' knowledge in agricultural development has been very little, if anything at all. This informing has enabled me to raise epistemological concern and request the input from peasant farmers so that efforts could be enhanced.

"Epistemology concerns different theories about knowledge and specifically, about how knowledge is produced, distributed and consumed" (Mbilinyi, 1999:78). It concerns who can be a 'knower'. In relation to agriculture, the interventionist and the peasant farmer has comparable stakes since both are knowers in this context. The researcher’s position which seeks non-violent interaction, agrees that both interventionist and the peasant farmers are knowledgeable (both have the facts, information, understanding and experience) in the field and synergy can be realized if this is appreciated and utilized effectively. This knowledge, which is a dynamic process and depends on interaction among people for its development, enriches lives, broadens horizons and enables one to understand the world, and as well as helps to make better-informed decisions and cope more efficiently with daily challenges. It is a product of processing information or transformed information. The researcher’s concern dwells on the ingredients of knowledge which are the facts, information, understanding and skills acquired through experience or education. “Children begin learning the essentials of farming by following their parents to the fields” (Spore, 2004:1). It transmission according to the indigenous modes occurs (Caldas, 1993). The knowledge of the farmer has not been utilized and thus there has not been complementing efforts between the interventionists and the farmer.
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Farmers are ‘knowers’ or agents of knowledge with regards to agriculture. This analysis is meant to serve as a further/additional call for the reconstruction of agricultural extension process, maximizing the potential of peasant farmers with regards to this knowledge. The appreciation and serious considerations in this perspective can facilitate negotiations and thus critical transformation of the agricultural extension process.

3.6 RESEARCH DESIGN

For any investigation, the selection of an appropriate research design (form or structure that provides complete guidelines for data collection and analysis) is crucial in enabling one to arrive at valid findings. Hence, the research design that was adopted for the study is the Descriptive and Quantitative Survey Research Design (Yin, 1993; Brown, 1996) This Survey Research Design looks at small populations (samples) to discover the relative incidence, distribution, and interrelations of variables. It relied upon the questioning of a selective group (sample) of a population and analyzing data in order to answer or describe set characteristics (Saunders et.al., 1997).

Two main sample techniques/means (probability sampling and non-probability sampling) were adopted and applied for the study. Background information with respect to certain characteristics such as rurality as opposed to urban-ness was also employed. In this study, the entire population was not worked with but a sample which is a representation of the population. For instance, the two districts were involved in the study instead of one district which does not represent the entire districts (population).

Eight area councils were picked (purposefully selected) out of the nine. Tumu was left out from the 9 administrative structures in the Districts because it falls under town area council and it is also urban. In each of the districts, the names of the four area councils were written on pieces of paper and then wrapped into balls for children to pick two per districts (simple random sampling). From this selection, representative villages were randomly selected for the study from the four selected area councils. In each area council, simple random sampling was employed; the total number of villages was written on pieces of paper, wrapped and
made children to pick 50% of it (the names of the villages). This simple random sampling resulted in 5 villages in the West and 10 in the East (Table 3.1). A prepared semi-structured questionnaire was administered to farmers in these villages. In these Villages 10 informants (5 men and 5 women) were purposefully (in terms of sex) and simple randomly (within sex) selected for interviewing.

Table 3.1: Community and districts sample for the study

<table>
<thead>
<tr>
<th>S/No.</th>
<th>Community</th>
<th>Districts</th>
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<tbody>
<tr>
<td>1</td>
<td>Kupulima</td>
<td>Sissala West</td>
</tr>
<tr>
<td>2</td>
<td>Gbarima</td>
<td>Sissala west</td>
</tr>
<tr>
<td>3</td>
<td>Nimoro</td>
<td>Sissala West</td>
</tr>
<tr>
<td>4</td>
<td>Kankanduale</td>
<td>Sissala West</td>
</tr>
<tr>
<td>5</td>
<td>Chetu</td>
<td>Sissala West</td>
</tr>
<tr>
<td>6</td>
<td>Dimajan</td>
<td>Sissala East</td>
</tr>
<tr>
<td>7</td>
<td>Pieng</td>
<td>Sissala East</td>
</tr>
<tr>
<td>8</td>
<td>Kasana</td>
<td>Sissala East</td>
</tr>
<tr>
<td>9</td>
<td>Kasapori</td>
<td>Sissala East</td>
</tr>
<tr>
<td>10</td>
<td>Kwapun</td>
<td>Sissala East</td>
</tr>
<tr>
<td>11</td>
<td>Du-east</td>
<td>Sissala East</td>
</tr>
<tr>
<td>12</td>
<td>Fatchoboi</td>
<td>Sissala East</td>
</tr>
<tr>
<td>13</td>
<td>Gwosi</td>
<td>Sissala East</td>
</tr>
<tr>
<td>14</td>
<td>Gbenebisi</td>
<td>Sissala East</td>
</tr>
<tr>
<td>15</td>
<td>Santijan</td>
<td>Sissala East</td>
</tr>
<tr>
<td>Total</td>
<td>15 communities</td>
<td>2 districts</td>
</tr>
</tbody>
</table>

*Source: Field data, June 2007*

The researcher’s choice of the sample size was also influenced and informed by the following factors:

- The size of the population; the two area councils selected in the Sissala West district have less population (number of villages) compared to the Sissala East and hence 5 and 10 villages in the West and East respectively.
• The specific population parameters of interest; eight area councils which are based in rural areas were selected since farmers are the target of the study.
• The cost of study.

Observations made during the data collection that otherwise could not be captured during interviewing were noted and incorporated into the data. Aside, secondary data was reviewed from earlier works in relation to the subject matter.

3.7 DATA COLLECTION STRATEGIES AND INSTRUMENTS USED

Based on the epistemological and ethical considerations, as well as chosen design, the researcher found it appropriate to approach the research from both qualitative and quantitative standpoint.

Quantitative approach, with proper sampling, allows for the measurement of respondents’ reaction to a set of questions with answers. The qualitative approach gives an in-depth experience and the real life in its many variations of the respondents. According to Creswell (1998) it provides greater richness and more information, even though about a smaller number of people, newer and more innovative. The researcher adopted the qualitative approach or method in gathering information for the research but as much as possible, representative sample was worked with so as to effect generalization even though in real life situation life is not that general.

As much as possible, the researcher used more than one method in data collection from the primary sources since this afforded me triangulation and these were interviews, observation and focus group discussions.

3.7.1 Interviews

Karma (1996) defined interview as any person-to- person interaction between two or more individuals with a specific purpose in mind. Interviews are classified into unstructured and structured.
In using the unstructured interview approach, also known as the in-depth interview (focus group discussion), a framework (Appendix B) was developed to guide the interview process. This made it possible for me to collect data among key informants (men and women). The primary level actors (farmers from the actor perspective) have been important for the study and were given the opportunity to determine what the diversities and discontinuities are (with other actors) in their ways of production. Hence, this approach solicited in-depth information on the potentials of farmers that could be harnessed for agricultural development through extension. Face to face discussions were held with respondents (Appendix B) and interaction was more informal than formal especially during the group discussion and this disposed respondents who talked freely.

Four communities (two from the west (Gwollu)-Lulo and Bullu and the other two from the east(Tumu)-Kunchorgu and Kuroboi) of the Sissala districts (Figure 2) were randomly selected and visited. In each of the district, the villages which were not picked for the individual interactions were written on pieces of paper, wrapped for a child to pick two names per district. The discussions were held with four groups. The participants of the four groups total 22 men and 29 women from the four communities (Table3.1).

**Table 3.2: The randomly selected and visited communities**

<table>
<thead>
<tr>
<th>S/No.</th>
<th>Community</th>
<th>District</th>
<th>Participants in discussion held</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Men</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td>1</td>
<td>Lulo</td>
<td>Sissala West</td>
<td>3 (37.5)</td>
</tr>
<tr>
<td>2</td>
<td>Bullu</td>
<td>Sissala West</td>
<td>8 (50)</td>
</tr>
<tr>
<td>3</td>
<td>Kunchorgu</td>
<td>Sissala East</td>
<td>5 (41.7)</td>
</tr>
<tr>
<td>4</td>
<td>Kuroboi</td>
<td>Sissala East</td>
<td>6 (40)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>22 (43.1)</td>
</tr>
</tbody>
</table>

*Source: Field data, July 2007*
3.7.2 Questionnaire

This is a written list of questions, applied for respondents to provide answers to specific questions. The questions were read to respondents who interpreted what had been read and then provided the answers. The questionnaire approach was adopted and used. Saunders et al., (1997) argued that the choice of using a questionnaire is influenced by a variety of factors as follow:

- Characteristics of the respondents from which you wish to collect data.
- Importance of reaching a particular person as respondents.
• Importance of respondents answers not being contaminated or distorted.
• Size of sample you require for your analysis, taking into account the likely response rate.
• Type of questions you need to ask to collect data and.
• Number of questions you need to ask to collect your data.

