Report of community analyses for sustainable intensification of cereal-based farming system in the Sudano-Sahelian zone in Ghana

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Produced by

University of Maiduguri
Borno State Agricultural Development Programme
International Institute of Tropical Agriculture (IITA)
CSIR-Savanna Agricultural Research Institute (CSIR-SARI)

Published by

International Institute of Tropical Agriculture (IITA)

25 May 2012
www.africarising.net

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.

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ACRONYMS

AA	Action Aid
ADB	African Development Bank
ACDEP	Association of Church Development Projects
ADDRO	Anglican Diocesan Development Relief Organization
ADRA	Adventist Development and Relief Association
ADVANCE	Agricultural Development and Value Chain Enhancement program
AEA	Agricultural extension agent
CBO	Community Based Organization
BEWDA	Bawku East Women Development Association
CCFC	Christian Children's Fund of Canada
CLW	Community Livestock Worker
CODI	Community Development Initiative
CRS	Catholic Relief Service
CSLD	Center for Sustainable Local Development
F	Female
FAO	Food and Agricultural Organization of the United Nations
FSC	Forestry Service Commission
GCCL	Ghana Cotton Company Limited
GES	Ghana Education Service
GHS	Ghana Health Service
GWI	Global Water Initiative
JICA	Japan International Cooperation Agency
ICOUR	Irrigation Company of Upper Region
IDA	Irrigation Development Authority
IFAD	International Fund for Agricultural Development Nations
IFDC	International Centre for Soil Fertility and Agricultural Development
IITA	International Institute for Tropical Agriculture
M	Male/men
MAP	Methodist Agriculture Program
MASLOC	Microfinance and Small Loans Centre
MiDA	Millenium Development Authority
MoFA	Ministry of Food and Agriculture
NCD	Newcastle Disease
NGO	Non Governmental Organization
OIC	Opportunities Industrialization Center
PDL	Plantation Development Limited
PICS	Purdue Improved Cowpea Storage
PPR	Peste des Petits Ruminants
PREA	Participatory Research and Extension Approach
RAAP	Rural Action and Appraisal Project
R4D	Research for Development
SARI	Savanna Agricultural Research Institute
SILDEP	Sisaala Literacy and Development Program
SFMC	Savanna Farmers Marketing Company
SWOT	Strengths, Weaknesses, Opportunities and Threats
TUDRIDEP	Tumu Deanery Rural Integrated Development Programme
UDS	University for Development Studies
UER	Upper East Region
UNDP	United Nations Development Programme

USAID	United States Agency for International Development
UWR	Upper West Region
VVI	Village Vision Images
W	Women
WAAPP	West African Agricultural Productivity Program
WVI	World Vision International
Y	Youth
YARO	Youth Action on Reproductive Order
ZOVFA	Zuuri Organic Vegetable Farmers' Association

Mixed Youth Group

Mixed Elderly Group

Elderly Men Group

Elderly Women Group

Executive summary

Background and Purpose

- Rural livelihoods in West Africa are mainly agro-based, and the major components of the livelihood means are crops and livestock production, processing and marketing;
- Farmers produce cereals, legumes, vegetables and fruit trees; and keep livestock;
- However, optimal system productivity is limited by cocktail of constraints which include socioeconomic, biophysical, institutional and financial;
- Farmers' dependence on the present methods of agricultural production without improved interventions has often resulted in environmental degradation, poverty, food insecurity and malnutrition, especially among the vulnerable;
- In the recent past, development in rural communities entails government agents instructing farmers as to what to do which often resulted in partial adoption;
- The evolution of the research and extension process has led to more involvement of farmers as partners in the research and extension agenda by adopting the Participatory Research and Extension Approach (PREA);
- Participatory research entails involving farmers in the process at all stages in the definition of the research agenda, conduct of research, evaluation of results and dissemination of the findings;
- The objectives of the PREA approach are: to facilitate local farmers in their identification of problems and the search for solutions; build strong linkages between local communities, extension agents and researchers and the private sector working as partners; and encourage transfer of appropriate technologies from farmer to farmer;
- The Africa Rising – Ghana Project is a Feed the Future support from the United States Agency for International Development (USAID) and coordinated by the International Institute of Tropical Agriculture (IITA) Ibadan;
- The project adopts the research for development (R4D) strategy and targets 'sustainable intensification of maize/legume farming system in the sudano-sahelian zone of Ghana';
- The Project aims to provide pathways out of hunger and poverty for small holder families, particularly for women and children, through sustainable intensification of cereal-based farming System ;
- Situation or community analysis is the first among the four key stages of the Participatory Research and Extension Approach;
- The analysis entails encouraging and mobilizing the communities to undertake their own situation analysis and start thinking on how they can deal with their own problems.
- The major objectives of the community analysis were to:
- share knowledge and information about the livelihood situation in the communities in relation to legumes/cereals/livestock production/processing/marketing,
- identify priority problems and opportunities for improved livelihoods,
- assess with the community members the existing technology options, and
- identify entry points for members within the innovative platforms for project implementation in the respective communities,

- identify community based organizations and select lead farmers and community seed producers at the community level,
- The task was accomplished through the conduct of stakeholder training workshop on community analysis tools; and the conduct of actual field work between 9th and 21st May 2012 in 60 communities using a field survey and community entry approaches;
- Data were collected on men, women and youth livelihood means as described by Hagmann et al. (1999) and Ellis-Jones et al. (2005) in the 60 communities in the project districts in Northern, Upper East, and Upper West Regions.

Salient Findings from Northern Region

- The results of the analysis in northern region showed that the project communities are clustered settlements with populations ranging from 180 in Frafra No.4 the most sparsely populated to 3850 in Zungu, the most densely populated;
- The common ethnic groups are the Dagomba, Mamprusi, Komkomba Chokosi, Gonja, Fulani, Ewe, Frafra, Dagarti, Sisala, Waala, Akan and Grunsi among others;
- The climate of the region is relatively dry, with a single rainy season that begins in May and ends in October with average annual rainfall of about 1000-1200 mm
- The dry season starts in November and ends in March/April with maximum temperatures occurring towards the end of March-April and minimum in December and January;
- The harmattan winds, which occur during the months of December to early February, have considerable effect on the temperatures in the region, which may vary between 14°C at night and 40°C during the day;
- The vast area in the region is still under populated and under cultivated;
- The agro-ecology is characteristically northern Guinea savanna with vegetation ranging from semi-deciduous clustered trees in West Gonja District to scattered trees and shrubs in Yendi District;
- The soils are gravelly sand in Savelugu/Nanton and sandy loam in the other 3 districts;
- Analysis of the existing farming system in the region showed that the men, women and youth in all communities are engaged in crop and livestock production ;
- The cereals are predominantly produced by men, while women are mainly involved in the production of legumes and the youths produce both cereals and legumes;
- Maize and sorghum are the major staple food crops followed by millet and rice, but rice is also grown for cash;
- Legumes such as groundnut, soybean and cowpea are mainly grown for cash although 10-40% of groundnut, soybean and cowpea are also devoted to food.
- The trend in production of maize is increasing probably because the crop is a major staple food crop in the region;
- Although soybean is relatively a new crop in the region the trend in production is increasing because farmers consider soybean production as an improved practice, also it improves women livelihood, it is easy to produce and ready source of income;
- Cattle, sheep, goats and local poultry (chickens, ducks, guinea fowls, pigeons, turkeys and doves) are the major livestock species raised;

- Most animals are kept for sale to realize income, but 5-10% of the small ruminants and poultry are used for food;
- The men and few youth predominantly keep cattle, while more women keep poultry, sheep and goats except in some communities where women do not keep any livestock;
- The trend in cattle production is decreasing in West Gonja and Savelugu/Nanton districts due to increased theft and poor/lack of kraal, however, the trend is increasing in Tolon/Kumbungu and Yendi districts as cattle provides stable source of income, indicator of wealth and improved livelihood at the community level;
- Goat and sheep production is increasing across the four districts as these categories of animals are used for ceremonies, paying bride price, source of income and savings;
- The trend in poultry keeping is mixed but more participants reported increase in trend because poultry is a source of income and food, it is also used for rituals and savings;
- Most processing activities done at the community level are for value addition for domestic home consumption.
- The processing activities identified included manual or mechanical threshing, winnowing and milling and only women and youths are mainly involved;
- The multiplicity of forms for uses, ease of processing, ready market, increase in food preference and consumption are the major reasons for increase in trend for processing of crop produce;
- Lack of processing skills and milling machines, low produce, and limited use are some of the reasons why processing of a produce could remain static or decrease;
- All groups in the community sell crop produce but the youths are mainly involved in marketing of rice, while women sell most legumes, rice and maize;
- The trend in the marketing of maize, rice, cowpea, groundnut and soybean is increasing because there is ready market, good price and increased consumption;
- However, the trend for sorghum and millet is either static or decreasing due to low production and the declining preference for these two crops across the communities;
- Processing of cattle, sheep and goats is mainly restricted to butchers and households performing funeral or naming ceremonies;
- Poultry is mainly processed due to its ease of handling and domestic consumption.
- The trend in processing of livestock is static or decreasing in West Gonja district due to low patronage or lack of processing skills but the trend is on the increase in Savelugu/Nanton districts in spite of disease prevalence which reduces production;
- Marketing of livestock involve men, women and youths but most households are involved in marketing of poultry and less for cattle and dog;
- The ranking of crops and livestock in the region showed that the most popular cereal crop is maize followed by rice; groundnut and soybean are the two most common legumes grown and poultry and sheep are the most popular livestock species raised by all groups;
- The general crop production problems identified in the project communities were varied and included: low soil fertility, Striga infestation, erratic rains, pest

infestation, and high weed infestation, high cost of pesticides, inadequate certified seeds, and credit, inadequate extension and tractor services;

- Factors that limit livestock production in the area include prevalence of livestock diseases such as pneumonia and diarrhea in small ruminants, ticks and new castle in poultry, inadequate feeds and watering points especially during the dry season, lack of veterinary services and drugs and inadequate housing.
- Lack of processing facilities, lack of groundnut shellers and dryers, and lack of rice mill; lack of organized local market, low market prices, inadequate access roads and storage facilities, inadequate grinding mills and sometimes low demand for farm produce were some of the major processing and marketing constraints identified;
- The youths plant early maturing and/or drought tolerant varieties and conserve water by creating earth bunds to mitigate the problem of drought; apply chemical fertilizers/animal manure to cope with low soil fertility; and practice intercropping of cereals with legumes to reduce Striga infestation.

Salient Findings from Upper East Region

- The Upper East Region is located in the Sudan savanna zone.
- The average annual rainfall is about 900 – 1000 mm, occurring in a single rainy season from May to October. The rest of the year is dry
- The soils are predominantly sandy loam with some gravel which support small land holdings of low input-output farming systems, and has dire impact on household food security such as availability, access, quality and price;
- The population comprises 60% females and 40% males who live in scattered settlements;
- The region is highly diverse ethno-linguistically, and the major ethnic groups in the region are Kusasi, Moshie, Busasi, Mamprusi, Bisa, Fulani, Hausa and Zabarma.;
- The major cereal crops cultivated by all groups include early millet, late millet, maize, sorghum and rice, while major legumes are groundnut, cowpea, soybean and bambara groundnut;
- Greater proportion of all cereals produced is used for food with 10-50% devoted for cash. The legumes are essentially grown for cash with 10 – 50% used for food.
- The millets constitute the major food crop and soybean a major cash crop with 90% each devoted for food and cash, respectively.
- The trend in the production of all crops is decreasing except for maize in the region;
- Maize production is increasing across the region because maize is a new crop and can realize very high yield when chemical or organic fertilizer is applied;
- There is also increasing market opportunities for maize and maize products in the region.
- Declining soil fertility, erratic rains, and flower pests were some of the reasons advanced for decline in production of early and late millet, sorghum and rice;
- Prevalence of leaf diseases, low soil fertility and lack of improved varieties are discouraging farmers from producing groundnut and bambara groundnut, while these factors together with insect pest infestation reduce cowpea production;
- Lack of processing skill was the only reason advanced for decline in soybean production.

- Communities with access to water source for dry season gardening also engage in dry season farming to supplement the rainy season harvest and to generate additional income;
- In Bawku districts, men are involved in the production of all types of crops, but more men produce maize, sorghum and millet;
- The women do not produce sorghum and late millet, but more women are involved in the production of legumes such as cowpea, groundnut, soybean and bambara groundnut; ;
- More youths are involved in the production of maize and soybean; and some minor crops like sesame and neri in Binaba;
- Men produce the cereal crops mainly for food, while rice and legumes are mainly produced for cash by all groups;
- The trend in soybean production is increasing because it is considered nutritious and its production does not require external inputs such as fertilizers and pesticides;
- Local fowl, guinea fowl, ducks,turkey, sheep, goats, cattle, pigs, dogs and donkeys are produced by all groups;
- However, more women keep cattle and poultry, while more men and women keep pigs than youths in Talensi/Nabdam and Bongo districts;
- In Bawku districts, more youths keep dogs, more women keep donkeys and more men keep cattle than the other groups;
- Greater proportion of all categories of livestock is produced for cash, cattle are the least category used for food, while goats, dog, poultry and pigs are the most important food animals in the region;
- The trend in livestock production in Talensi/Nabdam and Bongo districts is decreasing for all categories except for poultry which is increasing because poultry is multipurpose and is used for rituals, festivals, payment of dowry, high quality food and for quick cash;
- However, poultry production could be marred by the prevalence of Newcastle disease which causes high bird mortality in the region;
- The decrease in trend for other categories is due to decrease in grazing area for cattle and donkeys, high cost of food and increase in incidence of rabbies in dogs, high cost of drugs, feeds and housing for pigs;
- The trend in the production of sheep, goats, pigs, donkeys and dogs is increasing in Bawku municipal because the small ruminants and pigs are prolific, and provide ready cash, and the use of donkeys as work animals is on the increase;
- However, high keet mortality in poultry, inadequate grazing area and theft are some of the major reasons for decrease in production of livestock across the Bawku area;
- All groups are involved in the processing and marketing of cereals and legumes in Talensi/Nabdam and Bongo districts;
- Sorghum is processed into pito, a local brew and the trend is increasing due to high demand and ready market in the region, maize is processed into kenkey, and millet into koko (watery porridge) and masah (fried paste) but the demand for these products is low and hence there is less incentive in the processing and the trend is decreasing;
- Groundnut is processed into oil, paste and cake and soybean is processed into dawadawa;
- In Bawku districts soybean, rice, sorghum and groundnut were the dominant crops where value-addition and secondary processing are mostly done by women and women groups;

- Men and Youth are found more in the processing of animals into kebab but women still dominate if it is to be smoked or fried for sale;
- Early millet and sorghum are the major food crops in Talensi/Nabdam and Bongo districts;
- The ranking of the cereals for cash showed that sorghum and maize are the major cash crops in the two districts;
- Maize is gradually gaining dominance over sorghum as cash crop due to its high response to fertilizers and high productivity;
- The ranking of the legumes for food and cash was similar in the order: groundnut > cowpea > groundnut > soybean;
- Poultry is the most important among the livestock species as it was ranked first for both food and cash across the communities in the region;
- In Bawku, districts, maize and millet were the co-dominant livelihood contributors;
- Maize is preferred due to high yields per unit area compared to millet and sorghum;
- Secondly, maize could be used for same local dishes as millet and sorghum;
- Soybean production is gradually increasing due to high income value, compatible for intercropping with maize and varied forms of utilization;
- Goat and pig production were second most important economic animals after poultry particularly among women and female-headed households in Bawku districts;
- Cattle are owned by few households and mainly used for tillage, but majority of households owned donkeys, which are mainly used for traction and transport;
- The most common crop production problems identified in Talensi/Nabdam and Bongo districts are unreliable/erratic rains, declining soil fertility, lack of improved seeds, inadequate land preparation equipment, pests, diseases and weeds; and lack of credit;
- Farmers cope with unreliable rains by planting early improved/drought tolerant varieties, which are high yielding and attract higher market price;
- But these varieties are not readily available and require higher inputs than the local ones;
- Use of farm yard manure, chemical fertilizers and intercropping of cereals with legumes are the major coping strategy for low soil fertility, but inadequate access and high cost of transportation are the major factors limiting the use of these options;
- Use of animal traction ensures early land preparation, however, there is limit to its use in heavy soils or rice ecologies which are difficult to cultivate; also animal traction is inadequate and takes a long time to plough a larger area;
- The major livestock problems in the region include: new castle disease (NCD) in poultry, high keet mortality in guinea fowls, poor housing for pigs, and poultry and Peste des Petits Ruminant (PPR) in small ruminants;
- In Bawku districts the most recurring constraints were drought, declining soil fertility, lack of credit, high cost of agro-inputs, degraded grazing lands, inadequate watering points for animals and lack of bullocks and tractor services during land preparation;
- High animal mortality was a recurring constraints in all communities and this discourages, especially the youth from keeping livestock;
- The farming system in the region is also vulnerable to drought, flood, bush burning and destruction of farm land by small scale miners;

- Although each of these factors is important, more grievous are the problems of bush burning and destruction of farm land by the small scale miners;
- Women and youths have less access to land especially in Bawku districts and can be considered more vulnerable since they have fewer alternatives.

Salient Findings from Upper West Region

- The Upper West Region is located in the extreme northwest of Ghana with a landscape that is gently undulating, 200-350 m above sea level;
- The vegetation is Guinea savanna, with a high density of typical tree species, while the soils are mainly sandy loam with patches of laterite in some of the communities;
- The low population densities observed across most of the communities in the region have permitted a remarkable conservation of vegetation, unlike the other two regions;
- The climatic regime is semi-arid with annual rainfall of 1000 – 1200 mm received within a seven-month rainy season beginning from April and ending in October;

- The major ethnic groups in the region include Dagaaba, Waala, Lobbi, Sissala and Chakali;
- The major cereal crops grown in the Upper West region are sorghum, maize, millet and rice, while the major legumes are cowpea, groundnut, groundnut and soybean;
- The cereals are mainly produced for food (40 – 99%) with millet and sorghum leading;
- Rice and maize are also produced for cash, while Kersting's groundnut, cowpea and groundnut are also used more for food than the other legumes;
- About 10-50% of legumes produced are used for food across the communities but, 90-98% of the legumes are produced for cash;
- There is increase in production of maize across the region due to availability of improved management practices such as improved maize varieties and fertilizers;
- Rice production is also increasing in Goriyiri and Kalsegra in Nadowli district and in Kpalinye and Naaha in Wa East district due to use of improved management practices;
- The production of sorghum and millet is decreasing across all communities due to erratic rains, low soil fertility, poor management practices and Striga infestation;
- Cowpea production is increasing across the region due to use of improved management practices such as improved seed and adoption of appropriate pests control practices;
- The trend in production of the other legumes is increasing in some communities due to availability of improved management practices and tolerance to drought, while the reverse is the case in other communities where erratic rains and poor soil fertility occur;
- Major livestock species produced in the region are goat, sheep, cattle, pigs and poultry;
- Women are generally not involved in livestock production in Goriyiri in the Nadowli district, while a few keep poultry, pigs and goat in Kpalinye in Wa East district;

- Rabbit and poultry are mainly raised for food (50 – 99%), goat, sheep, cattle and pigs are major sources of cash (50-99%), while donkeys provide traction and cash;
- The trend in livestock production is increasing for cattle and rabbit in Tabiase and for donkey in Goriyiri due to proper health care;
- The trend is increasing for cattle due to proper care by the Fulani and for poultry due to its use for spiritual purposes in Kpalinye in Wa East district;
- Except for pigs in Loggu, livestock production is increasing for all the livestock species due to improved veterinary services, availability of pasture and good market price;
- The decline in livestock production in some communities could be due to increase in prevalence of diseases and mortality, high incidence of theft and poor management;
- Processing of cereals and legumes is a major activity in Tabiase where more people are involved than in the other communities in Nadowli district
- Fewer people are involved in processing in Daffiama and Kalsegra in Nadowli district; Zinnye and Loggu in Wa East district.
- Less people are involved in the processing of millet, rice; groundnut, bambara groundnut and soybean compared to other crops across most of the communities in the region.
- Sorghum is also processed into malt or pito, a type of local alcoholic drink.
- Many recipes are derived from cowpea and few from soybean; groundnut is processed into paste and oil;
- Knowledge of processing soybean is limited and dawadawa is the only recipe derived;
- The trend in processing of the major crops is increasing either due to increase in domestic consumption or increase in market price to generate income;
- Low yields, low production level and lack of knowledge of processing are some of the major factors limiting processing and marketing of agricultural produce in the region;
- Processing of livestock products is limited to an average of 30-40% of the households per community;
- Goat, poultry, pig and sheep are the most common livestock species processed mainly for domestic consumption, while cattle are also processed for cash;
- The trend in processing of livestock in some communities is on the increase due to increase in domestic consumption, while it is decreasing in other communities due to increase in animal mortality;
- More households are involved in marketing of livestock products in Tabiase and Goriyiri in Nadowli district and Kpalinye in Wa East districts than the other communities;
- The trend in marketing of livestock products is increasing in Tabiase, Goriyiri, and Ombo in Nadowli district; and Kpalinye, Naaha and Loggu in Wa East district due to increase in demand and the need for more cash by households;
- The trend is on the decrease in the other communities due to low production and theft;
- The ranking of the crops revealed that maize was ranked first for both food and cash, sorghum was ranked second, followed by rice and millet;
- Cowpea was ranked first followed by groundnut in Nadowli district, while groundnut was ranked first followed by soybean and cowpea in Wa East district;
- The most important food and cash crops are maize, sorghum, cowpea, groundnut and soybean;

- Poultry, cattle and pigs are the most important animals for food and cash depending on the community in Nadowli district
- In Wa East district, sheep and goat are the most popular animals for food, while cattle was ranked first for cash and poultry was next in ranking for both food and cash;
- Although all livestock species are used for food and cash, cattle is the most important livestock species for income generation, while poultry, sheep and goats are the most important animals food in the region;
- The most recurring crop production problems mentioned across the region were erratic rainfall, inadequate land preparation equipment, lack of improved seeds, declining soil fertility, Striga infestation, pests, diseases and weeds;
- Farmers plant early maturing varieties or/and plant early to cope with the erratic rainfall;
- Animal traction is used for land preparation in the absence of tractors;
- Local varieties are used in the absence of improved varieties, local varieties are cheap and timely, but result in late maturity and low yields;
- Application of chemical fertilizers is the main coping strategy for declining soil fertility, but the trend is declining due to unavailability and high cost of the fertilizers;
- Insecticide spray is used to control insect pests of cowpea, herbicides are applied to control weeds and the PICS bags are used for cowpea storage;
- The trend in the use of these practices is increasing because they are effective, improve product quality and reduce drudgery despite the hazards involved;
- Lack of machinery, skills and storage facilities were the major crop processing problems;
- Lack of organized market, low produce price and inadequate means of transportation were the major marketing problems;
- The major livestock production problems mentioned were high mortality due to diseases, lack of improved breeds, high incidence of theft, inadequate watering points, inadequate housing and inadequate veterinary services;
- Drought and low product prices, were the major types of shocks, bush burning and deforestation are the major causes of drought which occur annually;
- The coping strategies are prayers and use of early maturing varieties.

Salient Findings Common to All Regions

- Analysis of the resource inventory in the region showed that opportunities exist for irrigated farming by underground water abstraction using wash boreholes and tube wells and fish production in the low lying areas and inland valleys;
- Other crops of economic importance that contribute to livelihoods are yams, sweet potato, cassava, tomato, onion and pepper; mango, citrus and banana;
- Most communities in the three regions do not have organized market days and marketing activities are restricted to market days in the district and regional capitals;
- Low product prices also occur annually and are caused by lack of access to market and few buyers in the communities especially in the Upper West region;
- There is poor infrastructure of roads and transportation linkage among communities that may affect movement of farm produce and market access;
- Also the presence of input dealers in the communities is low as the farmers often depend on markets in the district and regional capitals for farm inputs;

- While farm produce constitute the major commodities moved by farmers and few middlemen from the communities to the district and regional centers, the major commodities moved to the communities are soup ingredients, farm inputs, clothing and building materials;
- Community based organizations were identified in the communities, and a quick SWOT analysis of the CBOs showed that most of them are weak with the exception of a few in Yendi district in Northern region;
- There was high presence of both non-governmental and government institutions especially near the district and regional capitals;
- It was observed that these institutions presently have or had some links with the farmers groups in most of the communities in the three regions;
- The level of enthusiasm and willingness to cooperate with the project shown by the participants during the study is an indication of strength towards achieving the set goals, purpose and objectives of the project.

Background and purpose

Rural livelihoods in West Africa are mainly agro-based. The major components of the livelihood means are crops and livestock production, processing and marketing. Farmers produce cereals, legumes, vegetables and fruit crops; and keep livestock. However, optimal system productivity is limited by cocktail of constraints which include socioeconomic, biophysical, institutional and financial.

The traditional farming practices of farmers in Northern Ghana without improved interventions has often resulted in environmental degradation, poverty, food insecurity and malnutrition especially among the vulnerable. In Ghana for example, seasonal cycles of food insecurity of 3-5, 4-5, and 6-7 months for maize (*Zea mays)*, sorghum (*Sorghum bicolor*) and pearl millet (*Pennisetum americanum)*, and 5-7, 4-5 and 6-7 months for cowpea (*Vegan unguiculata*), groundnut (*Arachis hypogaea* L.) and soybean (*Glycine max*) are recorded in the Northern, Upper West and Upper East regions, respectively (Quaye 2008). Main staple crops include sorghum, millet, cowpea, groundnut, bambara groundnut (*Vigna subterranea* [L.] Verdc.), yam (*Dioscorea spp*), cassava (*Manihot esculenta*) and sweet potato. Maize is the most important cereal crop grown by a majority of farmers in all parts of the country. Currently, maize-based cropping systems have become dominant in drier parts of northern Ghana where sorghum and millet were the traditional food security crops. According to SRID (2010), maize is the most cultivated crop (991,669 ha) on arable land compared with 181,228 ha for rice (*Oryza sativa*), millet (176,000 ha), sorghum (252,555 ha), cassava (875,013 ha), and yam (384,942 ha).

In the recent past, development in rural communities entails government agents instructing farmers what to do to improve agricultural production and food security. The process resulted in partial technology adoption or adaptation. The evolution of the research and extension process has increased the involvement of farmers in the research and extension agenda by adopting the Participatory Research and Extension Approach (PREA). Participatory research seeks to involve farmers in the process at all stages in the definition of the research agenda, conduct of research, evaluation of results and dissemination of the findings. The objectives of the PREA approach are: to facilitate local farmers in their identification of problems and the search for solutions; build strong linkages between local communities, extension agents and researchers and the private sectors working as partners; and encourage transfer of new and appropriate technologies from farmer to farmer. The approach comprises four stages: situation analysis and social mobilization, action planning; farmer experimentation; and sharing experiences (Ellis-Jones *et al*., 2005).

The Africa Rising – Ghana Project is a Feed the Future support from the United States Agency for International Development (USAID) and coordinated by the International Institute of Tropical Agriculture (IITA), Ibadan. The research for development (R4D) Project targets 'sustainable intensification of cereal-based farming system in the sudano-sahelian zone of Ghana'. The Project aims to provide pathways out of hunger and poverty for small holder families, particularly for women and children, through sustainably intensified farming systems with special focus on maize/legume farming system. The specific objectives are to: identify demand driven sustainable intensification options that are socially acceptable, economically feasible, and environmentally sound; combine and adapt these options to address constraints and exploit opportunities; evaluate the effectiveness of the options; and strengthen capacity of partner research and development institutions, farmers, community-based organizations, and non-governmental organizations; among others.

The Project is being implemented in four districts in each of three regions in northern Ghana (Northern, Upper East and Upper West Region) with five communities per district, bringing the total to 60 participating communities. An innovation platform of diverse stakeholder institutions have been put in place for implementation of the project activities. This comprises the Ministry of Food and Agriculture (MoFA), CSIR-Savanna Agricultural Research Institute (CSIR-SARI), agro-input and output dealers, farmers, community-based organizations and policy makers. The direct beneficiaries of the project output are farmers, community-based organizations (CBOs), agro-input and output dealers, research and extension staff in both public and private sector and the public in general.

Situation or community analysis is the first among four key stages of the Participatory Research and Extension Approach. The community analysis entails encouraging and mobilizing the communities to undertake their own situation analysis and think of how they can deal with their own problems. The major objectives of the community analysis were to:

- share knowledge and information about the livelihood situation in the communities in relation to legumes/cereals/livestock production/processing/marketing,
- identify priority problems and opportunities for improved livelihoods in the communities,
- assess with the community members the existing technology options, and
- identify entry points for members within the innovative platforms for project implementation in the respective communities,
- identify CBOs and select lead farmers and community seed producers at the community level.

Consequently, the project management recruited a team of consultants to facilitate the conduct of the community analysis in three regions in northern Ghana. This report summarizes the salient findings made during the community analysis of the Africa Rising Project in Ghana.

Methodology

The task was accomplished through the conduct of stakeholder training workshop on community analysis tools; and the conduct of actual field work in the 60 communities using a field survey and community entry approaches between 9th and 21st May 2012.

Community Analysis Training Workshop

The training workshop was conducted on 9th and 10th May 2012. A total of 32 participants drawn from MoFA, CSIR-SARI, University for Development Studies (UDS), IITA, Village Vision Images (VVI) and CSLD took part in the training exercise. The three Regions were well represented during the workshop.

The principles and practices of PREA were discussed to increase awareness and understand its modus operandi vis-à-vis project implementation. Participants were taken through each activity enshrined in the four stages of the approach. A large number of participatory tools are available for community analysis depending on the situation. Six tools were selected and participants were trained on their use for the conduct of the study in the project area. The community analysis tools used included livelihood analysis, problem ranking, resource mapping, institutional and market analyses and seasonal calendar.

Participants were trained on how to collect general information (population structure-men and women, settlement pattern, ethnic composition, vegetation, soil type, agro-ecology, community hierarchy, location and distance from Regional and District headquarters). Participants were trained on good facilitation principles by building trust and respect for community norms and values, facilitation and not teaching during the process, letting farmers speak, control dominators, ensure that the quietest are also involved and mainstream gender and the vulnerable. Participants were divided into two groups and each group simulated practical demonstration on how community analysis is conducted using the tools.

Planning for field work

Six teams were composed with two teams per each of the three regions: Northern, Upper East and Upper West. Each team was assigned 10 communities to facilitate per region, thus making a total of 60 communities. Each team was supplied with checklist of information required and copies of community analysis tools, vehicles, stationary and field agenda.

Field work and process of tools application

The study commenced concurrently using a field survey and community entry approaches in Northern, Upper East and Upper West Regions of Ghana starting from 14th May to 21st May 2012. A team of facilitators including agricultural extension officers (AEAs) and researchers facilitated the communities during the meetings to identify possible intervention strategies in the livelihood systems and to plan together for follow-up actions. Half a day was set aside for the community entry as agreed with the community members. Time spent at each meeting was about 4-5 hours. After exchanging greetings with the elders, the project team briefed the community members of the team's mission. The community members were then facilitated to identify their natural resources, livelihood systems, discuss the problems and

coping strategies and rank them where appropriate. The groups in each community split into three subgroups after the general introduction to collect data on men, women and youth livelihood means as described by Hagmann et al. (1999) and Ellis-Jones et al. (2005). The participants provided data on the following:

- *Livelihood Analysis:* participants brainstormed and identified major means of deriving livelihood at the community level. Estimates were made of the extent of number or percentage of people involved in the production, processing and marketing of crop and livestock enterprises, their relative importance for food and cash, trends and reasons for such were also elicited.
- *Crop and livestock priority ranking*: participants listed the major crops and livestock species produced in the community. These were ranked using pair-wise ranking and the status of each enterprise produced in the community was thus established.
- *Problem analysis*: participants were facilitated to list their major problems related to production, processing and marketing of cereals, legumes and livestock. These were prioritized and ranked using pair-wise ranking.
- *Coping strategies:* participants articulated their coping strategies and adaptation to the priority problems ranked; the method used, when known, from whom, advantages and disadvantages, percentage involved in the community, trends and reasons
- *Resource analysis*: existing environmental resources were assessed for opportunities with respect to production, processing and marketing of cereals/legumes/livestock. The community resources were identified and placed in the community map drawn on the ground by the participants. These were later transferred to a community map on paper which was further confirmed by the participants.
- *Institutional Analysis*: participants were assisted to identify both formal and informal institutions within and outside the community, including CBOs; membership and linkages. The CBOs identified were further analyzed to determine their strengths, weaknesses, opportunities and threats (SWOT). The strong CBOs later selected lead farmers and seed producers that were to participate in the project activities
- *Market Analysis*: farmers were assisted to establish the flow of agro-inputs and outputs into and out of the community (market network mapping); establish market infrastructure that facilitated the performance of market functions; and market channels of wholesalers, middlemen, retailers and farmers or producers through whom the commodities passed before reaching the final consumer. The analyses also included the identification of market opportunities existing for input service providers and constraints to marketing of cereals, legumes and livestock.
- *Seasonal calendar of household activities*: participants identified major farm and non-farm activities performed at household levels all year round; their peak and low periods.

Each of the six groups presented the findings at plenary during a wrap up meeting on 22nd May 2012. These findings assisted in the articulation of community action plan for project implementation.

Results of community analysis in Northern Region

Biophysical Characteristics and Agro-environment

The Northern Region, which occupies an area of about 70,383 km^2, is the largest region in Ghana in terms of land area. It shares boundaries with the Upper East and the Upper West regions to the north, the Brong Ahafo and the Volta regions to the south. Northern region shares borders on the east with the republic of Togo and to the west with Cote d'Ivoire. The land is mostly low lying except in the north-eastern corner with the Gambaga escarpment and along the western corridor. The region is drained by the Black and White Volta and their tributaries, rivers Nasia, Daka, etc.

The project communities in the northern region are clustered settlements (Annexes 1a and 1b). The populations range from 180 in the most sparsely populated Frafra No.4 community to 3850 in Zungu, the most densely populated. Other densely populated communities are Damongo Zongo, Busunu, Tigoli and Kanshegu. Among the Mole-Dagbon ethnic group, the largest sub-groups are the Dagombas and Mamprusis, while Komkombas are the largest of the Gurma; the Chokosis are the largest of the Akan ethnic group while the Gonjas are the largest of the Guan group. Dagombas constitute about a third of the population of the region. Other prominent ethnic groups include Gonja, Fulani, Ewe, Frafra, Dagarti, Sissala, Waala, Akan and Grunsi. In the Dagomba community, the chief is the community head, while the assembly man, Kpalana and/Wulana, religious and youth leader, respectively, are next in leadership hierarchy in that order.

The climate of the region is relatively dry, with a single rainy season that begins in May and ends in October. The amount of rainfall recorded annually varies between 1000 and 1200 mm. The dry season starts in November and ends in March/April with maximum temperatures occurring towards the end of the dry season (March-April) and minimum temperatures in December and January. The harmattan winds, which occur during the months of December to early February, have considerable effect on the temperatures in the region, which may vary between 14°C at night and 40°C during the day. During the harmattan period, the humidity, is quite low and this mitigates the effect of the daytime heat. A vast area of the region is still under populated and under cultivated.