In the light of the above, my choice of using the questionnaire was based on the fact that: the target respondents were scattered over the geographical area. Interviewer-administered questionnaire was conducted on the non-literate respondents (75 men and 75 women) to ensure that the respondent is the person purposefully sampled for questioning (Table 3.2).

Table 3.3: Participation in Questionnaire Survey at the community level

<table>
<thead>
<tr>
<th>S/No.</th>
<th>Community</th>
<th>Districts</th>
<th>Participants in the individual interview</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>1</td>
<td>Kupulima</td>
<td>Sissala West</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Gbarima</td>
<td>Sissala West</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Nimoro</td>
<td>Sissala West</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Kankanduale</td>
<td>Sissala West</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Chetu</td>
<td>Sissala West</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Dimajan</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Pieng</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Kasana</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Kasapori</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Kwapun</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>Du-east</td>
<td>Sissala East</td>
<td>5'</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>Fatchoboi</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Gwosi</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>Gbenebisi</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>Santijan</td>
<td>Sissala East</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>2</td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>

Source: Field survey, June 2007
3.7.3 Observation

Karma, (1999) defined observation as a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place without asking the respondent. He further outlines the basic conditions under which it is most appropriate to observe as in learning about interactions, functions and behaviours in a group. This is more so, relevant in situations where accurate information cannot be elicited by questioning. This approach was relevant in obtaining data during primary visits to obtain information, interviewing and administration of questionnaire. Observation was employed after having ensured that natural conditions existed and non-verbal modes of individuals as well as groups studied/noted. This started from the pre-visits stage up to the end of the data collection. At Kunchorgu, the keen attention and acceptance of the interviewee’s responses during the discussion made a respondent to whisper to another that “if not today, I never knew that these people value us this much”. This came to light when their (the two respondents) interaction were probed. Observing the modes of the respondents revealed that I was being observed and this influenced the responses from respondents. It also revealed the importance of follow up and informal discussions.

3.7.4 Desk Review

Stewart and Kamins (1993), as cited in Saunders et. al. (1997), argued that in using secondary data, you are at an advantage compared to researcher using primary data because the data already exist and you can evaluate them prior to use. They further argued that the time you spend evaluating potential secondary data source is time well spent, as rejecting unsuitable data earlier can save much wasted time later. In the light of this, earlier works done on the subject matter were reviewed. The major source included documentary review. The documents here are used to mean information on magazines, books, journals, and the internet on the subject matter was elicited. It saved a lot of time.
3.7.5 Pre-testing of the instruments

Pre-testing is the trying out of an instrument under instrumentation (e.g. questionnaire) on similar interviewers with respondents to be used in the study. Pre-testing offers the opportunity for the standard of clarity, adequacy and lays out an easy administration of the instrument (e.g. questionnaire) to be determined. Pre-testing helps the researcher to assess whether the interviewers do understand and can administer the instrument effectively and whether the target respondents find the schedule adequate and to its purpose. The pre-testing provides the opportunity to estimate the time duration to administer completely one instrument to each category of the respondents.

Economy, convenience and interpretability also characterize the practicality of a measuring instrument (Yin, 1993). Economy consideration suggests trade-off between the ideal and what the budget can afford. Convenience suggests ease of administration of the instrument. Interpretability consideration is paramount especially when others apart from the designer are to interpret and administer the measuring instrument. Pre-testing provides an opportunity for necessary changes to be made on the instruments and thus addressing the above concerns.

After having trained the research assistants, the pre-testing in two communities, Gbenebisi in the East and Lulo in the West of the Sissala districts, posed a serious challenge to administration and interpretation of the questionnaire. Preceding this revelation, initial visits were made to familiarise, establish linkages and rapport, and build relationships with the two communities. This was followed by a second round of visits to these communities during which the administration of the questionnaire, the purpose of the interaction, was discussed with respondents (2 persons: One man and one woman). The assurance of anonymity and then the consent for the questions to be asked was solicited from the respondents. Having had an affirmation, the interaction commenced.

In the first community the interaction took quite some time; questions had to be re-asked for better understanding and interpretation. The furthest of the randomly selected communities were purposefully selected. The outcome of this pre-testing informed the conduct of the
research; trained research assistants were used but closely monitored after having taken them through the questionnaire for enhanced understanding. This had improved the data collected. Even though this was intended to be done in January 2007 it really took place in April 2007.

3.8 DATA ANALYSIS AND TECHNIQUES EMPLOYED

Karma, (1999) referred to data analysis as the computation of certain measures along with searching for patterns of relationship that exist among data-groups. In analyzing data in general, Yin (1993) also states that a number of closely related operations are performed with the purpose of summarizing the data collected and organizing them in such a manner that they answer the research question. The data analysis for this study entailed the employment of both qualitative (descriptive) and quantitative methods. The analysis, however, was heavily skewed towards qualitative descriptive analysis.

In the light of the above, qualitative data analysis was made during the data collection process and after the over all data was collected. This goes to support Yin’s (1993) view that data analysis should not be a separate step coming after data collection but a continuous and simultaneous process. In the data collection process, qualitative field notes were captured on daily basis on events, conversations, interviews and stories in relation to indigenous knowledge on agricultural production. These and other issues during group discussions and interactions were analyzed after each day’s work. During the data collection, issues were noted and cross examined for validation, informally. Based on the outcome of the informal interactions, the issue was discussed at the group and/or individual levels. The rationale was to keep track of important events/ issues that cropped up in the day’s work and note them. This process also served to prepare researchers for the next day.

The analysis involved the employment of the constant comparative method, content analysis, sorting and tabulating, simple percentages and tables techniques. The constant comparative analytical technique was used to examine and analyze descriptive data across issues and groups. Responses to the main issues of the research by individuals, groups and communities were identified and these were then compared with that of other individuals, groups and
communities. Content analysis was employed to arrive at the age limits and ranges of the respondents. A representative sample (75 respondents) of the collected data was examined to arrive at the 10 and 80 as the lower and upper age limits of the respondents. This is represented in an age interval of seven (7) within which all the respondents fell. Sorting, which entailed categorization and tabulating was employed. Respondents were categorized into men and women from which their responses were identified for tabulating. Simple percentages were also employed and this facilitated the aggregation of responses for easy comparison. Simple tables were also used to capture and present statistical data. Data analysis was planned to last for two months (May and June) but was extended to August and September due to unforeseen circumstances.

3.9 CONCLUSION

The theoretical underpinning of the study goal and objectives, coupled with ethical considerations, provided direction and hence quality data collection and analysis. This would not have been possible without the co-operation of the respondents, my supervisor and the research assistants.
4.1 INTRODUCTION

The study entailed an investigation into the ways rural peoples’ knowledge systems become part of and can be incorporated into current agricultural extension systems to ensure optimal use for increased productivity. The situation involved social actors (farmers and interventionists) and thus analysis was not based on external influences alone even though certain important changes result from the impact of it. This situation is about a social change and thus concerns the mutual interplay of internal and external factors and relationships, which recognizes the central role played by human action and consciousness (Long, 1994).

As far as this study is concerned, a number of actors were identified. These were the small-scale farmer, the community, family or village, the state or formal institutions and their relationship with farmers. Thus three actors were involved in the investigation at the community level. Having identified these actors as key, the smallholder and his/her environment (community, family or village) were directly interacted with as well as attention paid to the relationship between these actors and the state or formal institutions. Informal discussions, observations and existing literature were also employed.

The first or primary actor was the average smallholder, practice mixed farming (i.e. keeping cattle, sheep, goats and poultry along side crop production), and spread risks by adopting mixed cropping, combining cereals with legumes, roots, tubers and vegetables (Millar, 1992). According to Bekye (1998:16), there is wisdom in mixed farming: “if one failed the others would not”. According to Millar (1990), the small-scale farmer belongs to organized and unorganized relationships, from which s/he derives support for production, consumption and general welfare.
These insights which formed the basis of the actor-oriented framework were used to guide the research process. The tools used were informed by some basic concepts; namely human agency, strategizing, interfaces and boundaries, social actors, struggle and power.