The agro-ecology is northern Guinea savanna with vegetation ranging from semi-deciduous clustered trees in West Gonja district to scattered trees and shrubs in Yendi Municipality. The soils are gravelly sand in Savelugu/Nanton and sandy loam in the other 3 districts (Annexes 1a and 1b). The main vegetation is largely grassland, Common trees in the zone consist of drought and fire resistant trees such as baobab (*Adonsonia digitata*), West African locust bean commonly called dawadawa (*Parkia biglobosa)*, shea tree (*Vitellaria paradoxa*), Neem (*Azadirachta indica*) and Acacia [*Faidherbia albida* (Del.)]. The greatest influence on the vegetation is the prolonged dry season. During this period, the grass becomes dry and the subsequent bush burning leaves the area patched and mostly bare landscape Shea nuts and charcoal are collected from the wild and constitute some of the common/access resources that enhance livelihoods in the region.

Existing Farming Systems and Problem Analysis

Analysis of on-farm livelihood activities in northern Region

Analysis of on-farm activities in the four districts in the northern region revealed that all men, women and youths in most communities are engaged in crop and livestock production as means of livelihood (Annexes 2a-d). The cereals are predominantly produced by men, while women are mainly involved in production of legumes and youths produce both cereals and legumes (Annexes 2a and 2b). Maize and sorghum are the major staple food crops followed by millet and rice. However, rice is also grown for cash. Legumes such as groundnut, soybean and cowpea are mainly grown for cash although 10-40% of groundnut, soybean and cowpea are also devoted to food. The trend in production of maize is increasing probably because the crop is the major staple food crop in the region. However, maize production is decreasing in Jonokponto in West Gonja district and Zang in Yendi municipality due to declining soil fertility. Sorghum production is either static or decreasing due to many constraints including erratic rainfall, declining soil fertility, lack of interest from the farmers and low intercrop compatibility with legumes. Although rice production is increasing especially in the Savelugu/Nanton district because it is a source of income and yields are improving, the trend is either static or decreasing in the West Gonja district due to low interest, lack of necessary inputs and cumbersome field operations. The trend in pearl millet production is generally decreasing across the communities with the exception of Zakoli in Yendi municipality due to lack of interest, declining soil fertility, erratic rains and declining yields.

The trend in cowpea production is mixed with responses ranging from increasing, static and decreasing (Annexes 2a and 2b). The prevalence of pests and diseases were the major reasons contributing to the static or decreasing trend of cowpea production. However, some farmers said cowpea production was increasing because of the existence of a ready market and high returns. Groundnut production is increasing across the region except at Sori No.1 where it is static because of low yields and at Jana where the trend is decreasing due low interest. Although soybean is relatively a new crop in the region the trend in production is increasing because farmers consider its production as an improved practice. Additionally, soybean improves women livelihood and is easy to produce and also a source of income, except in some communities where limited access to seeds limits its production. Both bambara groundnut and pigeon pea (*Cajanus cajan*) are considered minor crops which are mainly grown by men for food.

The major livestock species raised included large ruminants like cattle, small ruminants (sheep and goats) and local poultry (chickens, ducks, guinea fowls, pigeons, turkeys and doves). Most animals are kept for sale to realize income (Annexes 2c and 2d). However, 5-10% of the small ruminants and poultry are used for food. The men and few youths predominantly keep cattle. More women keep poultry, sheep and goats except in Dundo, Kpachi, Zugu and Sabegu in Tolon/Kumbungu district where women do not keep any form of livestock. Similarly, youths do not keep any form of livestock in Tingoli and Zugu communities of the Tolon/Kumbungu district. However, youths keep all categories of livestock in West Gonja and Savelugu/Nanton districts s well as Yendi municipality.

The trend in cattle production is decreasing in West Gonja and Savelugu/Nanton districts due to increased theft and poor or lack of housing (Annexes 2c and 2d). However, the trend is increasing in Tolon/Kumbungu district and Yendi municipality as cattle provides stable source of income, indicator of wealth and improved livelihood at the community level. Goat and sheep production is increasing across the four districts as these categories of animals

are used for ceremonial functions, paying bride price, source of income and savings and general livelihood improvement. The trend in poultry keeping is mixed but more participants reported increasing trends because poultry birds are source of income and food. They are also used for rituals and savings. Those who reported decreasing trend revealed that prevalence of diseases increased bird mortality and hence reduced production.

Analysis of off-farm livelihood activities in Northern Region

Most processing activities done at the community level are for value addition for domestic home consumption. All crops produced are processed at the community level with the exception of rice at Duko and Manguli in Savelugu/Nanton district and cowpea and soybean in Tingoli in Tolon/Kumbungu districts where no machinery and lack of skills, respectively, were reported as bottlenecks (Annexes 3a and 3b). Processing activities identified in the communities included manual or mechanical threshing, winnowing and milling, Women and youths are mainly involved in crop processing activities. The multiplicity of forms for uses, ease of processing, ready market, increase in food preference and consumption are the major reasons for increase in trend of processing for a crop produce. Lack of processing skills and milling machines, low produce, and limited use are some of the reasons why processing of a produce could remain static or decrease.

All groups in the community sell crop produce. The youths are mainly involved in marketing rice, while women sell most legumes, rice and maize (Annexes 3a and 3b). The trend in the marketing of maize, rice, cowpea, groundnut and soybean is increasing because there is ready market, good price and increased consumption probably due to increase in population. However, the trend for sorghum and pearl millet is either static or decreasing due to low produce realized and the declining preference for these two crops across the communities

Processing of sheep and goats is mainly restricted to butchers and households performing funeral or naming ceremonies (Annex 3c). The cattle are rarely processed except by butchers who sell the meat to consumers. Poultry are mainly processed due to its ease of handling and domestic consumption. Reduction in livestock production due to increased mortality from diseases reduces processing of livestock. The trend in processing of animal products is mainly static or decreasing in West Gonja district mainly due to low patronage or lack of processing skills. However, the trend is on the increase in Savelugu/Nanton district in spite of reduced production as a result of disease prevalence. Savelugu/Nanton district is close to the regional capital, Tamale and this may provide ready market for livestock produce in the district. The availability of market expose farmers to more patronage and good price for the produce as shown by increase in trends of marketing of the livestock produce in the region.

Marketing of livestock involve men, women and youths. Most households are involved in marketing poultry and less for cattle and dog (Annex 3c). The trend in marketing of livestock is static in Sori No 1, decreasing in Damongo Zongo due to low patronage and increasing in Jonokponto due to ready market and good price in the West Gonja district. The situation in the Savelugu/Nanton district indicated a general increase due to ready market and good price offered by buyers. Sale of livestock generally provide source of income for other farming activities, ceremonies, paying school fees, and wedding, etc.

Crop and livestock census and prioritization

The major cereals identified and grown in the region include maize, sorghum, rice and pearl millet. In West Gonja district all the farmer groups ranked maize as the most important cereal crop grown across the communities (Annex 4a). All groups in Sori No.1 and Jonokponto ranked sorghum second, while millet was ranked 2nd in Damongo Zongo, the less popular crop in the district was rice. The order of popularity of the crops in West Gonja was: maize > sorghum > millet > rice. The major legumes grown were groundnut, cowpea, soybean, bambara groundnut and pigeon pea. Groundnut was more popular among all groups in most of the communities in the district. The order of popularity of the legumes was: groundnut > cowpea > soybean > bambara groundnut > pigeon pea. Poultry was the most popular livestock raised by all the groups and the ranking for livestock was in the order: poultry > goat > sheep > cattle > dog > pig

In Savelugu/Nanton district, rice was the most popular cereal crop as it was ranked first, followed by maize, sorghum and millet, respectively (Annex 4a). However, maize was more popular at Jana where all the groups ranked the crop first. Although mixed responses were observed for the legumes, the order of preference was soybean > groundnut > cowpea > bambara groundnut Poultry, sheep and goat were the livestock species raised by men, women and youths in the district. Cattle production is restricted to men and youths. The livestock species were thus ranked in the order: poultry > sheep > goat > cattle.

In Tolon/Kumbungu district the cereals were ranked in the order maize > rice > sorghum > millet (Annex 4b). Groundnut was more popular followed by soybean, cowpea, bambara groundnut and pigeon pea, respectively. All the groups are involved in the production of all the crop types grown in the region. Sheep > poultry > goat > cattle was the order of popularity of livestock species in the region. However, the women do not keep livestock and thus the practice is restricted to men and youths. The ranking in Zakoli in Yendi municipality revealed that the most popular crops were maize > rice > sorghum > millet, Women are not involved in sorghum and millet production. Soybean was relatively more popular among all groups. This was followed by groundnut, cowpea, bambara groundnut and pigeon pea, respectively. The livestock ranking in the Yendi district was in the order: sheep > goat > poultry > cattle. Cattle production was restricted to men and youth.

The most popular cereal crop in the northern region is maize followed by rice. Groundnut and soybean are the two most popular legumes grown, while poultry and sheep are the most popular livestock species raised by all groups. There is need to target and focus these enterprises for improving livelihoods in the northern region.

Problem census, prioritization and coping strategies

The general crop production problems that limit crop productivity in the project communities in the region included low soil fertility; *Striga* infestation; erratic rains; pest infestation; high weed infestation; high cost of pesticides; inadequate certified seeds; inadequate credit facilities; low extension and tractor services. The prevalence of livestock diseases such as pneumonia and diarrhea in small ruminants, ticks and new castle in poultry, inadequate feeds and watering points, especially during the dry season, lack of veterinary services and drugs and inadequate housing limit livestock production. Inadequate processing facilities, groundnut shellers and dryers, and unavailability of rice mill; lack of organized local market, low market prices, inadequate access roads and storage facilities, inadequate grinding mills and sometimes low demand for farm produce were some of the major processing and marketing constraints identified. The ranking of some of the major problems and strategies adopted by farmers to cope with such problems are presented in Annex 5.

At Dundo, the women group ranked high cost of land preparation as topmost priority problem, while high cost of fertilizers and lack of improved seeds were second and third crop production problems, respectively. The youths in Kpachi ranked erratic rainfall, low soil fertility and *Striga* infestation in that order of importance. Although the women group did not outline their coping strategies, the youths sow early maturing/drought tolerant varieties and conserve water by creating earth bunds to mitigate the problem of drought; apply chemical fertilizers/animal manure to cope with low soil fertility; and practice intercropping of cereals with legumes to reduce *Striga* infestation. About 40-100% of people in the community adopt these coping strategies and the trend is increasing, indicating that farmers observe some advantages from these practices.

At Tingoli, the men group ranked low soil fertility > weed infestation > *Striga* infestation as priority problems thus buttressing the ranking made by the youth group at Kpachi. The response at Tingoli also showed the women group ranking high fertilizer cost, land scarcity and high cost of improved seeds as priority constraints. The youths at Zugu also ranked inadequate tractor service for land preparation, low soil fertility and lack of credit, respectively as the major crop production problems in the community. Thus low soil fertility, *Striga* infestation, lack of land preparation equipment and low financial status to pay for input and services especially among women and youths are the major problems that cut across the region. Land scarcity is specific to women group probably because land ownership is skewed in favour of men in this region.

The livestock production problems ranked in Sabegu and Aibos revealed that ticks and worms were ranked first by both men and youths group. The other priority problems were anthrax/swelling and inadequate veterinary services and drugs. No coping strategies were articulated for these problems at the community level. Low farm gate prices for farm produce, low demand and inadequate means of transport to transport farm produce to nearby markets were some of the marketing problems ranked in decreasing order of importance. The farmers also mentioned inadequate grinding mills, shellers and dryers as some of the constraints to increased crop production.

Resource Analysis and Opportunities in Northern Region

The inventory of resources in Savelugu/Nanton district revealed the presence of farmlands and grinding mill in Kanshegu; farmland in Jana; dam at Libga; bore hole, teak plantation and solar light at Manguli. In West Gonja district, the resources included farmlands and borehole in ,Sori No. 1; farmlands in Jonokponto; grinding mill, borehole and filling station in Damongo Zongo, while in Frafra No 4 were farmlands and teak plantation.

The situation in Tolom/Kumbungu district showed that at Tingoli, a low resource community (Fig.1), there were potable drinking water, inadequate farm land and gravel mined pit. This explains the ranking of land scarcity as major crop production problem by women in the community. The resource inventory also included farmlands at Dundo; teak plantation, gravel pit, adequate farmland, pond for livestock, and potable drinking water at Kpachi being medium resource community (Fig. 2). Zugu is well resourced among the communities in the district with pipe borne water; cement well, teak plantation, adequate farmland, kraal and uncompleted bridge. Opportunities exist for further expansion of farmlands when the bridge is completed and irrigation farming in the low lying areas in Zugu (Fig. 3).

In Yendi municipality, Zang has farmlands, while Malzeri being average resourced has gravel pits, farm land, teak plantation, borehole, rain harvesting system, dam and insufficient farm land. Zakoli is poorly resourced with two bore holes and farmland. Pion is well resourced with bridge, low lying area where rice is produced, enough farmland, borehole, and cashew plantation and village market. Opportunities also exist for irrigated farming by underground water abstraction using wash boreholes and tube wells in the low lying areas where the water table could be high.

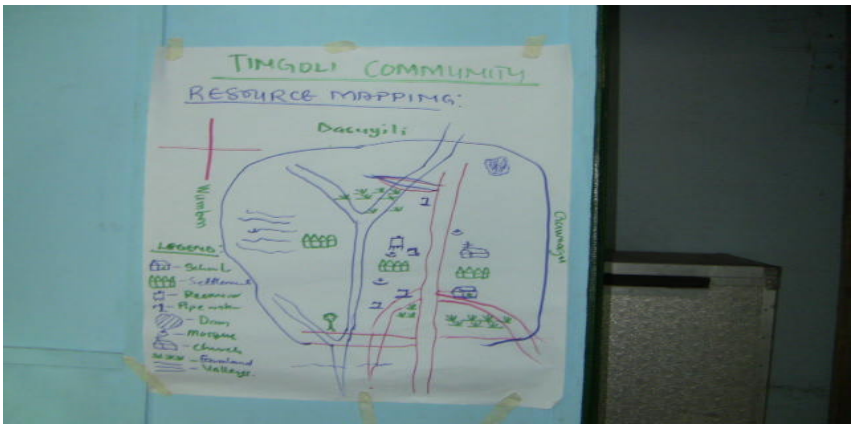

Figure 1. Resource map of Tingoli, a low resource community

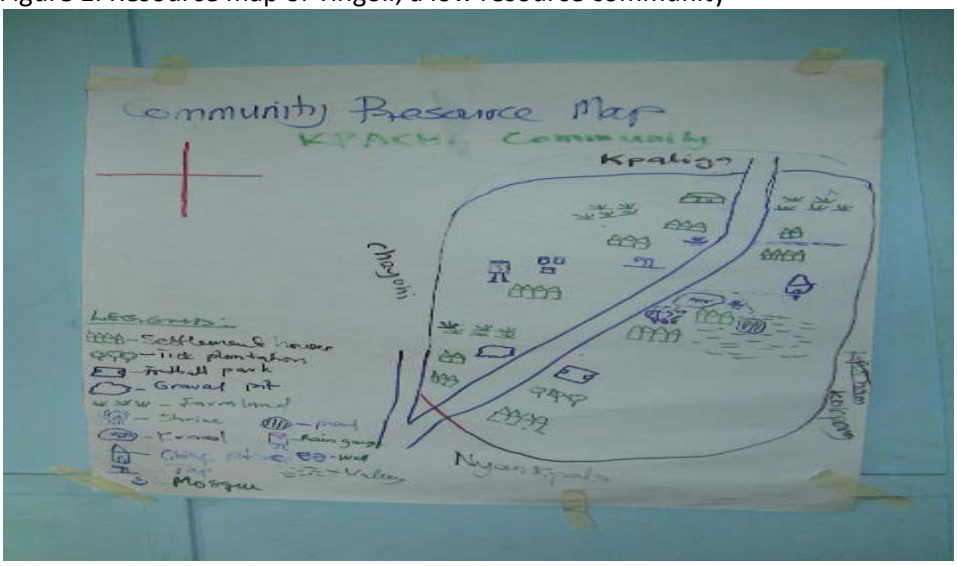

Figure 2. Resource map of Kpachi, a medium resource community

Figure 3. Resource map of Zugu, a well resourced community

Market Channels and Market Network in Northern Region

The market at Savelugu in Savlugu/Nanton district is central to all marketing activities of farmers in the five communities in the district. There is no community market at Kanshegu, Duko, Jana, Libga and Manguli in Savelugu/Nanton district. Farmers sell crop and livestock products and buy manufactured goods from the Savelugu, Nanton and Tamale markets (Fig.4). However, the link to Nanton and Tamale markets are not as strong as that of Savelugu. Farmers either sell directly in Savelugu market to middlemen or consumers, and sometimes the middle men enter the communities and buy the farm produce directly from the farmers, which they latter sell to retailers or consumers in other markets (Fig.5). Farmers in Manguli have strong market links with Tamale and Nanton than Savelugu market.