### 4.2.1 Human agency

Human agency is fundamental to social interaction. It is the idea that an individual’s actions are motivated by their own beliefs and desires. In social interaction, people as agents, pursue their own goals which are driven by their thoughts, beliefs and desires (Freedlander, 2004). People do not act blindly, but rather follow a principle of rational action. Behaviour is usually motivated and action is the result of desires.

Farming populations were found to be heterogeneous in terms of the strategies that farmers adopted for solving production problems (Long 1994). Even though conditions differ and may shape the opportunities open to the farmer, it is s/he who must actively process information (study the situation) and bring together the elements necessary for the operation of the farming enterprise. During the data collection, it came up through informal discussion that farmers still store yam in holes using ash and millet husks. Accordingly, if the quantity is large, millet is mixed with the spread tubers. This attracts ants, which check the invasion of termites. It is the termites and the millipedes that destroy tubers. Farmers, however, resort to the use of chemicals for the storage of large volumes of for instance beans. Thus, it is s/he who takes a major role in constructing his or her farming world, even to the extent of internalizing external rationalities and thus as it were appearing to carry out the commands of outside agents be that government officer or researcher.

This makes the smallholder, as human agency and the social system under which s/he operates, very relevant and indispensable for consideration if any intervention is to be of benefit to him/her.
4.2.2 Strategizing

Strategizing is a thinking process consisting of anticipation and preparation for the implications and consequences of contemporary actions. In acting as an individual, strategizing consists of recognizing one’s effect on others and coping with their responses among others. Thus, developing solutions requires prioritizing. As a societal leader or spokesman, it consists in considering the interests of all the stakeholders in a particular situation and seeking to protect systemic integrity (Sheridan, 1993). It applies to areas where implications and consequences are of concern to the participants.

Everyone does some amount of strategizing; informally or formally and plans and strategies are often beneficial. In strategizing, both extreme possibilities—well and worst outcomes—are anticipated. This usually motivates alertness for information about how events are actually developing. Strong rationalization in strategizing makes behaviours inflexible (Starbuck, 1992).

Similarly, pre-testing and keen observations raised issues (reliability and validity of information) of concerned. More careful became imperative and this enhanced the quality of the data collected.

The potential of local actors (farmers) to devise strategies enables them to appropriate, manipulate or subvert particular interventions, demonstration of thinking beings and thus, do not merit the ‘pupil’ or ‘recipient’ status of agricultural extension.

4.2.3 Interfaces and boundaries

According to Long (1994), interface is essentially concerned with discontinuities in social life and such discontinuities imply discrepancies in values, interests, knowledge and power, and typically occur at points where different, and often conflicting, life worlds or social domain intersect. The discontinuities depict social context wherein social relations become
oriented towards the problem of devising ways of overcoming, accommodation to, or struggling against other persons' social and cognitive world.

Social interface is a catalyst that transforms and reinvents the social and cultural environment. It provides a means for actors to interact, react and negotiate in an effort to create a common language for understanding (Long, 1994). The ability and willingness to learn and teach in a collaborative knowledge-based environment is paramount. Unfortunately, this has been overlooked in (agricultural extension) development efforts. The indigenous knowledge of the smallholder was never considered a resource and thus was not incorporated in the development effort.

4.2.4 Social actors

Social actors are autonomous beings and are equally agents of transformation of their own environments and situations. Peasants are social actors who are not disembodied categories or passive recipients of intervention but are active participants who process information and strategize in their dealings with various local actors as well as with outside institutions and personnel. They have the ability to construct and to justify behaviour that can not be reduced to the simple application of rules and norms (Touraine, 2000).

Social actors have the cognitive power about things going on around and have the capability to resolve them. According to Villarreal (1990), peasants are actors, thinking agents, capable of strategizing and finding space for manoeuvre in the situations they face and manipulating resources and constraints within limited opportunities and creating space to realize their agendas. Economic and political considerations, as well as life experiences and particular everyday circumstances, are relevant to the way actors tie together, act upon, attribute meaning to and recreate different elements. The life worlds of farmers as social actors are not confined to spatial and strategic options alone that are usually promoted by policy makers and this has accounted for the failures of most projects and non-adoption of some technologies.
4.2.5 Struggles and power

Action can not often be explained in pure terms of individual interest, especially when it is collective as in the case of smallholders. In fact the more an actor feels his or her self-esteem is threatened, the more norms and institutions appear to him or her unfair or illegitimate. S/he becomes convinced that social norms have not been created for the common good, but rather they are the expression of power which endangers freedom, responsibility and dignity of people (Touraine, 2000). The highest form of struggle usually and directly questions social organization. Thus reconstruction of social processes, from established social norms to reformulation of different norms, modified forms of social organization, has the potential of making social change possible.

According to Long (1994), food chains contain within them many other arenas within which commodity and non-commodity values are contested, negotiated and realized. These arenas, although often remote from the site of production, are important for understanding farming styles, interface networks and agrarian structure. For instance shifts in consumer tastes, technology development, and transnational or strategies set off a whole series of repercussions that can significantly affect farm decision-making. It is thus relevant for consideration not only the forms of organization that emerge from the struggles that take place between different interest groups within the regional setting, but also those ordering and organizing processes that arise from the ways in different farmers and other actors are bounded.

This chapter focuses on the presentation and analysis of data in line with the set objectives of the study. The findings of the study are discussed under socio-demographics, indigenous agricultural practices, modern agricultural extension, effects of modern agricultural extension on farmer knowledge, challenges or gaps between indigenous knowledge/agricultural practices and “modern” agricultural extension and opportunities for building synergy.
Conclusions are drawn on the findings and recommendations made for improvement are also discussed in the next chapter.

4.3 SOCIO-DEMOGRAPHIC INFORMATION

This study targeted one hundred and fifty (150) respondents who were met in fifteen (15) communities in the Sissala East and West districts, within the catchments area of Tumu Deanery Rural Integrated Development Programme (TUDRIDEP). The age distribution of respondents ranges from 10 to 80 years. See Table 4.1.

4.3.1: Age distribution of respondents

Through the sorting and tabulation of the demographic data, it was realized that women are the majority of the respondents met and also the majority of the respondents met fell within the 31-40 age range. Having collected the data, the minimum (10) and maximum (80) age limits of respondents was determined from content analysis. This analysis gave rise to the 7 intervals (age ranges) within which all the respondents fell. In categories (men and women), the lower (10-20) and upper (71-80) ranges recorded very low respondents but the women category is the higher of the two. The higher respondents met fell within the active range (31-40) and this level out within the very active range (41-50). This demonstrates a high population of women farmers in the study area and within the active age range (Table 1). This agrees with Nikoi (1998) that women living in rural area are predominantly peasant farmers, although they are disadvantaged regarding access to production resources and support services including agricultural extension.

Table 4.1: Age distribution of respondents

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10-20</td>
<td>21-30</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>Men</td>
<td>2 (2.7)</td>
<td>10 (13.3)</td>
</tr>
<tr>
<td>Women</td>
<td>5 (6.7)</td>
<td>15 (20)</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>25</td>
</tr>
</tbody>
</table>
4.3.2 Types of crops cultivated

A cross-tabulation of the data by sex and crop-type revealed striking differences. It revealed that in these communities, 12 crops (Table 4.1) were being cropped. The data, which was drawn from interviews revealed male in all the 12 crops types. 2 of the crops (cassava and sweet potato) were cropped by men only. For 3 crops (maize, groundnuts and bambara groundnuts), the gap between the male and female farmers was relatively small. For the 75 men and 75 women met, their responses in terms of crops are indicated and the calculation is based on the 75 responses/sex.