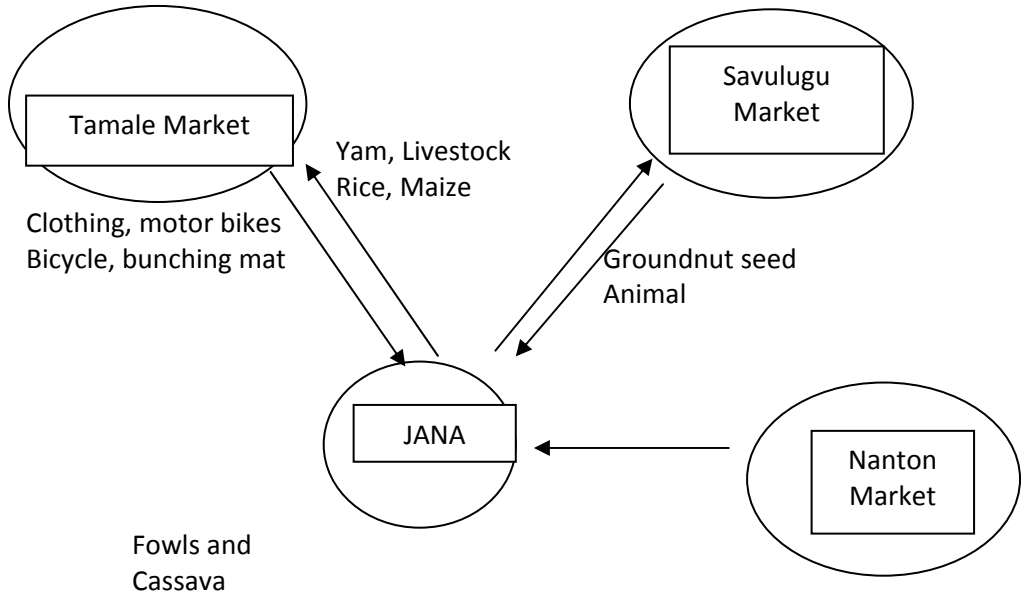

Figure 4. Market network in Jana in Northern Region

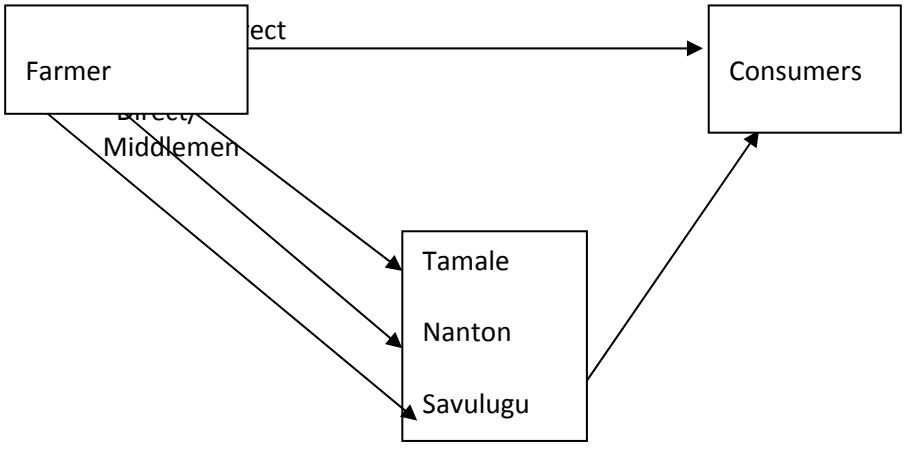

Figure 5. Market channel in Jana in Northern Region

In West Gonja district, there is no community market at Sori No.1 and Frafra No. 4, but farmers from the communities transact market business in Damongo, Kitampo and Sori No. 2 markets. Farmers in the communities sell cereals, legumes and livestock in Damongo and yam in Kintampo markets. They purchase vegetables, clothing, agro-chemicals, cutlasses and bicycle spare parts from the market. The farmers sell farm produce direct, but middlemen enter the communities periodically to purchase farm produce and sell to retailers and consumers in other markets. Jonokponto and Busunu have smaller markets, but also join bigger markets in Busunu, Yapei and Damongo. Farmers in these communities sell cereals, legumes and livestock and they purchase vegetables, bicycle spare parts and building materials from the big markets. Although farmers sell their produce directly, middlemen enter the communities periodically to buy farm products directly from the farmers.

The market network and channel in Dundo, Tingoli, and Sabegu communities in Tolon/Kumbungu district indicate that farmers patronize Nyankpala, Woribogu, Tamale and Kumbungu, markets. Farm produce are sold to individual middlemen and these include paddy and processed rice, maize, soybean, groundnut, processed groundnut (paste, oil and cake), livestock and vegetables. Items they buy back home include all that they send to sell at the lean season when there is shortage of food. A lot of rice and maize are produced at Zugu and farmers from the community patronize Kumbungu, Savelugu and Tamale markets. There is no organized group in the district that buys the produce from the farmers, but individual middlemen constitute the major channel for disposal of the produce.

Zang community in Yendi municipality does not have an organized local market. All produce are sold in Yendi market. The produce sold includes maize, rice, cowpea, sorghum and millet. The channel for produce disposal is from farmer to Savanna Farmers Marketing Company (SFMC) to consumer or from farmer to consumer directly. The SFMC is the only organized market channel through which farmers sell their produce. Malzeri farmers patronize Bonbon, Gushegu, Kpatina and Yendi markets. Produce sent there include maize, paddy and processed rice, groundnuts, small quantities of sorghum and millet and vegetables. Some soybean farmer groups in Mazeri go into contract agreement to get support in terms of farm inputs from SFMC and sell the produce to them after harvest, so Malzeri farmers have no problem selling their soybean. Farmers from Zakoli patronize Sakpaba, Yendi, Wonbong, Sabdoa and Yinsola markets. Those from Adibo go to Yendi, Bimbila, Tamale and Kumasi markets, while farmers from Pion patronize Yendi, Tamale, Katinga, Bonbong, Bimbila, Gushegu and Wapuli markets directly by individual and commercial farmers.

Community Institutions: Linkages, Purpose and Strengths

Existing community groups and links to livelihood support services

Individual farmers and those belonging to CBOs (Table 1) in most communities in the Northern Region benefit from livelihood support services provided by government and NGOs. . In Savelugu/Nanton district farmers are linked to service providers and they benefit from such institutions. The CBOs benefit from technology dissemination and farm inputs from MoFA and CSIR-SARI ; education, training and provision of school structures, feeder roads and boreholes from MiDA; bore holes, electricity, livestock technology and tree planting from NGOs like World Vision International (WVI), ADRA, CASPAD and OIC and education from GES. In general, MoFA often recover the cost of input supplied to farmers in kind.

Farmers in the CBOs in West Gonja district also benefit from the services offered by MoFA and CSIR-SARI. An NGO, Masara Na'arziki also provides farm inputs to farmers which are recovered in kind, while the Catholic Church and District Assembly provided solar lamps at Busunu. No organized CBO was identified at Frafra No.4, but individual farmers benefited from input and technology interventions from MoFA, CSIR-SARI and WEINCO. In the Tolon/Kumbungu district, government institutions such as MoFA, CSIR-SARI, and GHS provided services to farmers in Dundo community with no private sector or NGO participation. Institutions that work with inhabitants and CBOs in Tingoli included CSIR-SARI, UNICEF, MiDA, MoFA, and MASLOC, while MiDA, MoFA and GHS provided services in Zugu in Yendi municipality, the SFMC, MoFA, GHS, UNDP, CSIR-SARI, IFDC, ACDEP, CCFC, ADB and Fire Volunteers partner with individuals and groups depending on the strategy and convenience. ACDEP in collaboration with SFMC support farmers to cultivate and buy the produce after the season, while CCFC and IFDC train them.

Table 1. Names of Community Based Organizations identified in Northern Region

District	Community	Name of Community Based Organizations (CBO)
Savelugu/	Kanshegu	1.Maltiti Farmers Assoc. 2. Tunteiya Youth Assoc. 3. Beilanabra Shea butter Processing 4. Nubuniyini Rice Processing
Nanton	Duko	1.Tiyuntaba Ataya Base Rice Producers, 2. Hpamanga Rice Processing, 3.Suglomboraburu Ataya Base Maize/Livestock Prod., 4. Honyorisonmlagniba Ataya Base Maize Production
	Jana	TRPA
	Libga	1.Rice and VegeAnnexGrowers Assoc. 2. Libga GAWU 3. Libga Women Shea butter Processing Assoc. (Kpamayga) 4. Kpamangu Kawusong Rice Processing 5. Suglumbora Soybean Farmers Assoc.
	Manguli	1.Suglumbore Boni Gbengka Male
West Gonja	Sori No. 1	6 groups (un named)
	Johokponko	5 small groups (un named)
	Bususnu	1.Tuntey Shea butter Processing 2. Naskure Shea butter Processing 3. Christian Mothers Assoc. 4. Kentiwale Production
	Damongo Z.	1.Bulonso Women Grp. 2. Kechito Fowl Production 3. Awurinkeni Production
	Frafra No.4	Not listed
Tolon/Kumbungu	Dundo	1.Bonzali Youth Farmer Group 2. Yumbobgu Farmers Group
	Kpachi	1.Nnganwuni Farmers Group 2. Bobgu Nyaya Farmers 3. Pumaya Women
	Tingoli	1. Bobgu Nyaya Farmers 2. Tibomyam Farmers 3. Kpanmeng Farmers
	Zugu	1.Kpangmang Farmers Assoc.

		2.Suglo Nbori Buni Farmers Group
	Sabegu	1.Biala Nnabra Women Group 2. Sahabiani Farmers Group
Yendi	Zang	1.Nangbanyihi Vela 2. Kulinoli
	Malzeri	1.Fire Volunteers Farmers 2. Malzeri Soybean Farmers 3. Tiyumtaba Veg. Farmers
	Zakoli	3 unnamed: 1. KP1 2. KP2 3. KP3
	Adibo	Not listed
	Piong	Not listed

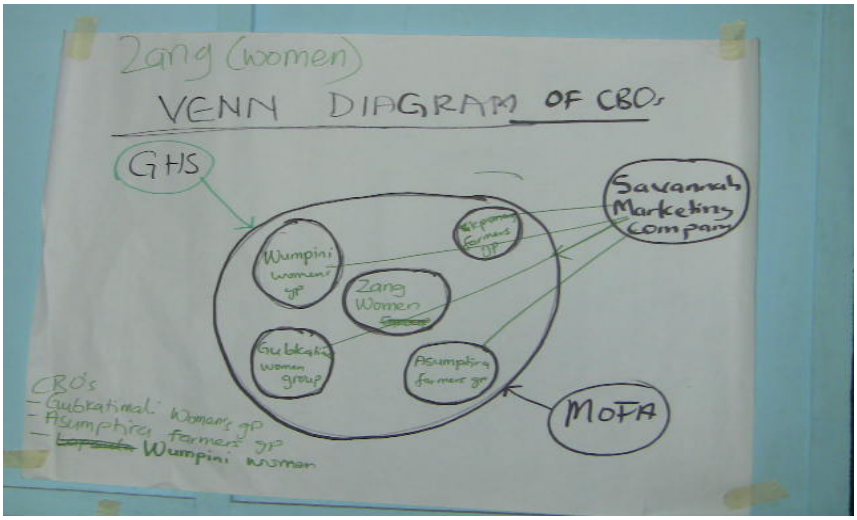

Figure 6. Venn diagram of women CBO in Zang, Yendi district

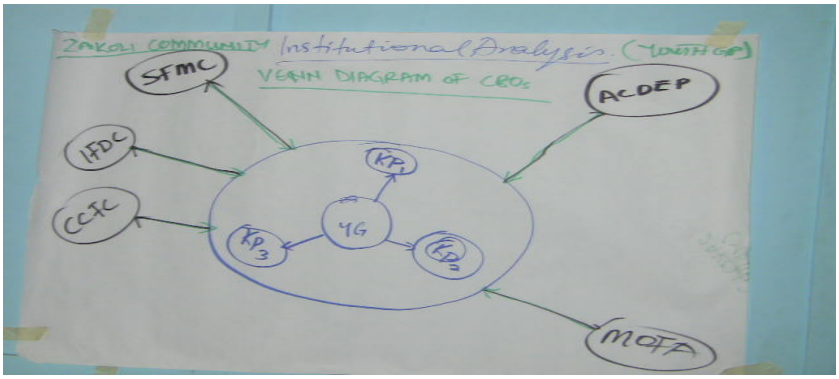

Figure 7. Venn diagram of youths CBO at Zakoli, Yendi district

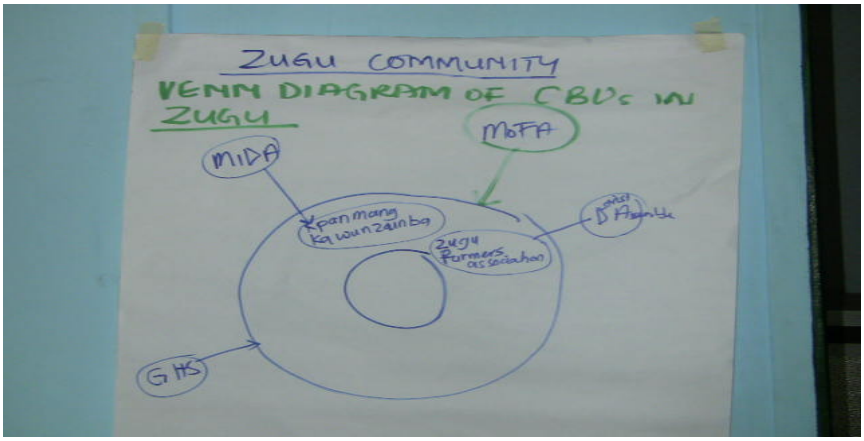

Figure 8. Venn diagram of CBO in Zugu, Tolom/Kumbungu district

Strengths, weaknesses and purpose of selected CBOs

The CBOs groups identified in Dundo, Kpachi and Tingoli in Tolon/Kumbungu district (Table 1) were established 1-7 years ago and are involved in crop production supported interventions. The membership of the groups in Dundo comprised males only, while membership consisted of both males and females in the groups in the other communities. The groups have not been trained or registered and have no bank account, except Pumaya Women group at Kpachi that has an account. Apart from owning some acres of land and attending meetings, the groups have not achieved much. The situation of the CBO groups in Zang in Yendi district is similar except that the groups are involved in cashew and soybean production and have received trainings from MoFA and SFMC on improved techniques in cashew and soybean production, respectively. The groups have been empowered financially which facilitated more school enrolment. All the CBOs identified in Malzeri were established 5-15 years ago have bank accounts, have large acres of farm land and are involved in soybean, vegetable and maize production. The Fire Volunteer Farmers Association has registered and some members were able to buy motor cycles and roof their buildings thus indicating significant achievement in livelihood improvement. All the CBOs identified in Zakoli are registered and have bank accounts. Also, they received trainings on financial management from ACDEP and livestock and crop management from MoFA. Some members were able to buy motor bicycles and animals and many women have been empowered financially.

Most of the CBOs identified and analyzed in the Tolom/Kumbungu district were weak and needed to be strengthened. The CBOs could be encouraged to open bank account and establish link with service providers that could identify and provide trainings in their area of operation. Owning bank accounts would enable the groups' to access credit that can provide cash for payment for inputs and services that have been listed as priority constraints . The CBOs in Yendi municipality ranged from moderately strong in Zang to very strong in Malzeri and Zakoli. All CBOs could further be strengthened by embracing both crop and livestock production in order to exploit synergies in crop-livestock interactions.

Capability of CBOs to resolve identified problems

The PREA strategy requires the participation of CBOs in resolving identified problems in the community. The CBOs identified have some experience in working with government institutions and NGOs and showed their readiness to partner with the project during the community analysis. The CBOs selected their lead farmers and community seed producers during the exercise and the number will increase during the subsequent years of project

implementation. The CBOs should be linked to agro-input and output markets and their capacities strengthened in crop and livestock management practices and entrepreneurial skills. Both intra and intercommunity networks among CBOs should be strengthened and organized agricultural produce companies should be sourced from nearby cities and linked to the producers association at the community level. The coping strategies that are prevalent at the community levels should be improved upon or tested along with improved best practices to resolve the priority problems.

Results of community analysis in Upper East Region

Biophysical Characteristics and Agro-environment in Upper East Region

The Upper East Region (UER) which is located in the north eastern section of Ghana lies between longitude $1^0 15'$W to $0^0 5'$E and stretches from latitude $10^0 30'$N to $11^0 8'$N. The region shares borders on the east with the republic of Togo, on the north with Burkina Faso and to the west with Upper West Region. It occupies the greater part of Sudano-sahel savanna zone of Ghana. The physical geography of the region is marked by the line of the Gambaga escarpment, running West-East along its southern edge and marking a division with lower density, higher-rainfall terrain, which is largely part of Northern region. The average annual rainfall in the region is some 900-1000 mm (Blench, 2006a). The region is characterized by a short rainy season which is erratic, from May to October and long dry season that stretches from October to April with hardly any rains. The most common economic trees are the shea nuts, *dawadawa*, baobab and acacia with ground flora of grass, while the soils are predominantly sandy loam with some gravel (Annex 6). The area is characterized by small land holdings of low input-output farming systems, which has dire impact on household food security such as availability, access, quality and price.

The population comprises about 60% females and 40% males who live in scattered settlements. The hierarchy of leadership in most of the communities shows that the chief is the head of the community followed by the assembly man. In some communities like Sakote, the queen mother is next to the chief. The underlying social structure in UER is the extended patrilineal family. Families form part of lineages and these in turn compose clans. The region is highly diverse ethno-linguistically, and the major ethnic groups are Kusasi, Moshie, Busasi, Mamprusi, Bisa, Fulani, Hausa and Zabarma (Annex 6). There is no *lingua franca* that serves as an effective medium of intercommunication although a type of Hausa is often used as a market speech in large towns (Blench, 2006a).

The farming system in the region is based around cereals and legumes which are common in lower rainfall zones elsewhere. Cultivar diversity is low, probably a response to poor soil fertility. Animal traction is extensively used, even in ridging that could improve rooting and counteract erosion (Panin, 1986). Actual soil fertility is determined as much by the exceptional concentrations of population allied with a low-input farming system. Throughout most of UER, except in the extreme west, there are virtually no elements of the system that encourage the return of nutrients to the soil. The crops are produced under continuous monoculture in which soil resources are steadily depleted and average crop yields are gradually declining. The average farm size is 2.5ha/crop with low yields due to the highly degraded soils. Livestock roam freely in the dry season, but in the rainy season they are taken away from the area to avoid damage to crops and the manure is effectively lost. Most trees, even leguminous ones, have been removed from the farms in order to increase cropping area. Firewood is so short that the stover of cereals are removed from the farms and used to cook food, thus not returning their organic matter to the soil. The elimination of almost all types of ground cover leaves the area patched and mostly bare landscape. Consequently, the torrential early rains cause soil erosion; with heavy surface run-off and poor moisture infiltration (Blench, 2006a).