Table 4.2: Types of crops grown by respondents

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Type of crop</th>
<th>Men(n=75) N (%)</th>
<th>Women(n=75) N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Millet</td>
<td>75 (100)</td>
<td>20 (26.7)</td>
</tr>
<tr>
<td>2</td>
<td>Sorghum</td>
<td>75 (100)</td>
<td>20 (26.7)</td>
</tr>
<tr>
<td>3</td>
<td>Cotton</td>
<td>70 (93.3)</td>
<td>10 (13.3)</td>
</tr>
<tr>
<td>4</td>
<td>Yam</td>
<td>70 (93.3)</td>
<td>10 (13.3)</td>
</tr>
<tr>
<td>5</td>
<td>Maize</td>
<td>75 (100)</td>
<td>50 (66.7)</td>
</tr>
<tr>
<td>6</td>
<td>Rice</td>
<td>75 (100)</td>
<td>20 (26.7)</td>
</tr>
<tr>
<td>7</td>
<td>Soybean</td>
<td>70 (93.3)</td>
<td>30 (40)</td>
</tr>
<tr>
<td>8</td>
<td>Groundnuts</td>
<td>75 (100)</td>
<td>70 (93.7)</td>
</tr>
<tr>
<td>9</td>
<td>Cowpea</td>
<td>15 (20)</td>
<td>5 (6.7)</td>
</tr>
<tr>
<td>10</td>
<td>Sweet potato</td>
<td>15 (20)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>11</td>
<td>Bambara groundnuts</td>
<td>75 (100)</td>
<td>55 (73.3)</td>
</tr>
<tr>
<td>12</td>
<td>Cassava</td>
<td>5 (6.7)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Source: Field data, June 2007. Notes: Percentages are in parenthesis

In two communities, Fatchoboi and Guosi, in the Sissala East all the crops (except cowpea, cassava and sweet potato) were cropped by both men and women. In these communities, the 3 crops were not known and this accounted for their not being cropped. In one community, Kankanduale, in the Sissala West, none of the crops was cropped by women. The difference with regards to women’s involvement could be attributed to the difference in resources in terms of land and time availability (to the woman). In the Sissala East, where Fatchoboi and Guosi are located, there is more land compared to the west where Kankanduale is located. In the Sissala West, a man said “the land is scarce due to population pressure and belongs to the
man and the woman will “joke” with the fertile land.” Another man added that “Land is scarce and it is the man who has to lead or struggle for it while the woman follows if she is to get it at all.” This agrees with Millar (2004) that there is land constraint in localized districts in the savannah zone. Also, cultural differences, indicative of family control of women’s time and labour equally contributes to this situation. A man said during the discussion that “(Hale e pare kinkan) women are not strong enough to work on virgin lands that are usually full of shrubs”. In addition, a woman said “we do not even have much time at our disposal to do that”. This notwithstanding, the study revealed that women have the potential of cropping all the known crops but for land, time and labour. This is indicative of the differential cropping scale between men and women and some unknown crops (cowpea, sweet potato and cassava) not being cropped at all or by majority of women. With the exception of cassava and sweet potato, all the crops are done by women but at a smaller scale compared to men. Women’s involvement in groundnuts and maize is of higher scale especially the cropping of maize which agrees with Millar (2004) that it is an important crop for subsistence.

4.3.3: Types of livestock reared

From the interviews, it was revealed that nine types of animals were reared by the farmers of the study area. All the nine types of animals were reared by both men and women farmers but the scale of involvement differed markedly (Table. 4.2). This difference in scale of involvement has been greatly influenced by the culture of the respondents. All the respondents (100%) indicated that they reared the said animals because of their culture.

All the animals are allowed and rear except donkey (6.7%) by the men compared to the women who are allowed and rear fowls (73.3%) and goats (73.3%). Religious beliefs were attributed to rearing of pigs (46.7%) by men only. Donkey rearing (6.7%) could also be attributed to its nature as traction animal and use in carting goods.

In both cropping and rearing, the pattern in terms of scale and species is greatly determined by the culture of the people and this agrees with (Millar et. al., 2004) that the traditional knowledge, skills and values direct or dictate the behaviour of farmers. During the study, it
was intimated that about thirty years ago, women were not cropping or rearing at all. "Women were only preparing food for their husbands and children" a man said. Currently, the number of crops cultivated and the species of animals reared by women has increased through the influence of the agricultural extension officers. According to a female respondent, "tagaare (meaning: it is true). The times are different. This time, we support the upkeep of the house, else it will be too much for our husbands" she added.

Table 4.3: Distribution of respondents by types of livestock reared

<table>
<thead>
<tr>
<th>S/No.</th>
<th>Type of animal</th>
<th>Man(n=75) N (%)</th>
<th>Woman(n=75) N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cattle</td>
<td>70 (93.3)</td>
<td>10 (13.3)</td>
</tr>
<tr>
<td>2</td>
<td>Sheep</td>
<td>70 (93.3)</td>
<td>25 (33.3)</td>
</tr>
<tr>
<td>3</td>
<td>Goats</td>
<td>70 (93.3)</td>
<td>55 (73.3)</td>
</tr>
<tr>
<td>4</td>
<td>Guinea fowls</td>
<td>70 (93.3)</td>
<td>15 (20)</td>
</tr>
<tr>
<td>5</td>
<td>Fowls</td>
<td>70 (93.3)</td>
<td>55 (73.3)</td>
</tr>
<tr>
<td>6</td>
<td>Ducks</td>
<td>65 (86.7)</td>
<td>10 (13.3)</td>
</tr>
<tr>
<td>7</td>
<td>Pigs</td>
<td>35 (46.7)</td>
<td>15 (20)</td>
</tr>
<tr>
<td>8</td>
<td>Turkeys</td>
<td>40 (53.3)</td>
<td>10 (13.3)</td>
</tr>
<tr>
<td>9</td>
<td>Donkey</td>
<td>5 (6.7)</td>
<td>20 (26.7)</td>
</tr>
</tbody>
</table>

Source: field data, June 2007. Notes: Percentages are in parenthesis

4.4 EXISTING INDIGENOUS AGRICULTURAL PRACTICES

The study revealed that farmers are quite knowledgeable in their farming (cropping and rearing) and this is governed by the economic, consumptive and spiritual needs and aspirations as well as world views of the farmers. The spiritual factor greatly influences the varieties and breeds produced by farmers and this unfortunately is overlooked in modern agricultural extension. This has been enhanced by their profound knowledge of the environment in which they find themselves. This section focuses broadly on indigenous agricultural extension on crops and livestock.

4.4.1 Indigenous knowledge on cropping

It was revealed (Table 4.3) that farmers have known times of sowing (100%) by using certain indicative signs from the environment since time immemorial. There is known time with
associated signs that have been derived from the environment such as rains, sprouting of some trees e.g. baobab, ripening of some fruits, shedding of leaves, and also migration of ants with their eggs. These known times enable them to adequately prepare both physically and spiritually (100%) for the cropping season.

Cropping has been mixed cropping and weeding is done to give the crops some space and access to sunlight. A farmer added that at some stage, “you only enter the farm and pull off the big grasses”. According to farmers, when the farm is clean you do not lose most of the farm produce at harvest on the field.

In addition to the adequate preparation for the cropping season, they also protect their fields and the products (100%) in many ways. These protective practices, which involve sacrifices or placing certain things at the edge of the farm were said to ward off hazards that could potentially reduce farm yields. A farmer said one way of protection is “mixing burned weeds with shea butter and applying it on flat stones that are placed around the field or putting black medicine on a stone in the form of “T” on the farm”. These protection efforts also scare thieves from picking products from the fields.

Physical and spiritual preparation involves land and seeds while spiritual preparation involves sacrifice, which is, invoking the ancestors to guide and protect the process. A farmer said “the sacrifice is a call on the ancestors to pave the way for the cropping season to be successful”.

**Table 4.4: Indigenous agricultural practices in crops production**

<table>
<thead>
<tr>
<th>Known ways</th>
<th>Present(n=150)</th>
<th>30 years ago(n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Known time of sowing</td>
<td>150 (100)</td>
<td>150 (150)</td>
</tr>
<tr>
<td>Physical and spiritual preparation for farming</td>
<td>150 (100)</td>
<td>150 (100)</td>
</tr>
<tr>
<td>Protection of the farm and its products</td>
<td>150 (100)</td>
<td>150 (100)</td>
</tr>
</tbody>
</table>

*Source: field data, June 2007. Notes: Percentages are in parenthesis*

At harvest, a selection of healthy heads of crops such as maize, millet and sorghum with particular characteristics are kept as seeds. These are often the best looking in terms of size,
color and weight. A man said, “the big big heads of maize, millet and sorghum are usually kept as seeds at harvesting time”. He added that with the exception of sorghum and millet, the grains at the base of these heads are used as seeds for sowing.