Major crops produced in the area include pearl millet, sorghum, maize, rice, groundnut, cowpea, soybean and onion (*Allium cepa* L). However, millet is resilient to the environment of the zone. There are two groups of millet cultivars, a short-season millet harvested in July and a long-season millet, harvested in November or December. The dominance of millet in such a high rainfall area is striking as millet is usually associated with sub-desert regions. The early millet is inter-planted either with late millet or sorghum in fields close to the compound where fertility is highest. The further fields are planted with sorghum intercropped with pulses, especially cowpeas and occasionally groundnuts. At smaller dam sites, dry-season cultivation is mainly vegetables, most commonly onions and tomatoes. In the early period, lettuce, pumpkins, cucumbers and watermelon were brought in, but these are now of minor significance. Onion cultivation is particularly popular and represents one of the most important agricultural exports from the region (Blench, 2006a).

Existing Farming System and Problem Analysis

Analysis of on-farm livelihood activities in the Upper East Region

All gender groups are involved in crop cultivation in the region. The major cereal crops cultivated by all groups include early millet, late millet, maize, sorghum and rice, while the major legumes grown are groundnut, cowpea, soybean and bambara groundnut (Annexes 7a and 7b). In Talensi/Nabdam district, more men are involved in groundnut production, while more women are involved in maize production. Soybean is popular among all groups in Bongo district as 80 to 100% of the groups are involved in its production. Greater proportion of all cereals produced is used for food with 10-50% devoted for cash. The legumes are essentially grown for cash with 10 – 50% used for food. The millets constitute the major food crop and soybean a major cash crop with 90% each devoted for food and cash, respectively.

The trend in the production of all crops is decreasing except for maize in the region. Maize production is increasing across the communities (Annex 7a). The reason for the increase as suggested by the participants was that maize is a new crop that respond remarkably to fertilizers when compared to sorghum and millet. There is also increasing market opportunities for maize and maize products across the region. Declining soil fertility, erratic rains, and head insects were some of the reasons advanced for decline in production of early and late millet, sorghum and rice. Prevalence of leaf diseases, low soil fertility and lack of improved varieties are discouraging farmers from production of groundnut and bambara groundnut, while these factors along with insect pest infestation reduce cowpea production. Lack of processing skill was the only reason advanced for decline in soybean production.

The situation in Bawku municipality showed that more than 70% of households produce millet, sorghum and maize (Annexes 7b and 7c). Around 40-60% produces rice, soybean and groundnut. However the proportion of households producing sorghum and millet is declining while maize and soybean is increasing. Cowpea and bambara groundnut production were steady while groundnut production is declining. Communities with access to water source for dry season gardening engage themselves in dry season farming to supplement the rainy season harvest and to generate additional income. Some farmers obtain more incomes from their dry season farms than the major rainy season farming. Maize is becoming an alternative cereal crop cultivated by farmers in Binaba and Bawku West district generally for food in the place of millet due to the comparatively higher yields

obtained especially when the appropriate cultural practices are followed. In recent years, also poor yields are being recorded in millet. In addition, maize can be used to prepare various dishes compared to millet. Maize is therefore cultivated both as a cash crop and for food. The cultivation of millet would however, not stop because it is used for the preparation of some traditional meals and for cultural performances. Improved varieties of millet therefore need to be promoted. Women farm mostly to supplement the family food normally provided by the man and for cash to meet their basic and social needs such as buying clothes for themselves and their children, bowls, supporting the payment of children school fees etc. They mostly produce rice as well as groundnuts though on small plots of land.

Men are involved in the production of all types of crops, but more men produce maize, sorghum and millet than women. The women do not produce sorghum and late millet, but more women are involved in the production of legumes such as cowpea, groundnut, soybean and bambara groundnut. More youths are involved in the production of maize and soybean; and some minor crops like sesame and *neri* in Binaba. Men produce the cereal crops mainly for food, while rice and legumes are mainly produced for cash by all groups. The trend in the production of sorghum, millet, rice and groundnut is decreasing due to declining soil fertility, pests and diseases infestation, drought and inadequate land. The trend in soybean production is increasing because it is considered nutritive and does not require external inputs like fertilizers and pesticides.

Poultry birds such as local fowl, guinea fowl, ducks and turkey are raised in Talensi/Nabdam and Bongo districts. Small ruminants such as sheep and goats, and large ruminant (cattle), pigs, dogs and donkeys are raised by all groups in the communities (Annex 7d). Although all groups keep all categories of livestock in the region, more women keep cattle and poultry than men and youth in Talensi/Nabdam district, while more men and women keep pigs than youths in Talensi/Nabdam and Bongo districts. Greater proportion of all categories of livestock produced is sold for cash. Cattle are rarely used for food, while dog, poultry and pigs are the most important food animals in the region. The trend in livestock production is decreasing for all categories except for poultry which is increasing across the region but static in Balungu in Talensi/Nabdam district. The increasing trend is because poultry is multipurpose and is used for rituals, festivals, payment of dowry, high quality food and attracts quick cash. However, poultry production could be marred by the prevalence of Newcastle disease which causes high bird mortality. The decrease in trend for other categories is due to decrease in grazing area for cattle and donkeys, high cost of food and increase in incidence of rabies for dogs, high cost of drugs, feeds and housing for pigs

The situation in Bawku municipal and Bawku West district (Annexes 7e and 7f) showed that cattle, goat, sheep and poultry production is popular among all groups in the 10 communities. In addition, more youths also keep dogs, more women keep donkeys and more men keep cattle than the other groups. Greater proportions of all animals are raised for cash than food. Goats, poultry and pigs are the main food animals, while cattle are raised mainly for cash and donkeys are work animals as means of traction and transport. The trends in the production of these animals differ across the communities. In Bawku West district, the groups gave divergent views (Annex 7e). The men group reported decrease in production of all categories of animals at Yarigu, cattle at Bianaba, poultry at Tilli and donkey at Tanga, among others. The women and youth groups reported increases in trend of production of these animals. All the groups reported increase in trend at Tanga, except for donkey. The trend in cattle production is decreasing due to inadequate grazing area and prevalence of diseases. The trend in the production of sheep, goats, pigs, donkeys and dogs

is increasing in Bawku municipal because the small ruminants and pigs are prolific, and provide ready cash, there is improved vaccination for poultry and the use of donkeys as work animals is on the increase (Annex 7f). However, high keet mortality in guinea fowl rearing due to prevalence of diseases, inadequate grazing area and theft are some of the major reasons for decrease in production of these animals across the Bawku area.

Analysis of off-farm livelihood activities in the Upper East Region

All groups in the Talensi/Nabdam district are involved in the processing of cereals and legumes with the exception of rice (Annex 8). Among the cereals, sorghum is processed into *pito*, a local brew whose trend is increasing due to high demand and ready market in the region. Maize is processed into *kenkey*, and millet into *koko* (watery porridge) and *masah* (fried paste) but the demand for these products is low and hence there is less incentive in the processing and the trend is decreasing. Groundnut is processed into oil, paste and cake. The oil is competing with other cooking oils that are cheaper and the trend is gradually decreasing. Soybean is processed into *dawadawa* (local seasoner) and is competing with the products from the locust bean. All groups are involved in the marketing of agricultural produce. Processing of livestock products is not common at the local community level except for domestic consumption and ceremonies or rituals. The central markets at Bolgatanga and Bawku are major centers for livestock marketing and processing.

The situation in Bawku municipality and Bawku West district showed that soybean, rice, sorghum and groundnut were the dominant crops where value-addition and secondary processing were mostly carried out by women and women groups (Annex 8). *Dawadawa* processing is also a common feature using either soybean or the locust bean seed. This is done mostly during the dry season as an income generation activity to supplement family income. Small to medium scale micro-enterprises for women should consider involving women along the value-chain businesses of these crops. The processing of cereals and legumes is an income generation activity for women. Maize apart from its use as food is processed into flour for sale or food such as *kenkey* and *banku.* Millet is used in preparing millet cakes for sale, but much of it is consumed by the family as not much yields are obtained in recent years. Many farmers are into the cultivation of cowpea and soybean due to its high market value and comparatively high yields obtained. In fact soybean is gradually replacing groundnut because yield of groundnut is declining. Some farmers have even stopped cultivating it, because the yields obtained do not merit the tedious work involved in its cultivation.

The processing of agricultural products for storage is mainly done by women. The men and youth help during the harvesting and threshing of the produce with the youth playing a major role since they are physically stronger. The female youth assist their mothers. Processing for the market is an income generation activity for women, for example processing sorghum into malt, soybean into *dawadawa*, groundnuts into oil and paste. Middlemen come in from Bolgatanga, Navrongo and sometimes beyond to purchase the processed malt and *dawadawa*. The district is noted for its premium *dawadawa* and malt. Men and the Youth are found more in the processing of animals into *kebab* but women still dominate if it is to be smoked or fried for sale.

Crop and livestock census and prioritization in Upper East Region

Early millet is the major food crop in Talensi/Nabdam district as the crop was ranked first or second across the communities (Annex 9a). In this district, the order of ranking of crops for food was early millet > sorghum > maize > late millet > rice. Sorghum is the leading food crop in Bongo district followed by early millet, maize, late millet and rice in that order. Early millet

and sorghum are considered crops of food security, because they mature early and provide food when other crops have not matured. The ranking of the cereals for cash showed that sorghum and maize are the major cash crops in the two districts. Maize is gradually gaining dominance over sorghum as cash crop because it responds significantly to fertilizer application and therefore produces higher grain yields.

The ranking of the legumes for food was in the order: groundnut > cowpea > Bambaranut > soybean. Groundnut paste and oil are used for soup, while whole grains are eaten fresh or cooked, while cowpea is cooked and constitute simple meal for the family. The longer cooking time of bambara groundnut and inadequate knowledge of recipes from soybean are the major reasons for their low ranking for food. Local farmers largely prefer fast-cooking, early varieties of Bambara groundnut with large, cream-coloured seeds. The ranking of the legumes for cash was similar to that of food as the ranking was in the order: groundnut > cowpea > bambara groundnut > soybean. Thus groundnut and cowpea are the two most important leguminous food and cash crops in the region.

Poultry is the most important among the livestock species as it was ranked first for both food and cash across the communities in the region (Annex 9a). The men ranked dog as the second most important food animal followed by goat and sheep in that order in Talensi/Nabdam district. The order of ranking for the women group was: poultry > goats > sheep > pig > dog > cattle > donkey. The order of ranking of the animals in Bongo district was: poultry > goat > sheep > cattle > pig > donkey > dog. The ranking of the animals for cash was similar to that for food in the region. Other uses of the animals are for traction and transport by cattle or donkey; dogs are pets and provide security. It was noted that both dogs and donkeys become food animals when they grow old and can no longer provide their primary functions.

In Bawku, West and Bawku Municipal, maize and millet were co-dominant in terms of contribution to livelihood (Annex 9b). Maize is now preferred due to its comparative high productivity compared with millet and sorghum. Secondly maize can now be used for same local food dishes as millet and sorghum. Soybean production is gradually increasing due to high income value, compatible intercropping with maize and various forms of utilization. Some development partners are promoting soybean production by way of providing credit and inputs for production. The domestic fowl plays an important role in household livelihood. The advantages of the domestic fowl include low costs of production and short gestation period. Goat and pig production were the second most economic animals particularly to women and female-headed households. Cattle were owned by few households and mainly used for tillage. Majority of households owned donkeys, which are mainly used for traction and transportation of farm produce and goods to nearby markets.

Problem census, prioritization and coping strategies

The most widespread crop production problems identified in the Talensi/Nabdam and Bongo districts are unreliable or erratic rains, low or declining soil fertility, lack of improved seeds, inadequate land preparation equipment, insect pests, diseases and weeds; and lack of credit (Annex 10). These problems account for the major decline observed in crop production in the region. Farmers cop with unreliable rains by planting early improved and/or drought tolerant varieties, which have high and stable yields and attract higher market price. However, seeds of these varieties are not readily available and require higher inputs than the local cultivars. Application of farm yard manure, chemical fertilizers and intercropping cereals with legumes are the major coping strategy for low soil fertility, but inadequate access and high cost of transportation are the major factors limiting the use of

farm yard manure and fertilizers in the region. Farmers are able to remedy the problem of land preparation by using animal traction which ensures early land preparation. However, there is limit to the use of animal traction in heavy soils or rice ecologies which are difficult to cultivate; also animal traction is inadequate and takes a long time to clear a larger land area, thus delaying land preparation and planting. About 60-90% of the respondents are involved in these practices and the trend is increasing given the benefits farmers derive from such coping strategies. The major livestock problems identified include: new castle disease (NCD) in poultry, high keet mortality in guinea fowls, poor housing for pigs, and poultry and Peste des Petits Ruminant (PPR) in small ruminants. Early reporting of PPR outbreak to MoFA, treatment and vaccination are the major coping strategies, but cost of treatment increase the cost of production. Artificial brooding of guinea fowl keets has reduced mortality and many farmers now own brooder houses.

In Bawku municipal and Bawku West district the most recurring constraints were perennial drought, decreasing soil fertility, lack of access to credit, high cost of agro-inputs, degraded grazing lands, inadequate watering points for animals and lack of bullocks and tractor services at planting (Annex 10). High mortality across all kinds of animals was recurring constraints in all communities. The livestock mortalities and theft are discouraging the youth from rearing them even though they say it is good to have them. This is because they are sold to buy food to supplement the family food when it runs short during the long dry season in addition to solving other social and cultural obligations. “One can lose the entire flock or herd”, they complained. The veterinary services of MoFA need to be strengthened in order to conduct routine vaccination of animals to avert this problem and hence the use of Community Livestock Workers (CLWs) should be encouranged.

Vulnerability to shock or stress and coping strategies

The farming system in the region is vulnerable to drought, flood, bush burning and destruction of farm land by small scale miners (Table 2). Although each of these factors is important, more grievous are the problems of bush burning and destruction of farm land by small scale miners. What is more worrisome is that these grievous problems are caused by humans competing for use of natural resources. Community education should be intensified at all levels in the region to reduce the depletion of natural resources that is increasing as a result of human activities. Drought and flood, although natural are also indirectly caused by human activities. Thus all groups in the community are vulnerable to these hazards. However, women and youths have less access to land especially in Bawku municipality and Bawku West district and can be considered being more vulnerable since they have less alternatives.

Table 2. Shock or risk and coping strategies in Upper East Region

Type of shock or risk	**Relative importance (1-10)**	**Causes**	**Frequency of occurrence**	**Coping strategies**
1.Drought	5	Natural, degraded environment	Occasional, less frequent	Plant early maturing varieties
2. Flood	4	Natural, silted rivers and dams	Occasional	Avoid low lying areas by 50 m, dry season gardening, sell animals to supplement
3.Bush burning	7	Hunters, children,	Every dry season	Use early maturing varieties, gather crop residue

		smokers		
4.Destruction of farmland	7	Small scale miners	High	Community education, limiting mining operations

Resource Analysis and Opportunities in Upper East Region

Resource maps

The resource maps of selected communities in the region are presented in Figures 9 to 13. There are diverse opportunities in communities with low lying areas, rice valleys and grazing areas. These provide opportunities for both rainfed and irrigated farming and livestock production. Opportunities exist in Yidongo, Binduri, and Baare for irrigation and dry season farming. Googo is a crop processing center with presence of several grinding mills.

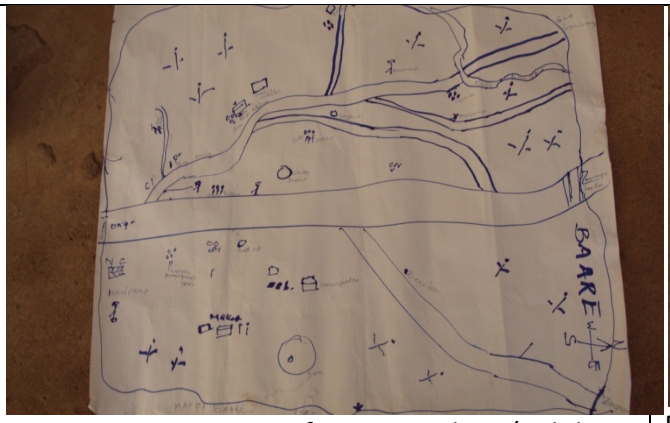

Figure 9. Resource map of Baare in Talensi/Nabdam district

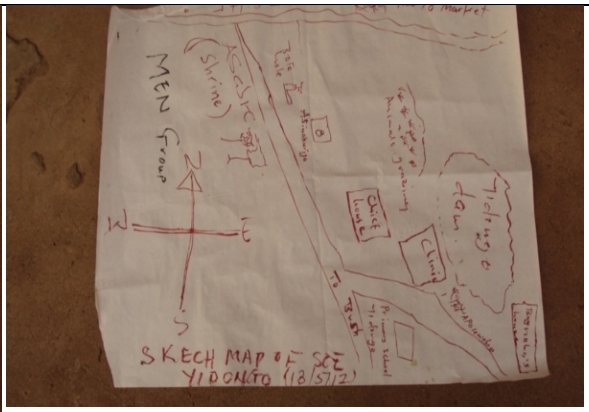

Figure 10. Resource map of Yidongo in Bongo district

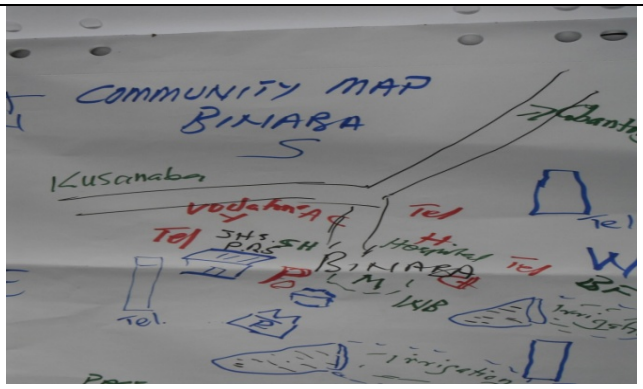

Figure 11. Resource map of Binaba in Bawku West district

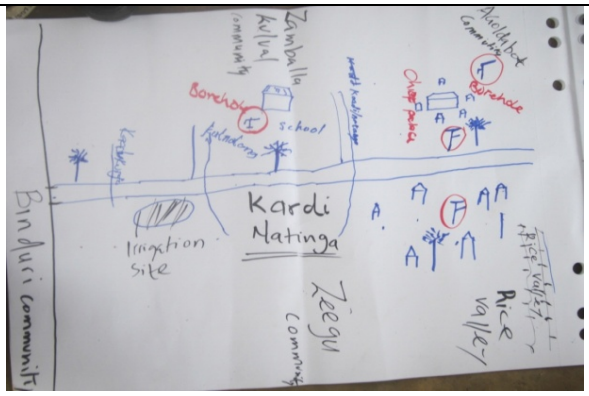

Figure 12. Resource map of Binduri in Bawku municipal

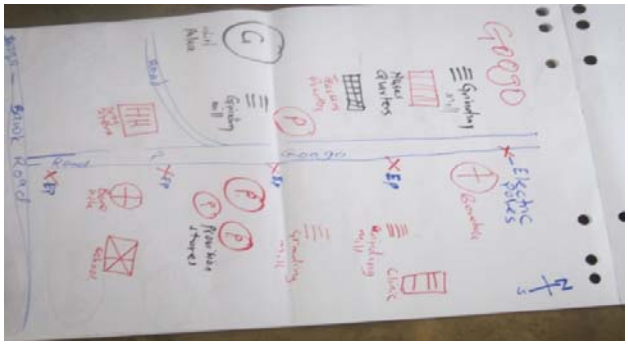

Figure 13. Resource map of Googo in Talensi/Nabdam district

Cropping calendar

The cropping calendar of farming activities in the region during any rainy season is summarized in Figure 14. Farming activities start in March with land clearing and run through December when farm produce are harvested and marketed.

Activity/operation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Clearing												
Land preparation												
Planting												
Filling in												
1st weeding												
Fert. Application (1st)												
2nd weeding												
Transplanting												
Top dressing												
Earthen up												
Harvesting												
Drying &processing												
Storage												
Marketing												

Figure 14. Cropping calendar of farming activities in Upper East Region

The activity pattern of the people is mainly agricultural and some amount of petty trading. Rain-fed agriculture commences from May to November while dry season irrigated agriculture is done between November and April each year.

Seasonal calendar of resource availability in Bawku municipal

High food availability concurs with harvesting which starts from August and reaches its peaks by October to November while chronic shortages occur from May to July (Table 3). Availability of food, cash and labour may vary among households. Labour shortage occurs during the time of planting and harvesting of major crops. However, during the periods of food scarcity, farm families offer labour for cash to able them purchase foodstuffs for the family.

Table 3. Seasonal calendar of resource availability in Bawku municipal

Resource availability	Month of the Year											
	Jan	Feb	Mar.	Apr	May	Jun	July	Aug.	Sept.	Oct.	Nov.	Dec.
Cash available												
Cash not available												
Chronic cash shortage												
Food available												
Food not available												
Chronic food shortage												
Labour available												
Labour not available												

Soil fertility assessment and management practices

The classifications of soils in the Talensi/Nabdam and Bongo districts vary from gravel, gravel loam, sandy loam to clay loam and clay. The fertility status of these soils is generally low with few pockets of fertile soils observed in Onchocerciasis-free zone in Namoo Abbaskoma in Bongo district. The farmers testified that crop yields on such soils are low if soil amendments such as mineral and/or organic fertilizers are not applied. In addition, the soils are amenable to erosion by water and wind; *Striga* infested; and prone to water logging when located close to water bodies. Farmers apply fertilizers or homestead refuse as soil fertility management practice or integrate the options by use of chemical fertilizer and organic amendments such as homestead refuse and farm yard manure in an integrated nutrient management. Conservation tillage practices include planting on the center ridges, and field drainage to remove excess water from waterlogged fields. Soils in Bawku districts were described as fairly infertile or somehow degraded by the communities. In some areas, crop survival is virtually impossible without soil amendment. Some community lands were quite rocky and sometimes with many low lying valleys. Animal manure, chemical fertilizer, and household refuse are the main soil amendments used by the farmers in the districts. Problem of *Striga* infestation often featured prominently in most community discussions.

Market Network and Market Channels

Market network

Bolgatanga remains the principal regional market, but Bawku is also a significant trading centre. In Bawku municipality and Bawku West district, the marketing of legumes and cereals is done by women. Even if the man has some farm produce to sell, it is the woman who sends them to the market to sell and then hand over the income to the man. The exception is when the produce is plenty, then a middleman is arranged to purchase in bulk from the man. The marketing of livestock on the other hand is done by men. Community members who are typically farmers do trade in their immediate neighbouring communities. As shown in the analysis in Figures 15, 16 and 17, farmers go to the other markets with their farm produce to sell to obtain cash to solve other domestic and capital problems and also buy manufactured goods.

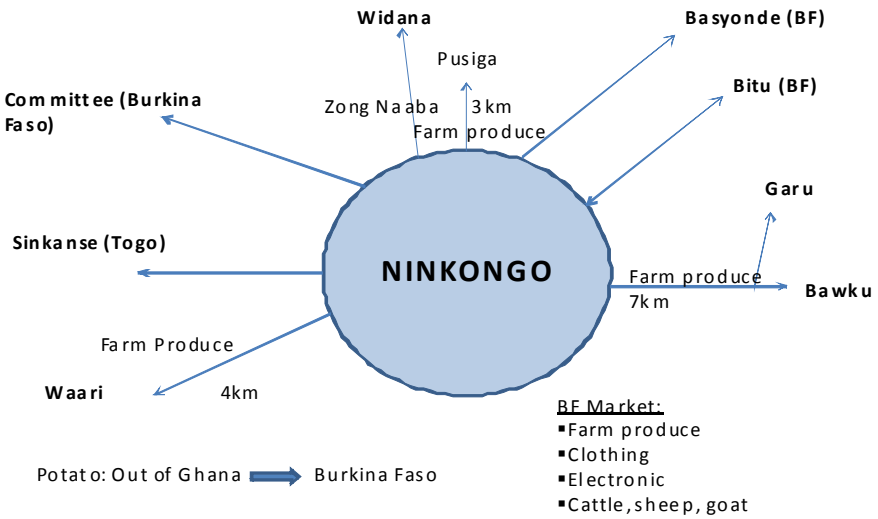

Figure 15, Market network of Ninkongo in Bawku municipal

The farmers may also buy soup ingredients, cosmetics, and soap. Access to market is not a major problem as distances to nearby markets are less than 30 km. Only few agricultural produce and livestock are traded in these local markets. The rural folks in turn buy household provisions and clothing from those markets but mostly from the major markets where the commodities are cheaper and where they obtain higher prices for their agricultural produce. Communities like Googo and Ninkongo are engaged in some cross border trade with other communities in Burkina Faso and Togo. Agro-inputs are obtained from near-by markets. Thus access is not a major challenge; however, high cost of inputs was a recurring problem. Inadequate access to improved seed and delay in arrival of fertilizer was frequently mentioned as the major marketing problems.

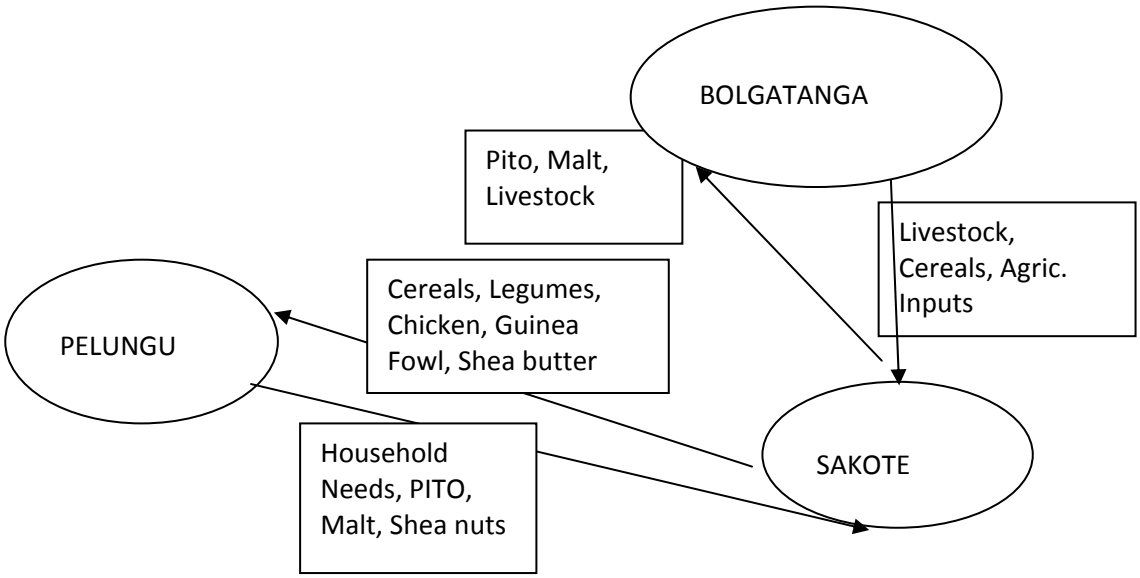

Figure 16. Market network of Sakote in Talensi/Nabdam district

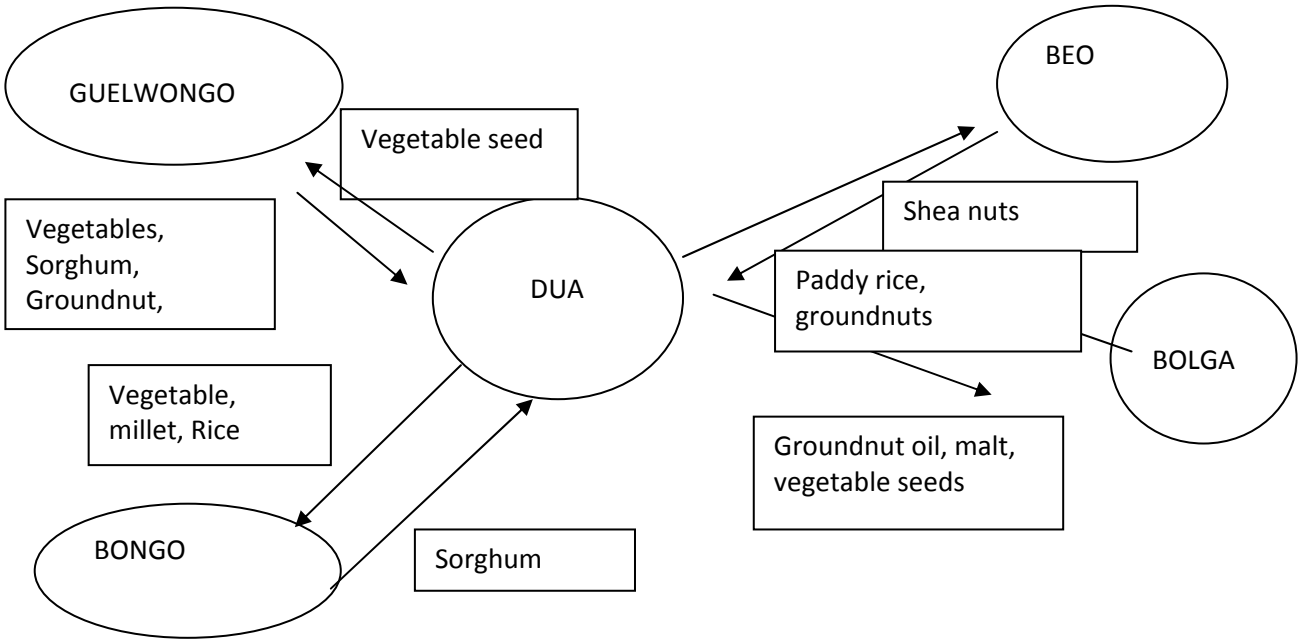

Figure 17. Market network of Dua in Bongo district

Market channels

Binaba market is one of the major markets in the Bawku West district, with middle men and women coming in from Bolgatanga and Zebilla to buy farm produce such as maize, cowpea, groundnuts, bambara groundnut millet as well as poultry and livestock for retailing in their markets. People from neighbouring communities (Zongoyire, Apotdabogo, etc) also come to purchase farm inputs, soup ingredients, provisions and other essential commodities. On the other hand, farmers from Binaba community also go to Bolgatanga, Bawku and Zebilla markets to purchase farm inputs such as seed and agro-chemicals not available in their communities as well as for other essential goods. In addition, the farmers go to the bigger towns for banking services and to sell processed farm produce.

Table 4. Work sheet for farm inputs at Binaba in Bawku West district

Type of input	**Source of input**	**Availability**	**Quantity**	**Unit price**
Fertilizer	Binaba ,Zebilla and Bolgatanga	Sometimes Unavailable	Depends on allocation/ funds	NPK-GH₵30.00 Sulphate-GH₵25.00
Improved seed	MoFA and input dealers in Zebilla, Bolgatanga	Mostly available	Depends on need	Depends on type of seed and variety
Chemicals	Dealers in Zebilla, Bolgatanga and Bawku	Always available	Depends on funds	Varies but ranges from GH₵ 7-GH₵15
Sahelian goats and sheep	Burkina Faso and Togo	Always available	Depend on need	Ranges between GH₵80 .00 --GH₵150
Sprayers	Dealers	Always	Depend on need	GH₵70-GH₵150

Protective clothing	Input dealers	available Always available ‘	Depend on need	-

Four (4) input dealers were identified in Binaba. One of them, Madam Victoria Asaaro who was present at the meeting and was interviewed. Madam Victoria Asaaro who is 40 years old and has been in the input sales business for the past 4 years (Table 4). She sells fertilizers, seeds, pesticides, sprayers and protective clothing. She received training from MoFA on safe input handling and business management. Her constraints are that she has limited storage space for the fertilizer.

Table 5. Inputs market matrix at Binaba in Bawku West district

Inputs	**Source**	**Quantity**	**Buying price**	**Selling price**	**Handling cost**
Seeds	Bolgatanga and Zebilla	As demanded	Maize- GH₵1.30- GH₵1.50per kilo	GH₵1.50- GH₵1.70/ kilo	80p – Gh₵1.00 /bag
Fertilizers	Bolgatanga and Zebilla	Amount allocated and funds available	Compound- GH₵28.00 Sulfan or sulphate- ₵23.00	NPK - GH₵30.00 GH₵25.00	“ “
Pesticides	Bolgatanga and Zebilla	Based on funds and demand	Gh₵55-78/lit	Gh₵57-80/lit	50p/box
Livestock species	Togo and Burkina Faso	Not in that business	-	-	-
Feeds	Not available	-	-	-	-

According to Madam Victoria Asaaro, the quantities of fertilizer allocated to her was insufficient (600 bags /dealer each time). She had 5,000 bags for the whole season last year. This allocation was from Government’s fertilizer subsidy programme. The fertilizer prices quoted are also the subsidized prices. The unsubsidized prices bought for the dry season gardens were Ghc45.00/bag for both compound (NPK) and Sulphate brands of fertilizers. She admitted that has limited knowledge on safe and efficient use of pesticides and record keeping and that she needs training on these issues.

Community Institutions: Linkages, Purpose and Strength

Existing community groups and links to livelihood support services

Several **CBOs** exist in each community in the region (Table 6). The groups and farmers in the communities are linked to government agencies such as MoFA, GES, GHS, CSIR-SARI and Irrigation Company of Upper Region (ICOUR). Nongovernmental organization like the WVI is also linked to the CBOs in Baare. The Forestry Commission, ONCHO Transport Border and Bongo Rural Bank are patronized by farmers at Soe Yindogo in Talensi/Nabdam district. In Bawku West district, the most visible NGOs that provide services to farmers include Toende

Rural Bank, ADDRO (Anglican Diocesan Development Relief Organization), Community Development Initiative (CODI), Irrigation Development Authority (IDA), WEINCO Company and ActionAid, among other agencies.

It seems each community has received assistance from an NGO either in the past or currently, albeit different intervention programmes. Women seem not to know the names of agencies which are or have worked with them, and often associated those organizations with kind of support or name of project staff. Few of these were ActionAid, WVI, BEWDA, IFAD, ZOVFA, etc, though presently weak linkages appear to exist between the partners. Programmes of these development agencies appear uncoordinated, thus efforts to integrate these interventions will be beneficial to the target rural households in the current project.