Traditional means of storage still exist (60%) in addition to chemical storage (33.3%). The mode of storage is greatly influenced by the volume meant to be stored. The traditional mode of storage involves mixing ash with seeds before putting it into the container especially of a smaller volume. “As for ‘lodar’ (a botanical), it is put into the barn first before the seeds are added,” according to a respondent at Chetu. Sorghum and millet that are selected for seeds are normally put into the ban first and the one which is meant for eating is put on top.

4.4.2. Indigenous modes of livestock keeping

In acquiring animal, physical and spiritual preparation is also done. Consent is sought from the elders and blessings from the ancestors. Farmers who have the means (money) of purchasing an animal for breeding, would seek the permission of the elders of the family, often the family and/or clan head before. After the purchase, the animal is handed over to the elders who then ask for the guidance and protection of the ancestors. “The bought animal is usually presented to an elder who sacrifices and hands over the animal to the ancestors for protection” he said. The study also revealed that all farmers have known means of selecting an animal for breeding as in Table 4.4. A farmer said “if an interest is expressed on an animal and it defecates, do not buy that animal because it is not a good animal for breeding. But if it urinates, it is a good animal”. Accordingly, urinating is associated with good breeds and it holds good for them.

Farmers also have traditional means of managing animal diseases and wellbeing. Some involves the use of plants. According to a farmer, “lodar” (a botanical) is used for dressing the sores or wounds of animals. Also, the sap of and the bark of “paa” (*khaya senegalensis*) are used to treat animals that are suffering from diarrhea.
These practices are still very relevant to farmers and their benefits are demonstrated in the current use of these practices (Table 4.4). However, these practices are not formally or publicly taught. One learns them as s/he grows in the practice of them.

### Table 4.5: Indigenous agricultural practices and level of involvement of the agricultural officers on livestock rearing

<table>
<thead>
<tr>
<th>Known ways/opinion</th>
<th>Present (n=150)</th>
<th>30 years ago(n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Known means of selecting animals for breeding</td>
<td>150 (100)</td>
<td>150 (100)</td>
</tr>
<tr>
<td>Enhanced level of participation and production of livestock</td>
<td>70 (46.7)</td>
<td>70 (46.7)</td>
</tr>
<tr>
<td>Physical and spiritual preparation prior animals acquisition for breeding</td>
<td>150 (100)</td>
<td>150 (100)</td>
</tr>
</tbody>
</table>

*Source: Field data, June 2007. Notes: Percentages are in parenthesis*

### 4.5 MODERN AGRICULTURAL EXTENSION IN THE SISSALA DISTRICTS

Since colonial and post-colonial periods, donors and project implementers have sought to improve the lot of their target beneficiaries or partners in agricultural development via various strategies in an effort to realize their goals. This effort has been continued since the 1970s in an effort to promote food security with focus on the economic and consumptive aspects of production to the neglect of the spiritual aspect and this has created a gap between the two bodies of knowledge systems.

In considering modern agricultural extension technologies in the Sissala area in view of the past 30 years and also the household work distribution, significant differences were revealed in view of types of modern agricultural extension in focus as depicted in Table 4.5 below. The direction of the extension has been focused on sustainable mechanization, seed production, mode of sowing and household work distribution in view of weeding and harvesting. The mode or method of the extension is also considered in terms of enhanced participation and productivity.
4.5.1 Types of modern agricultural extension in focus

Land preparation for cropping has significantly changed over the past 30 years in favour of animal traction (67.7%) from manual (33.3%). Seed production however, has not changed. All the respondents (100%) said seeds are separated from main harvest at harvesting time. Unlike seed production, sowing is done in lines (60%). Also sowing by women, weeding by men and harvesting by both which in the past 30 years were specifically done by women, men and both respectively. Currently, weeding and harvesting is done by the entire household and traction animals are employed for the weeding. In the past sowing was solely done by women, weeding solely by men and harvesting by men and women.

Table 4.6: Distribution of the trend of technology change

<table>
<thead>
<tr>
<th>Trend</th>
<th>Present (n=150)</th>
<th>30 years ago(n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed mode of land preparation in favour animal traction</td>
<td>100 (67.7)</td>
<td>50 (33.3)</td>
</tr>
<tr>
<td>Mode of seed production (separation at harvest)</td>
<td>150 (100)</td>
<td>150 (100)</td>
</tr>
<tr>
<td>Mode of sowing in favour of lines</td>
<td>90 (60)</td>
<td>60 (40)</td>
</tr>
<tr>
<td>Whole household for the sowing</td>
<td>150 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Whole household and bullock for weeding</td>
<td>150 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Whole household for harvesting</td>
<td>150 (100)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Source: field data, June 2007. Notes: Percentages are in parenthesis

The trend has changed towards enhanced productivity except in the area of seed production.

4.5.2 Mode of the modern agricultural extension

Traditional practices existed prior to the encounter of the agricultural officials. Interaction between the farmer and the agricultural officers is viewed in the light of enhanced participation and productivity. This is an extension of knowledge on agriculture for its
development. Technologies were focused and assessed in terms of participation/involvement of the farmer as partner in the agricultural extension development and the effects of technologies on productivity. Participation (40%) is far below average even though enhanced productivity scored (53.4%) indicative as in table 4.6.

Table 4.7: Distribution of farmers on the level of participation and productivity

<table>
<thead>
<tr>
<th>Performance</th>
<th>Enhancement (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td>Productivity</td>
<td>80 (53.4)</td>
</tr>
<tr>
<td>Participation</td>
<td>60 (40)</td>
</tr>
</tbody>
</table>

Source: field data, June 2007. Notes: Percentages are in parenthesis

Even though productivity is enhanced, the score is less than 100% and this could stem from the low participation/involvement of farmer in the agricultural extension development.

4.5.3 Reflection of the agricultural officer on the farmer

Notwithstanding the challenges, the relationship between the agricultural officer and farmer has been acknowledged to be beneficial (73.3%). The farmer contributes to this benefit (66.7%) and this benefit trickles down (73.3%) to other farmers. In the relationship, the farmer sees him/herself as a pupil (46.7%) and gave his/her opinion that the agricultural officer sees him/her as a teacher (6.7%) as in table 4.8. This has demonstrated the teaching situation in modern agricultural extension instead of knowledge generation and exchange.

Even though the relationship exists and which the farmer acknowledged as beneficial, the farmer perceives him/herself as pupil and not teacher or co-equal to the agricultural officer. The relationship environment might have contributed to this situation or thinking of the farmer.
Table 4.8: The Status of the farmer through assessment

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Affirmative(n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer’s assessment of relationship as beneficial</td>
<td>110 (73.3)</td>
</tr>
<tr>
<td>Farmer’s opinion of contributing to beneficial relationship</td>
<td>100 (66.7)</td>
</tr>
<tr>
<td>Farmer-self assessment of his/her status in the relationship as pupil</td>
<td>70 (46.7)</td>
</tr>
<tr>
<td>Farmer’s opinion of his/her status (teacher) bestowed him/her by extension</td>
<td>10 (6.7)</td>
</tr>
<tr>
<td>agents.</td>
<td></td>
</tr>
<tr>
<td>Farmer’s opinion of the benefits from the relationship to others (farmers)</td>
<td>110 (73.3)</td>
</tr>
</tbody>
</table>

Source: field data, June 2007. Notes: Percentages are in parenthesis

The study confirmed that the farmer has in store his or her knowledge and skills (repertoire), extensive traditional practices in agriculture where s/he is well grounded (Table 4.3 and 4.4). This agrees with the observation of Roling and Jiggins (1994) and Ison (1990) that farmers have the potential in what they do (Spore, 2004); working to enhance their socio-economic situation in the development of their professional capacities and thus inappropriate to see them as requiring instructions on how to produce crops and livestock. Their traditional knowledge and values, skills, social and spiritual dispositions need to be recognized and accepted (Millar et. al., 2004).