Table 6. Names of Community Based Organizations identified in Upper East Region

District	**Community**	**Name of Community Based Organizations (CBO)**
Talensi/Nabdam	Sakote	1.Kuntabga group 2. Daasan group 3. Naboukin 4. Widows and orphans 5. Tankpa 6. Kugri group
	Winkogo	1.Asongtaba farmers 2.Asakibotaba 3. Maasam Lazime 4.Moaretime farmers
	Balungu	1.Apamyine group 2. MoFA group 3.
	Baare	1.Disdem farmers 2.Sakparadiemar 3.Songtagtaba women 4.Tiyeltaaba women 5. Pusarzeh youth
	Sheaga	1.Sag kop farmers 2.Nongtaba farmers 3.Songtaba farmers 4.Mataba farmers
Bongo	Gworie	1.Asarikua farmers 2.Akokare farmers 3.Adolipore 4. Gworie IPM 5.Akapikre
	Beo M.	1.Azontaba men 2. Noyine group 3. Anartaaba group
	Soe Yindogo	1.Asungtaaba women 2.Alagtaaba men 3. Asena women group
	Namoo Abas.	1.Abaskoma women group 2.Abaskoma men group
	Dua	1.Akafabil men 2.Alaktum group

		3.Kumsaga group 4.Alaskoma group 5. Asomtaba group 6.Dua women group
Bawku West	Binaba	1.Kopela women dev. Assoc. 2.Amaltaba women 3.Asongtaba men 4.Annanoori youth 5.Ateltaaba maize farmers 6.Alamtaba youth 7.Tes-um etc
	Tilli	Not listed
	Tanga	1.Red cross mothers 2.Mlother to mother support 3.Asung-Taba women 4.Alagsi-Taba women 5.Atolembesi women 6.Wigga women 7.Toned women
	Yarigu	1.Asongtaaba group 2.Akakom group 3.Onion farmers 4.Alaataba maize 5.Ateeltaba group
	Googo	1.Puag-Eyire 2. Tilagse-Mal 3.Abori Tuma group
Bawku Municipal	Kaade	1.Zuuri Veg. Farmers 2. Apiagsare cotton 3.Asung-Taba farmers 4. Amal-Taba farmers 5.Kaade Asongtaaba women
	Nafkolga	1.Aboritaba farmers group 2.Asungtaaba farmers assoc.
	Nayoko	1.Anongtaba 2.Abodbego 3.Sinkuwa Asongtaaba 4.Mothers club 5.Amaltaaba farmers 6.NakunNaatin farmers 7.Ayandaboo 8.Balensowa
	Binduri	Asuga farmers group
	Ninkogo	Not listed

Strengths, weaknesses and purpose of selected CBOs

Assessment of the activities of CBOs in Nayoko and Binduri in Bawku municipal showed that the CBOs can be classified as medium in strength with no bank account and external financial support (Table 6). *Anontaba*, a CBO in Nayoko was established in 2008. The purpose of the group is to support each other in farming and building activities, among others. The

group comprises of 12 members (8 males and 4 females) and meets monthly. The group registered with the Department of Cooperatives and has received trainings in maize and livestock production. The group is currently involved in maize, soybean and onion production and requires support of agro-inputs such as improved seeds and fertilizers. The major source of funding is dues from members. In Binduri, *ASUGA* another CBO was established in 1996 and support each other to access farm inputs. This unregistered group comprises 18 members (11 males and 7 females) who meet every two weeks. The group is involved in maize, millet, sorghum, onion, soybean and okra production, etc. They received trainings in compost making and use of improved seeds. The group requires support in improved crop and livestock production practices. These are few among the many CBOs that exist in the region that the project can work with, and strengthen their capacities.

Results of community analysis in Upper West Region

Biophysical Characteristics and Agro-environment

The Upper West Region is located in the extreme northwest of Ghana. The region borders Cote d'Ivoire and Burkina Faso. The landscape is gently undulating plains, 200-350 m., cut across by the Black Volta, the only perennial system, which runs north to South across the region. The floodplain soils vary from brown sandy clays to silty clay loams (FAO 1967). Apart from this, the highly weathered soils derived from granites are easily waterlogged and eroded. Geologically, these are characterized as the Upper and Lower Birrimian, the Upper with flat plains cut by granite outcrops, the Lower by outcrops of red laterite just below the subsurface (Blench, 2006b).

The vegetation is Guinea savanna, with a high density of typical tree species, while the soils are mainly sandy loam with patches of laterite in some of the communities (Annex 11). The low population densities observed across most of the communities in the region (Annex 11) have permitted a remarkable conservation of savanna vegetation, quite unlike much of the remainder of Northern Ghana. Typical anthropic species are locust (*Parkia biglobosa)*, shea tree (*Vitellaria paradoxa)*, mahogany (*Khaya senegalnesis)* and the silk-cotton (*Ceiba pentandra)*. Baobabs (*Adansonia digitata)* are very characteristic of former human settlement. Introduced trees such as, neem (*Azadirachta indica)* and mango (*Mangifera indica)*, are common in villages and increasingly common as escapes in uncultivated areas. However, much of the eastern stretches of the region are covered in dense forest (Blench, 2006b).

The climatic regime is semi-arid with average annual rainfall of about 900-1200 mm with a mean for three stations over 25 years of 989 mm. The rain falls in a seven-month season from April to October. Rainfall can be very patchily distributed and farmers must often plant seeds two or three times before the rains set in reliably. The region has extremely challenging conditions for farmers, with high temperatures, erratic rainfall and eroded soils resulting in lower crop yields. Reduction or elimination of fallows and an absence of strategies for returning adequate resources to the soil, combined with labour migration that makes typical soil and water conservation strategies difficult to carry out are likely to be the true causes (Blench, 2006b).

The major ethnic groups in the region include Dagaaba, Waala, Lobbi and Chakali (Annex 11). There is no *lingua franca* that serves as an effective medium of intercommunication although a type of Hausa is often used as a market speech in large towns (Blench, 2006b) similar to the situation also observed in Upper East region. This diversity presumably reflects the acephalous social structure characteristic of many peoples of the region. A major change that has taken place since the year 2000 is the movement of large herds of Fulani cattle into the region. (Blench, 2006b). Most of the communities are sparsely populated apart from Daffiama, Bulenga and Tabiesi that are slightly dense. The community leader is the chief who is assisted by the Tindaana.

The farming system in the region is based around sorghum, cucurbits and pulses which would normally be encountered in lower rainfall zones elsewhere (Coull, 1929). Cultivar diversity is low, probably a response to poor soil fertility (Blench, 2006b). The traditional

basis of the cropping system throughout the region was pearl millet as reported by Appa Rao *et al*. 1985. The reports further indicate that there are two groups of millet cultivars, a short-season millet harvested in July and a long-season millet, harvested in November or December. The early millet is interplanted either with late millet or sorghum in fields close to the compound where fertility is highest. The further fields are planted with sorghum intercropped with pulses, especially cowpeas and groundnuts (Blench, 2006b). Residual moisture crops grown in this area include bambara groundnut, kersting's groundnut and the Frafra potato. Maize underwent a burst of popularity during the period when fertilizers were available at subsidized rates and then fell in popularity. More recently it has begun to recover and recent statistics show high planting rates. This is a reflection of an expanding urban market in south-central Ghana and the downwards drift of the cedi, making local staples cheaper (Blench 2006b). Maize produced for cash is very common along the northern edge of Upper West Region, although farmers are at the mercy of unstable government import policies. Rice (*Oryza sativa*) is planted in swampy lowlands.

The other major staple and cash-crop is yam. In contrast to UER, yams are widely grown almost throughout the region, except in Lawra where pressure on soil fertility has reduced them to a very minor role (Blench, 2006b). Yams tend to be a male crop, as the labour requirements are very demanding. Yams have the effect of inducing young men to remain in the village, as producing yam is more profitable than going on labour migration and moreover, occupies the farmer throughout the dry season. However, the lack of a role for women has had the paradoxical result that they are now going preferentially on migration. Dry-season cultivation using small irrigation dams comprises mainly vegetables, most commonly onions and tomatoes. Onion cultivation is particularly popular and represents one of the most important agricultural exports from the region (Blench 2006b).

Existing Farming System and Problem Analysis

Analysis of on-farm livelihood activities in the Upper West Region

The major cereal crops grown in Nadowli and Wa East districts of the Upper West region are sorghum, maize, millet and rice, while the major legumes are cowpea, groundnut, bambara groundnut and soybean (Annexes 12a and 12b). Kersting groundnut, a minor crop is also grown in Tabiase in Nadowli district. It is assumed that all groups in the communities are involved in the production of the major crops, albeit at different levels. However, women are not involved in sorghum, millet and soybean production in Goriyiri in Nadowli district. Men are involved in the production of all crops and especially sorghum, maize and millet among the cereals and cowpea, groundnut and bambara groundnut among the legumes. The cereals are mainly produced for food, while most of the legumes are produced for cash. Rice and maize are also produced for cash, while kersting's groundnut, cowpea and groundnut are also used more for food than the other legumes. About 40 – 99% of the cereals produced are used for food, with millet and sorghum being the major food crops. About 10-50% of legumes produced are used for food across the communities. However, the greater proportion of legumes produced are cash crops, with soybean being the major cash crop with 90-98% used for cash. The proportion of legumes used for food in Daffiama is greater than those used in the other communities in the region.

The trends in the production of the major crops were almost similar across the region. There is increase in production of maize across the 20 project communities in the region. The reason given for the increase is the exposure of the respondents to maize improved management practices such as use of seed of improved varieties and the good response of

the crop to fertilizers and hence higher yields are realized than sorghum or millet. Rice production is also increasing in Goriyiri and Kalsegra in Nadowli district and in Kpalinye and Naaha in Wa East district due to the use of improved management practices. The production of sorghum and millet is decreasing across all communities due to erratic rains, low soil fertility, poor management practices and *Striga* infestation. Cowpea production is increasing across the region except at Zinnye where cost of insecticides is discouraging production. The increase in trend across the nine communities is due to use of improved management practices such as improved varieties and adoption of appropriate spraying regimes. The trend in production of the other legumes is increasing in some communities due to availability of improved management practices and tolerance to drought, while the reverse is the case in other communities where erratic rains and poor soil fertility reduce production. The trend in the production of most crops in Tabiase and Zinnye are decreasing, while the trend in most crops produced in Kpalinye and most legumes produced in Kalsegra and Bulenga are increasing due to low cost of production, high market value and ready income realized from the sale of the legumes. There is the need to consolidate the gains made in the use of improved management practices to improve crop production especially in Nadowli district where use of improved management practices is lagging behind.

The major livestock species produced across the 20 communities in the Upper West Region are goat, sheep, cattle, pigs and poultry (Annex 13). The most common livestock species raised across the communities are goat, poultry and sheep. Rabbit and donkey are minor livestock species as these are restricted to Tabiase, Daffiama and Goriyiri in Nadowli district. Women are generally not involved in livestock production in Goriyiri, while a few keep poultry, pigs and goat in Kpalinye in Wa East district. The trend of gender participation in livestock production in the other communities was not captured during the study. Rabbit and poultry are mainly raised for food as 50 – 99% of this category of animals is mainly used for food. Goat, sheep, cattle and pigs are the major sources of cash as 50-99% of these animals are sold for cash, while donkeys serves as means of traction and also provide cash.

The trend in livestock production is generally decreasing in Nadowli district. However, the trend is increasing for cattle and rabbit in Tabiase and for donkey in Goriyiri due to proper care (Annex 13). The trend is increasing for cattle due to proper care by the Fulani and for poultry due to its use for spiritual activities in Kpalinye in Wa East district. The trend is increasing for all the livestock species except pigs in Loggu due to improved veterinary services, availability of pasture and good market price that promote production. The general decreases in trend across the majority of communities are due to increase in prevalence of diseases and mortality, high incidence of theft and poor management. Thus, Loggu is a good example of community whose experiences can be replicated especially in Nadowli district to promote livestock production. Promotion of community livestock workers and enforcement of security measures and community awareness of punishments for theft may reduce the incidence and improve production.

Analysis of off-farm livelihood activities in the Upper East Region

Processing of cereals and legumes is a major activity in Tabiase where more people are involved than in the other communities in Nadowli district (Annexes 14a and 14b). Fewer people are involved in processing in Daffiama and Kalsegra in Nadowli district; Zinnye and Loggu in Wa East district. Less people are involved in the processing of millet, rice; groundnut, bambara groundnut and soybean compared to other crops across the communities. All crops produced are processed by threshing, winnowing and cleaning. The produce is sold whole grain or grind into flour or paste for food for domestic consumption or sale in the market. Sorghum is also processed into malt or pito, a type of local alcoholic

drink. Many recipes are derived from cowpea and few from soybean. Groundnut is processed into paste and oil. However, knowledge of processing soybean is limited and *dawadawa* is the only recipe derived from soybean at present. There is a need to conduct trainings on soybean processing especially among women across all the communities in the project area. The trend in processing of the major crops is increasing either due to increase in domestic consumption or increase in demand as the sale of the produce generates income. Processing of the cereal crops is increasing mainly due to increase in domestic consumption of the products. However, the need for more income was also indicated as another reason for the increase. Processing and marketing of the legumes are on the increase mainly to generate income to meet domestic financial obligations (Annexes 14a and 14b). High market price and demand of the products are the major incentives for the increase in processing and marketing of farm produce. Low yields, low production level and lack of knowledge of processing are some of the major factors limiting processing and marketing of agricultural produce in the region.

Processing of livestock products is limited to an average of 30-40% of the households per community (Annex 15). More households are involved in livestock processing and marketing in Tabiase than the other communities. Goat, poultry, pig and sheep are the most common livestock species processed mainly for domestic consumption, while these categories of animals in addition to cattle are also processed for cash. The trend in processing of livestock in Tabiase in Nadowli district and Kpalinye and Loggu in Wa East district is on the increase due to increase in domestic consumption. However, the trend is decreasing in other communities due to theft and increase in animal mortality as a result of diseases which reduce the number of animals for processing. More households are involved in the marketing of livestock products in Tabiase, Goriyiri and Kpalinye than other communities. The trend in marketing of livestock products is increasing in Tabiase, Goriyiri, Ombo, Kpalinye, Naaha and Loggu due to increase in demand for the product and need for more cash by households. The trend is on the decrease in the other communities due to low production and theft. It is apparent that more households are involved in the sale of whole crop or livestock produce than processing, indicating that there is opportunity for value addition for both crops and livestock to improve income and livelihoods at the community level.

Crop and livestock census and prioritization in Upper West Region

The ranking of the crops revealed that maize was ranked first for both food and cash across the region (Annex 16a and 16b). Sorghum was ranked second, followed by rice and millet was ranked fourth in importance for food and cash. Cowpea was ranked first followed by groundnut in Nadowli district, while groundnut was ranked first followed by Soybean and cowpea in Wa East district. Thus the popularity of the legumes in Nadowli district was in the order: cowpea > groundnut > bambara groundnut >soybean > kersting's groundnut. The ranking in Wa East district was in the order: groundnut > cowpea = soybean > bambara groundnut. Thus the most important food and cash crops in the region are maize, sorghum, cowpea, groundnut and soybean.

Poultry, cattle and pigs are the most important animals for food and cash depending on the community in Nadowli district (Annex 16a). Cattle are the most important in Tabiase, Ombo and Kalsegra where goats and sheep are second and third, respectively. In Daffiama, pigs are the most popular animal species, while poultry is second and goat is third in ranking. The situation in Wa East district showed that sheep is the most popular food animal, while cattle was ranked first for cash in Kpalinye, Naaha and Zinnye (Annex 16b). Goat and poultry were next in ranking for both food and cash across the three communities. However, goat was

ranked first, and sheep and poultry ranked second and third, respectively, for both food and cash in Loggu and Bulenga. Although all livestock species are used for food and cash, cattle is the most important livestock species for income generation, while poultry, sheep and goats are the most important food animals in the region. Other livestock species of less economic importance identified in the region include rabbits and donkey. Rabbits are kept by few households and attract low patronage in the market. Donkeys and also cattle are used for animal traction and transport.

Problem census, prioritization and coping strategies

The most recurring crop production problems mentioned across majority of the communities in the region were erratic rainfall, inadequate land preparation equipment, and lack of improved seeds, declining soil fertility, *Striga* infestation, pests, diseases and weeds (Annex 17). Farmers plant early maturing varieties or plant early to cope with the erratic rainfall in the region. These practices result in greater crop yield, though costly and labour intensive. It seems 50-100% of the respondents has been using these practices. The trends in use of the strategies are increasing due to increase awareness. The main coping strategy for lack of land preparation equipment like tractors is the use of animal traction. The practice enables timely and better land preparation, although it is costly and is sometimes not available. About 70% of the respondents adopt animal traction for land preparation. However, the practice is declining due to unavailability of herders and the fact that children who are supposed to assist are now in school.

The use of local varieties in the absence of improved crop varieties is cheap and timely, but results in late maturity and low yields. Almost all the respondents use local varieties, but the trend is decreasing due to the recent emergence of improved varieties in the region. Application of chemical fertilizers is the main coping strategy for declining soil fertility, but the trend is reducing due to unavailability and high cost of the fertilizers. Insecticide spray is used to control insect pests of cowpea, herbicides are applied to control weeds and the Purdue Improved Cowpea Storage (PICS) bags are used for cowpea storage. Although pesticides are effective and result in higher yields, the practice is unsafe to humans and the environment, unless safety precautions are followed. The trend in the use of these practices is increasing because they are effective and improve product quality and reduce drudgery.

Lack of machinery, skills and storage facilities were the major crop processing problems mentioned (Annex 17). Lack of organized market, low produce price and inadequate means of transportation were the major marketing problems mentioned. No coping strategies were proffered for these problems which are very crucial to value addition and livelihood improvement in the region. The major livestock production problems mentioned at Daffiama were high mortality due to diseases, lack of improved breeds, high incidence of theft, inadequate watering points, inadequate housing and inadequate veterinary services. These problems could as well be replicated across all the communities in the region because there is little variation in the farming system within the region.

The situation in Wa East district is almost similar to Nadowli as most of the constraints limiting crop and livestock production and the coping strategies adopted in the two districts are similar (Annex 17). Farmers in the region adopt farmer to farmer information sharing on integrated *Striga* control strategies to reduce *Striga* infestation. However, this strategy is not effective. The sources of these coping strategies adopted in the region are mainly from MoFA, GCC Ltd., and the farmers themselves. The integration of use of rotation, farm yard manure, fallowing, hand pulling, field sanitation and resistant varieties will prove effective for *Striga* control.