4.6 EFFECTS OF MODERN AGRICULTURAL EXTENSION ON FARMER’S INDIGENOUS KNOWLEDGE

Earlier and modern intervention efforts have been the development and spread of technologies which include among others animal traction sowing in lines and seed production (Table 4.5). The availability of agricultural officers and the mode of interaction between the farmer and the officials have greatly influenced the efforts.
Table 4.9: Distribution of agricultural officers and their effect on the farmer

<table>
<thead>
<tr>
<th>Mode of interaction</th>
<th>Farmer’s response (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td>Regular meeting</td>
<td>30 (20)</td>
</tr>
<tr>
<td>Encounter (teaching)</td>
<td>80 (53.3)</td>
</tr>
<tr>
<td>MOFA presence in the community</td>
<td>80 (53.3)</td>
</tr>
</tbody>
</table>

Source: field data, June 2007. Notes: Percentages are in parenthesis

The study however revealed that the spread or distribution of the agricultural officers is above 50% (53.3%) who regularly meet (20%) farmers and teach (53.3%) them (Table 4.9). Even though the distribution of the officers is good, the meeting is irregular and the mode of encounter or the interactive process depicts a teacher-pupil situation. This disagrees with Titilola (1994) and World Bank (1998) that the farmer is not a mere recipient but an expert as well. Spore (2004:1) posits that “Children begin learning the essentials of farming by following their parents to the fields”. This makes them active researchers and experimenters for various reasons and not passive receivers of ideas of scientists (Roling, 1995; Millar, 1994). The teacher-pupil situation as found from the study is inappropriate.

Even though the spread of the staff has not been total, the intervention efforts had an impact on peasant productivity (53.4%).as in Table 4.7. It also revealed that farmers learn among themselves (86.7%) and indigenous knowledge (40%) is being used. The efforts especially with regards to the use of IK is recognized and supported (20%) as in Table 4.10.

Table 4.10: Efforts at enhancing productivity

<table>
<thead>
<tr>
<th>Promoters</th>
<th>Farmer’s opinion (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td>Learning among farmers promotes and sustain agriculture</td>
<td>130 (86.7)</td>
</tr>
<tr>
<td>Efforts are recognized and supported by government</td>
<td>30 (20)</td>
</tr>
<tr>
<td>Farming with ik promotes agricultural production</td>
<td>60 (40)</td>
</tr>
</tbody>
</table>

Source: field data, June 2007. Notes: Percentages are in parenthesis

A farmer said “the introduction of bullocks has led to increased farm size and hence yields”. Another added “with improved agronomic practice, that is, sowing in lines for more plant population and hence more yields”. Farmers learn among themselves and farming with indigenous knowledge to promote agriculture, agrees with Spore (2003) and Warren (1991) assertion that farmers know a great deal about their farming situation and needs than anyone
else and thus are the best teachers even among themselves. Indigenous knowledge is inadequately recognized and supported even though its use as a resource is advocated in the Medium Term Agricultural Development Programme (MTADP). During one meeting, a woman observed with a smile that “If not today, we are not aware that people know of our knowledge let alone appreciating it”. This agrees with Warren and Rajasekaran’s (1993:1) assertion that “Indigenous knowledge in Third World agriculture is considerable and too often overlooked”

### 4.7 CHALLENGES/GAPS BETWEEN INDIGENOUS KNOWLEDGE/AGRICULTURAL PRACTICES AND “MODERN” AGRICULTURAL EXTENSION

The study has revealed significant challenges and/or gaps and this is focused to the two bodies of knowledges.

The study revealed that farmers are quite knowledgeable in what they do and it is greatly influenced by spirituality. At Kupulima, a farmer said “we meet as a community to sacrifice to our ancestors for a good farming season. Any animal for rearing is also handed over to our ancestors”. This demonstrates abundantly that farmers do not only focus on the economic and consumptive aspect of the farming but the spiritual aspect as well and this influences the varieties as well as the breeds of animals they keep. Farmers also learn among themselves a lot.

Modern agricultural practices focus on only the first two aspects; the economic and the consumptive aspect of farming to the neglect of the spiritual aspect. At Nimoro, a farmer said “the agriculture-teachers talk to us plenty about what they want us to do only. One day, one came to my farm and when he saw my “bangfu” he looked at it at length and shook his head. They are only interested in teaching us to produce more for food and money but least interested in why we do certain things”
4.8 OPPORTUNITIES FOR BUILDING SYNERGY OF INDIGENOUS KNOWLEDGE AND “MODERN” AGRICULTURAL EXTENSION

The study has revealed that the intervention efforts to enhance the productivity of peasants are very possible. Farmers learn among themselves and if agricultural officer-farmer interaction is made knowledge generation and exchange, a richer form of knowledge will exist among farmers for sharing. This will maximally make use of the few agricultural officers who are insufficient to do the teaching of farmers that they do. This will also enhance participation/involvement of the peasants in the extension development. This will also disabuse his/her perception that s/he is a pupil or novice in the relationship.

Agricultural officer need to go beyond the economic and consumptive aspect of farming to capture the concern of farmers. Even though farmers expressed interest in working with agricultural officers because of benefits thereof, the relationship will be enhanced and benefits maximized if efforts is grounded in the indigenous knowledge of the farmer.

4.9 CONCLUSION

The study revealed that indigenous knowledge/agricultural practices exist and this is focused on the economic, consumptive and spiritual aspect of farming. ‘Modern’ agricultural extension also exists but this neglects the spiritual aspect of farming. Farmers learn among themselves and with the few agricultural officers, more could be done if agricultural extension is grounded in indigenous knowledge: All the three aspects economic, consumptive and spiritual of farming is captured.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This Chapter discusses the main findings with respect to the indigenous knowledge system of farmers in the Sissala area of Ghana, agricultural extension, the gaps, challenges and potentials for synergy building. It also presents main conclusions and recommendations for building the relevant synergies for integrating IK and modernized agriculture with the view to improving production and reducing poverty in the area.

5.2 SUMMARY

Indigenous knowledge systems exist in Sissala among farmers and this has been amply demonstrated in literature and confirmed by the study. The study revealed that farmers draw from their IK in the area of seed production. They know the times for sowing, harvesting, processing and storage as well as the selection animals for breeding. Farmers also have indigenous practices of treatment especially of livestock as well as protection of farm/fields and their products. All their practices border on the economic, consumptive and spiritual aspect of farming.

Modern agricultural extension has been introduced into the Sissala districts in an effort to reduce rural poverty. The Ministry of Food and Agriculture (MOFA) has staff, although inadequate, who promote this modern agricultural extension among others. Its existence has been demonstrated by the introduction of technologies which include sustainable mechanization (animal traction), improved agronomic practices (sowing in lines) and seed production focusing on only the economic and the consumptive aspect of farming.
Introduced technologies are poorly adopted. Even those that are adopted are completely transformed to suit the farmer local conditions. This reflects gaps on the extension development and delivery mechanism. It has been revealed that farmers acknowledge the benefits thereof in working with agricultural extension agents and desire working with them and this is not demonstrated by 100% adoption of introduced technologies arising from the non-overlap of concerns. Farmers focus on economic, consumptive and spiritual aspect while agricultural officer focus on the first two.

The agricultural extension agents are inadequate who irregularly meet farmers and teach them. It has also been revealed that the very active youth (31-40 age range) are the majority in farming but are least knowledgeable in the indigenous knowledge/agricultural practices arising from western influence and low experiential knowledge. The recognition and support of indigenous knowledge is very low.

Farmers desire to work with extension agents, acknowledge benefits thereof and they also learn among themselves. Indigenous knowledge/agricultural practices are recognized and supported.

5.3 CONCLUSIONS

Smallholders'/peasants' knowledge exist and this has sustained their operation ever since. Agricultural development efforts in terms of technology development and introduction in the districts also existed and even though adoption is not total, it enhanced productivity (53.4%). The interactive process of the farmer and the agricultural official unfortunately depicts or promotes pupil teacher relation and this has influenced the rate of adoption of introduced technologies. Recognizing the potentials/concerns (economic, consumptive and spiritual aspect of farming) of the smallholder and involving him/her in the knowledge generation and exchange (participation) has the potential of enhancing adoption and hence productivity of peasants. This makes integration of efforts the indigenous knowledge/agricultural practices of the farmer and the modern agricultural extension imperative. It has been revealed from this study that the encounter with the agricultural officer increases the farmer’s desire or
The study also revealed that with technical support, their encounter has the potential of increasing yields. The current combination of efforts is not effective and efficient and thus worth reviewing; recognizing the spiritual aspect of farming which is core to the farmer has been neglected.

Farmers, through experiential learning, are quite knowledgeable in their farming activities. They also desire the support of other actors such as agricultural official to improve their farming situation. Even though this support, in the form of agricultural extension, was introduced since 1970s, the potential of the farmer in terms of his/her indigenous knowledge on farming has not been fully recognized and incorporated in the effort for enhanced productivity. There is potential for surmounting this by recognizing the spirituality aspect of farming by the farmer, bridging the gap that stems from extension development and delivery. There is a strong need for integrating and grounding agricultural extension with indigenous knowledge.

5.4 RECOMMENDATIONS

Drawing from the above conclusions and also re-visiting the research questions, objectives and problem which highlighted the gaps and challenges, the following recommendations are made.

The very active youth (31-40 age range) are the majority who are more exposed to the modern agricultural extension. But due to lack of experiential knowledge and western education and religious influence, this group is not as knowledgeable as the elderly in the indigenous agricultural practices who on the other hand are least exposed to the modern agricultural extension. Thus, they have a significant role to play if indigenous agricultural practices are to be harnessed or incorporated in modern agricultural extension for enhanced productivity of the peasants. In doing this, development actors (agricultural officers), could with the peasants come out with incentives which will motivate and encourage youth not to
shy away from indigenous agricultural practices. This will make the youth more curious to spend time on relevant indigenous agricultural practices.

Among the very active youth, the women are more than the males and their level of production is far less than the males. This reflects their less exposure to the modern agricultural extension. More females in the agricultural extension is recommended since this will enhance their exposure. Also, consciously working with women on indigenous agricultural practices and rewarding them based on output will motivate them to learn from the elderly.

Agricultural extension development has been isolated from the farmer. The extension development and delivery has neglected the spirituality concern of farmers. Thus technologies had been developed and transferred to the farmer. Those that are compatible to the farmer’s situation had been adopted as well as those that could adapt to the farmer local conditions. Those that could not meet any of the above conditions are not adopted. This is demonstrated in this study with particular reference to seed production. The agricultural officers are not equipped enough to do the “teaching” that has been the mode of interaction between the farmer and the agricultural officers. In the light of this, it is recommended that farmers practices are built on (generate knowledge with farmers) and this knowledge is learnt by both the parties (farmer and the agricultural officer). It has been revealed that farmers learn among themselves through excursions, field visits and informal interaction.

Two bodies of knowledge (modern agricultural extension and indigenous agricultural extension/practices) have been revealed by the study and these are capable of complementing each other for an enhanced output. In the area of extension development and delivery mechanism, a synergy could be built. The extension development should be based on building on local practices which according to the peasants have the potential of not only promoting productivity for food and money but satisfy the spiritual needs of the farmer. Collectively (the farmer and the agricultural officer) will agree of the practices that are to be built on. This will not only enhance participation and sustainability of these practices but also help address the economic, consumptive and spiritual concern of the farmer. The status of the
farmer will also be enhanced and s/he will effectively and efficient complement the work of
the agricultural officer. The delivery mechanism has also to be influenced by the rural
people's knowledge. Thus it is recommended that information transfer outlets or modes be
collectively identified. Once identified, collectively agreed persons are sought who use
relevant fora for extension delivery.
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Soliciting the consent of the interviewee (farmers).

There have been lots of efforts on the part of farmers including our forefathers and other actors e.g Non-Governmental Organizations (NGOs) and Governments (Ministry Of Food Agriculture-MOF A) to boost agricultural production. This is intended to address hunger and enhance our economic well-being. Inspite of these tremendous efforts, hunger and poverty are still staring at us.

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I assure you that your responses will be confidential and completely anonymous (you will not be identified in any way). Whatever information you provide will only be used for the purposes of this research and thus will not be used for any other purpose.

1. District: 1. Sissala East 2. Sissala West
2. Village
4. Age

A. CHANGE TREND OF AGRICULTURAL EXTENSION
A1.1. What crops are you allowed to produce?
   i. Millet
   ii. Sorghum
   iii. Cotton
   iv. Yam
   v. Maize
   vi. Rice
   vii. Soybean
   viii. Groundnuts
   ix. Bambara groundnuts
   x Others (specify)

A1.2 Why do produce what you produce and not the others? A) Cultural b) Religious

A1.3. Crop production involves:
   i) land acquisition
   ii) seeds acquisition
   iii) land preparation
   iv) sowing
   v) weeding
vi) harvesting
vii) storage
viii) storage
ix) others (specify)

A1.4 In your opinion, what goes into land acquisition for crop production?
a) cash payment b) free of charge d) payment in kind d) others (specify)

What is the traditional form of acquiring land for crop production?

A1.5 What goes into land acquisition for:
  a) Native (men).
  b) Native (women).
  c) Settlers (both men and women).

A1.6) How is land prepared for cropping (a) manually b) tractor c) bullocks

A1.7) In your opinion, is there change of land preparation for cropping? A) Yes b) no

How long is this change?

A1.8 How do you acquire inputs (e.g. seeds) for cropping (a) own seeds b) bought c) given to me by relative/friend) d) other (specify)

How is seed acquired traditionally for cropping?

A1.9) Which category of people do the sowing? (a) men b) women c) children d) all the three
Which category were doing the sowing before this?

A2.0 Do you sow in lines a) Yes b) No

Which are the crops you sow in lines and why are the rest not sown in lines?

A2.1) Do you have a specific time for sowing? a) yes b) no

How do you arrive at this time?

What signs do you use?

A2.2) Which form of preparation do you do prior to sowing? a) physical preparation b) spiritual preparation c) both d) other (specify)

How do you do the preparation?

A2.3) Do you have ways of protecting your crops/farm produce (in the farm) a) yes b) no

How do you do it?

How do those ways protect your crops/farm?

A2.4) The weeding is done by (a) men b) women c) children d) all the three e) bullocks

How does this differ from what happen in the past in terms of who was doing the weeding?

A2.5) Which category of people do the harvesting? (a) men b) women c) children d) all the three

Has this change from the past? A) Yes b) no

Why do you say so?

A2.6) How do you produce your seeds?
a) Separately produced b) Separated from grains only at harvest

How does this differ from the way grandfather used to do it?
A2.7) How do you store your seeds a) store with grains b) use chemicals c) traditional means

**How is the storage done?**

A2.8) Has your level of crop production increased? A) Yes b) no

Do you attribute that (increased) to increased participation (farming and extensionist learning from each other) in extension development? A) Yes b) no

**Why do you say so?**

What goes into animal acquisition? a) economic preparation b) spiritual preparation c) both

**How is it done?**

A2.9) Which of these animals do you rear?

i. Cattle
ii. Sheep
iii. Goats
iv. Guinea fowls
v. Fowls
vi. Ducks
vii. Pigs
viii. Turkeys
ix. Other (specify) ……………………..

A3.0) Why do you rear those that you rear and not the others? A) Cultural b) Religious

A3.1) How are animals and poultry acquired for rearing purposes? a) Purchase b) inherited c) donated by………………………………………………

A3.2) Are animals and poultry provided with housing? (a) yes b) no

A3.3) How is provision of healthcare done? (a) daily inspection of animals b) sent for veterinary officer c) manage condition traditionally d) none (no provision of health care)

A3.4) Selection of breed for breeding (a) randomly picked b) picking is usually based on some features/characteristics

**How do you arrive at this selection method/what features or characteristics inform the selection?**

**How do you arrive at this selection method?**

A3.5) Which development actors are working here with you a) moh b) mofa c) GES d) NGOs

**What does s/he do in your community?**

A3.6) Do you work with him/her? A) Yes b) no

Tell me more how you work with him/her

A3.6) How long have you come into contact with this/these development actor/s (e.g ext. agent/s) a) < 5 years b) > 5 years

**How did you start and work up to date?**

A3.7) How has been your relationship with the extension agent/s a) Beneficial b) not beneficial

**Why do you say so?**

A3.8) Do you see yourself contributing towards this/these benefit/s a) yes b) no

**How is it done?**

A3.9) How do you see yourself in the relationship now? a) teacher b) pupil c) equals

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Has it been like this? A) yes b) no

A4.0. Do you think people benefit from this your relationship with the actor/s a) yes b) no

A4.1. Who are they a) son b) wife c) other farmers

How do you make them benefit

A4.2. How do you think you are seen by this/these actor/s in the relationship a) teacher b) pupil c) equals?

A4.3 In your opinion, has your livestock production changed since your encounter with this actor? A) Yes b) no Has your encounter progressed to learning from one another (farmer and extensionist complementing efforts) and hence improved livestock production? A) yes b) no

What has changed and why?

How is that change promoting agricultural production?

B. ROLE OF INDIGENOUS KNOWLEDGE IN THE DEVELOPMENT OF AGRICULTURAL EXTENSION

B2.1. How often do you meet with the extensionist?
a) once/week b) once/week c) other (specify)...............

What do you think accounts for this?

B2.2 How is usually your encounter?
a) Interactive-learning b) Teaching by the extensionist c) other (specify)..........

B2.3 In your opinion, is the encounter different from the way you bring your child/fellow farmer up in farming?
a) Yes b) no

How do you do it?

B2.4 In your opinion, do you think farmers learn from each other? a) Yes b) No

How do you think it is done if it is yes?

2.5 Do you think this way/method of learning among farmers is promoting and sustaining agriculture? a) yes b) no

In your opinion, how can it be done better?

B2.6 Do you think this way/method (traditional way of learning by farmers among themselves) is recognized and supported by government and extensionists? A) Yes b) No

Why do you think so?

B 2.7 Traditional ways of farming is promoting agricultural production? A) Yes b) no

Why do say so?

Take me through how to crop cowpea

C. INTEGRATION OF AGRICULTURAL EXTENSION DEVELOPMENT EFFORTS AND INDIGENOUS KNOWLEDGE?

C3.1 Has your encounter with the extensionist increase your desire to meet him/her the more? A) Yes b) no

Why do you say so?

C 3.1 Have yields increased after your encounter with the extensionist? A) yes b) no

What do you think accounts for this answer that you give?
C3.2 How has been productivity before and after encounter with the extension agent/s? 
a) > about ...............b) < about......c) same  
What accounts for this situation in your opinion?  

C3.2 What is the level of use of the indigenous knowledge systems (traditional ways of learning among themselves) by farmers and extensionists? a) High b) Low  
In your opinion what accounts for this?  

C3.3. Are your efforts and that of the actor’s complementing? a) Yes b) No  
Why do you say so?  

C3.4) In your opinion, do you think combination of efforts produces an equivalent results (desired results) a) Yes b) No  

C3.5 Do you think this combination could produce more than equivalent results a) Yes b) No  

C3.6) Do you think this combination can be maintained for long time? a) Yes b) No  
Why do you think so?  

C3.7) Do you think with support, you can effectively complement the efforts of the actor a) Yes b) No  
What is the form of this support?
APPENDIX II: B
B: CHECKLIST/GUIDELINES FOR GROUP DISCUSSIONS AT THE COMMUNITY LEVEL
INDIGENOUS KNOWLEDGE SYSTEMS AND AGRICULTURAL EXTENSION AMONG FARMERS
IN THE SISSALA AREA OF GHANA

Soliciting the consent of the interviewees (group discussions).

There have been lots of efforts on the part of farmers including our forefathers and other actors e.g Non-Governmental Organizations (NGOs) and Governments (Ministry Of Food Agriculture-MOFA) to boost agricultural production. This is intended to address hunger and enhance our economic well-being. Inspite of these tremendous efforts, hunger and poverty are still staring at us.

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2. Village.................................
3. Attendance 1. Male.........................
   2. Female..............................

A. CHANGE TREND OF AGRICULTURAL EXTENSION (since the 1970s to date)
   a) Has it moved towards participation/involvement of the farmer as partner in agricultural extension development?
   b) Is the farmer recognized as a key player in agricultural extension development?
   c) How have farmers responded to the interventions?

Men crop/rear more crops/animals than women.

- 30 years ago were women cropping (having plots of their own)/rearing at all?
- Has the number of crops/animals crop/rear increases or not?
- What has accounted for the women involvement in cropping/rearing?
- Ploughed fields for women are usually exhausted, marginal or at the point of being abandoned and not refresh or fertile land (the best land).
- Why?

Culture dictates what you produce/crop/rear.

- Will you be in the position to produce/rear what your culture does not permit so that you will be able to sell and buy what your culture permits you to produce why?

Something is usually given out (especially a settler or if one is to get land from someone for cropping) in appreciation of the value (importance) of land

- Has this system changed over the past 30 years and why?
Land preparation for cropping (cropping generally) has changed (use of hands/manually to plus (bullock and tractor services) over the past 30 years.

- How is the farmer involved/contributed in this change in your opinion?

Seeds could be got from a relative/friend (“free of charge”). What is the traditional basis/indigenous reasoning for this in your opinion?

i). Solely women doing sowing have changed over the past 30 years to involve men and children.
ii) Weeding is now done by men, women, children
iii) Harvesting is now done by men, women and children
v) Provision of animal housing.

- Who introduce these changes?
- What is the involvement of farmer in this change?
- What is the reasoning of the previous position?

Sowing is done in lines for some specific crops and weeding/ridging is done by bullocks.

- Who introduce these changes?
- What is the involvement of farmer in these changes?
- What is the reasoning for these changes?
- Has the farmer been recognized as a key player in this change/development?
- Why do you say so?

ROLE OF INDIGENOUS KNOWLEDGE IN THE DEVELOPMENT OF AGRICULTURAL EXTENSION

B: What role has Indigenous knowledge of peasants played in the development of agricultural extension?

a) Is it a resource that can be optimized?
b) Has there been a policy framework backing on the use of IK in agricultural extension development efforts?
c) How have farmers been involved in the policy development and operation?

You have:
i) Learnt time for sowing and this is demonstrated by some signs (arrival of rains, fruiting/ripping of some trees from your environment).
ii) Physical and spiritual preparation prior to going to the field to start the cropping season.
iii) Physical/economic and spiritual preparation prior to keeping/rearing of animal/s.
iv) Learnt ways of physically and spiritually protecting your fields with the crops/farm produce
v) Learnt ways of getting seeds from main harvest and not separately produced e.g millet, sorghum or maize
vi) Traditional ways of storing seeds with grains e.g groundnuts or storing generally e.g ash with beans, bambara beans.
vii) Traditional means (inheritance, donation/giving as gift) of securing animals for rearing
viii) Traditional means of selecting animals for breeding
ix) Traditional ways of learning among yourselves (farmers).

- What would have happen without this knowledge/basis for your cropping/rearing?
- Are others (agric. people/govt) aware of this knowledge system of yours?
- How is this knowledge system regarded by others? (in terms of Importance?)
- Can this knowledge system be optimized? How?
- Is the govt supporting/policy framework backing this knowledge system (how)?
- How have you been involved in these policies development and operations?
Your iks is overwhelming and this has sustained (indispensable) you for years prior to your contact with the agric. people for the past 30 years.

- What do they do with you?
- How do you work with them (they teaching you or you teach each other?)
- How often do you meet/meeting influences your desire to work with them?
- Exactly how long do you work with them?
- Is your relationship beneficial/led to increase yield/why?
- Do you see yourself contributing towards this benefit if it exists and how?

You could be seen as a teacher

- How do you take somebody through to learn under you?
- How do you (farmers) learn among yourself?
- How can farmers learning among themselves be made better/improved?
- How is that change/learning promoting agricultural production?

C. INTEGRATION OF AGRICULTURAL EXTENSION DEVELOPMENT EFFORTS AND INDIGENOUS KNOWLEDGE?

C: Has there been integration between agricultural extension development efforts and indigenous knowledge?
   a) Has integration led to effectiveness?
      b) Has it afforded efficiency and sustainability?
      c) What are the gaps?
      d) How might they be closed?

Your encounter with the extensionist (agricultural officer) increases your desire to meet him/her. This has led to yields increase after your encounter with the extensionist. What accounts for this situation in your opinion?

The level of use of the indigenous knowledge systems (traditional ways/basis of learning/doing things among themselves) by farmers and extensionists is low. In your opinion what accounts for this? What is the contribution of this?

Your efforts and that of the agricultural officer are complementing. Why do you say so?

Combination of efforts produces an equivalent results/desired results. How is this done

Combination could produce more than desired results. Why do you say so?

This combination can be maintained for long time. Why do you think so?

Support on your part can effectively complement your efforts and that of the agricultural officer. What is the form of this support?

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<th>ACTIVITY</th>
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<th>WHERE</th>
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<td>Navrongo/Tumu</td>
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<td>Drafting of questionnaires</td>
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<td>Reconstruction of instruments to meet realities on the ground (2007).</td>
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