Vulnerability to shock or stress and coping strategies

Drought and low product prices, each with very high relative importance (10) were mentioned as the major types of shock. The respondents mentioned that bush burning and deforestation are the major causes of drought which occur annually. The coping strategies are prayers and use of early maturing varieties. Low product prices also occur annually and are caused by lack of access to market and the presence of few buyers in the communities. The produce has to been taken to distant markets at high cost and sold at low price. Thus poor market infrastructure of roads and transportation could be the major cause of inadequate access to markets.

Resource Analysis and Opportunities in Upper East Region

The resource map of Tabiase in Nadowli district shows the presence of mango and cashew plantations, flooded area, Fulani settlement, grazing area, borehole and dug out (Fig. 18). There are opportunities for irrigation farming, crop-livestock interaction and fish production in the community. The integration of these activities will reduce pressure on farmland and improve the declining soil fertility reported in the community. Vegetables and more tree species could be added to the crops grown to improve land use and livelihoods.

Daffiama is a large community and serves as market center to the neighbouring communities in the region. However, the community is medium resourced with pond, borehole, credit center and dam among others. The community can expand the market opportunities and improve livestock production in view of the prevailing opportunities.

Figure 18. Resource map of Tabiase, well resourced community in Nadowli district

Figure 19. Resource map of Daffiama, medium resourced community in Nadowli district

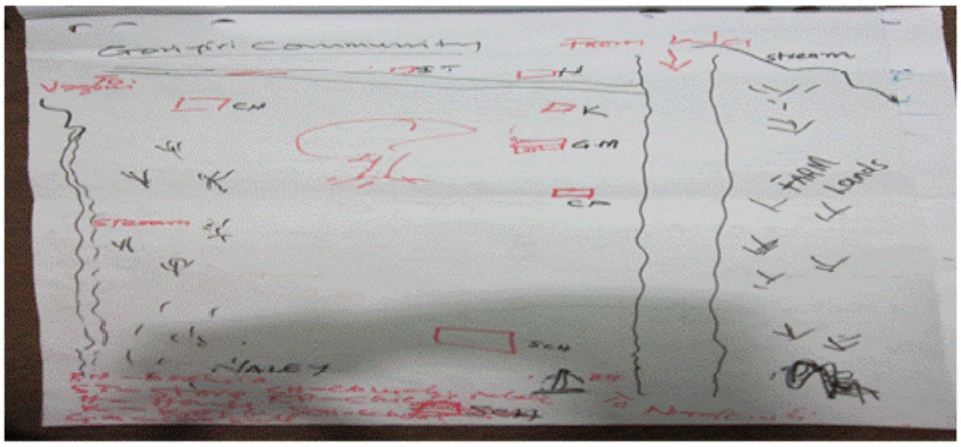
Figure 20. Resource map of Goriyiri, low resource community in Nadowli district

The three communities of Goriyiri, Ombo and Kalsegra are low resourced with presence of farm lands and in land valley in Goriyiri (Fig. 20) and Ombo There is an opportunity for community fish or rice production or both in each of the two communities. Vegetables could also be added to the crop inventory by use of irrigation through under ground water abstraction of wash bore holes and tubewells. There is presently less pressure on land dure to low population and scattered settlement parterns. Land use planning should be articulated to reduce overcultivation of farm lands that may pose more problem to the declining soil fertility, with increase in population.

The situation in Wa East district shows that the two communities of Naaha and Kpalinye (Fig. 21) are low resourced as there is no indication of resource elements apart from land. These are sparsely populated communities with low resource endowments, unlike Zinnye, although also sparsely populated has several grinding mills and can serve as processing center in the district.

Zinnye is a medium resourced community with several grinding mills, low lying land, kraal land and stream (Fig. 22). There are opportunities for crop-livestock interation, irrigated farming and fish and vegetable production in the community. Harnessment of these resource endowments will improve the inventory of crop and livestock enterprises and value addition for improving livelihoods in the region. Also medium resourced is Bulenga with bore

hole, community market and network of roads that provide access within and to other neigbouring communities, thus serving as market infrastructure and access to the community market.

Loggu community is relatively more resourced than the other communities sampled in the district (Fig. 23). The major resource elements in the community include stream, market, orchards, wells, forest plantation, dug outs, kraal, and farm lands among others. There are opportunities for crop-livestock interaction, irrigation, fish production and marketing of farm produce. Loggu is fairly large and is only second to Bulenga in population with clustered stellement. There is need for improved land use planning to harness bioresource flow between crops and livestock to improve both environmental and agricultiral sustainability in view of the high population in the community.

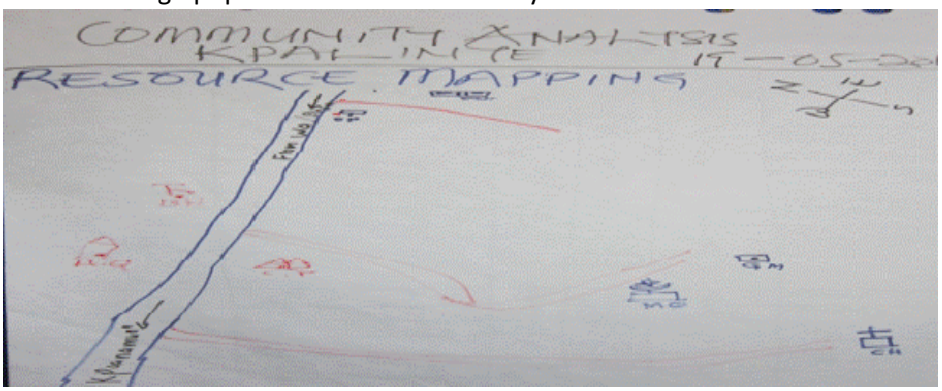

Figure 21. Resource map of Kpalinye, a low resouce community in Wa East district

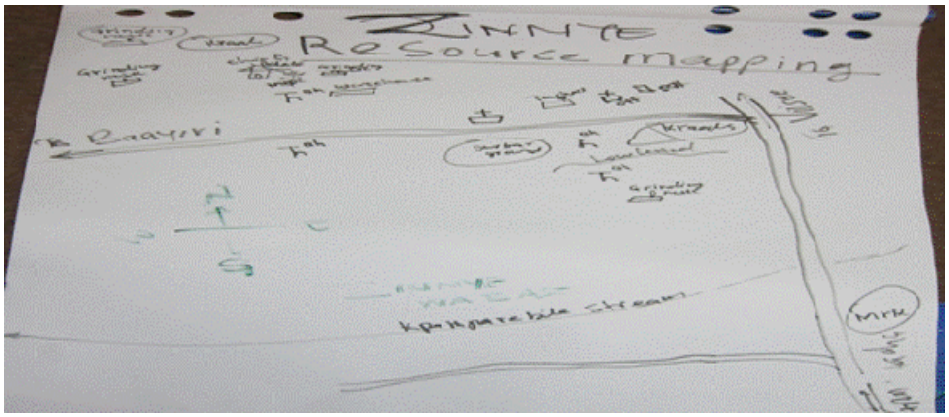

Figure 22. Resource map of Zinnyea, medium resourced and processing center in Wa East

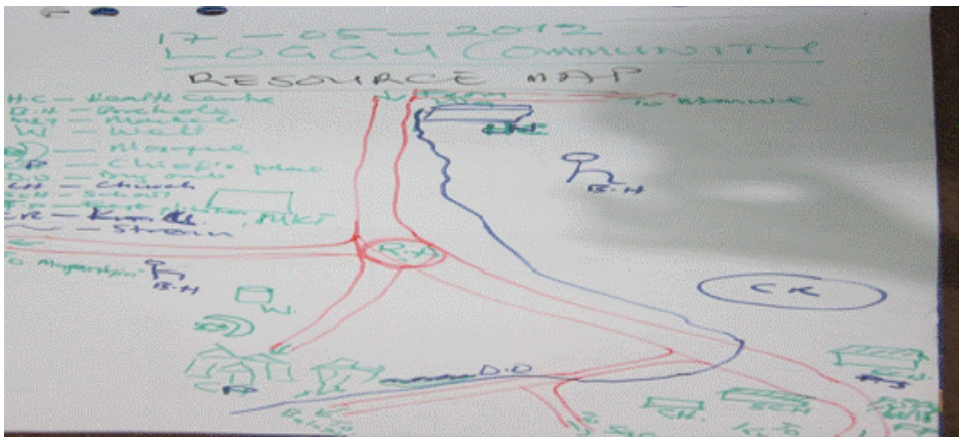

Figure 23. Resource map of Loggu, well resourced and market center in Wa East district

Market Network and Market Channels

Agricultural commodities such as maize, sorghum, yam, cowpea, oil, and tomato are taken from Tabiase to neighbouring markets in Kojokperi, Wa and Busie. The farmers buy soap, fish, and soup ingredients from these markets (Fig. 24). Farmers and middlemen from Goriyiri sell poultry and cattle; and rice, millet and cowpea in Tangasia, Nadowli and Wa markets, and buy building materials and soup ingredients on return. The farmers in Ombo patronize Jang, Sankana, Kaleo and Wa markets. They sell cereals, legumes and livestock products; yams, charcoal, goats and grains; and buy fertilizers, cement, roofing sheets and soup ingredients from the markets.

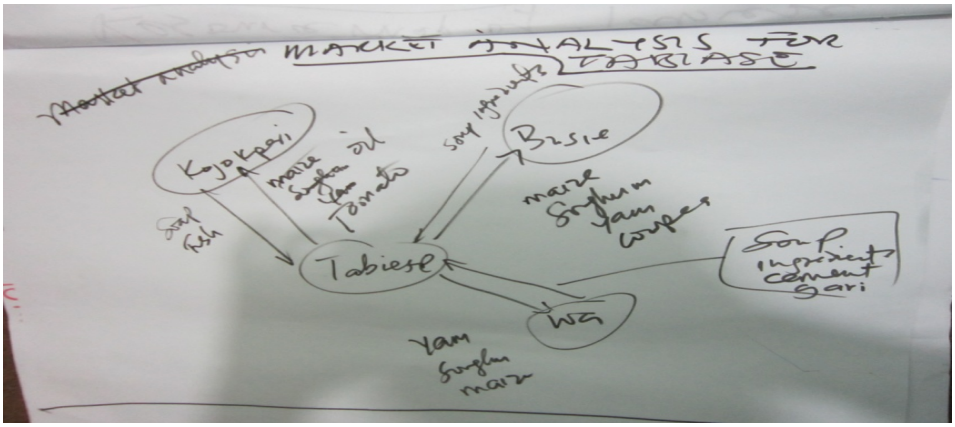

Figure 24. Market network in Tabiase in Nadowli district

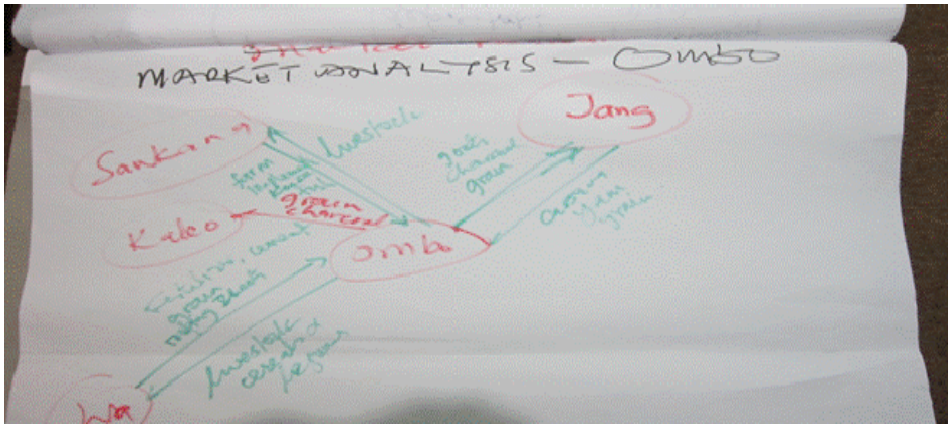

Figure 25, Market network in Ombo in Nadowli district


Figure 26. Market network in Daffiama in Nadowli district

Daffiama is a large market center in Nadowli district. Farmers and middlemen move crop and livestock products in and out of Daffiama as they also patronise the community markets in Wa, Busie, Tangesia, Nadowli and Sakana among others (Fig. 26). Both farm and industrial produce are interchanged among these community markets.

The market network in Wa East district is also characterised by movement of farm produce between Kpalinye and Kpaglahe and Wa. Food stuff, charcoal, poultry and shea nuts are moved out of Kpalinye to the other markets, while farm implements, cement, clothing, soup ingredients and etc are bought from these markets and moved to Kpalinye (Fig. 27). Similar market network exist between Naaha with Jang, Techiman, Wa and Baayika (Fig. 28).

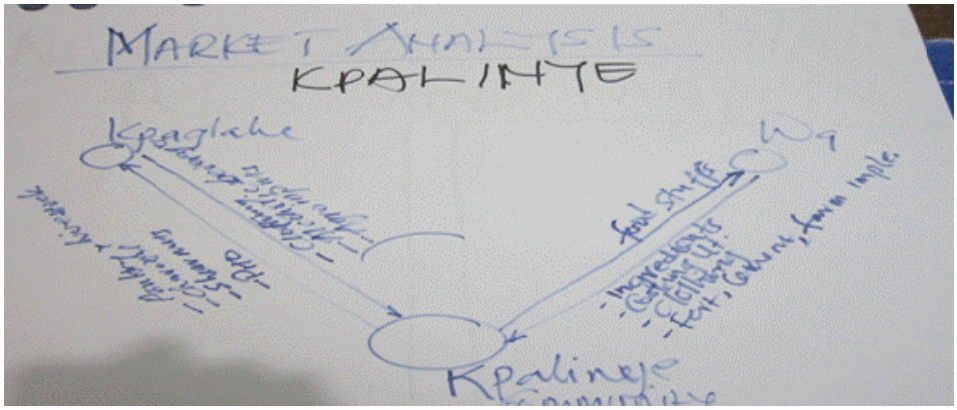

Figure 27. Market network in Kpalinye in Wa East district

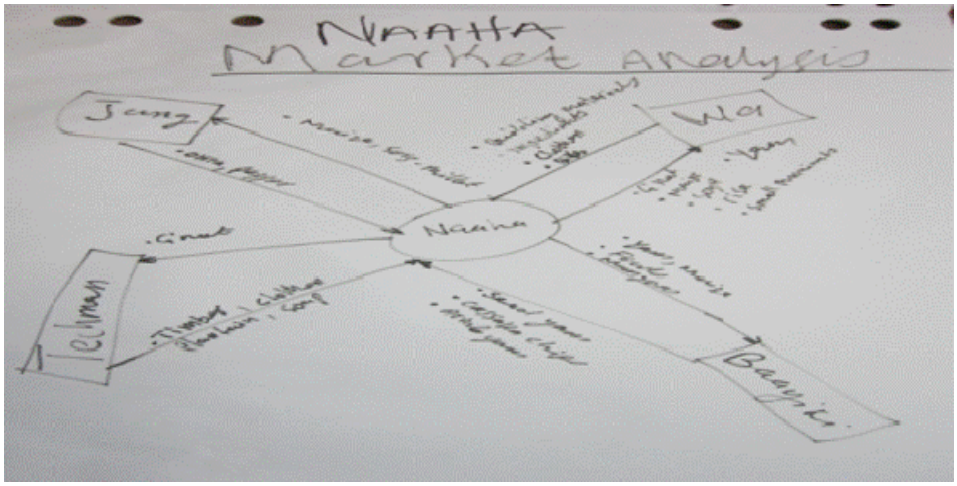

Figure 28. Market network in Naaha community in Wa East district

Loggu has a more elaborate market network with Wa, Panyen Tanga, Kulkapang, Chaase and Kendigi (Fig. 29). Apart from farm produce and soup ingredients, other commodities of exchange include second hand clothings, manufactured goods and building materials.

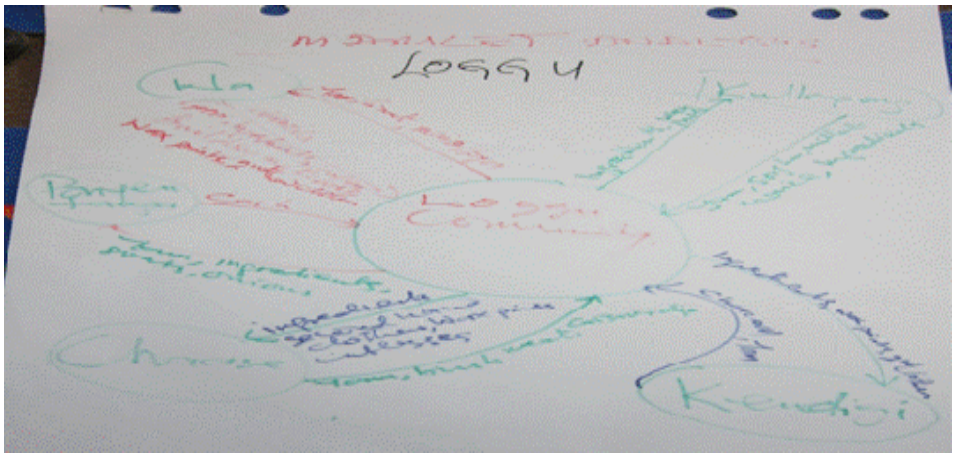

Figure 29. Market network in Loggu in Wa East district

Community Institutions: Linkages, Purpose and Strength

Existing community groups and links to livelihood support services

The summary of CBOs identified in Nadowli and Wa East districts in Upper East Region are presented in Table 7. Three CBOs currently exist in Tabiase in Nadowli district and are working with MoFA. Several NGOs such as WVI and JICA have some links and provide support to some groups in the community (Fig. 30). Although no CBOs were identified in Goriyiri, the presence of MoFA, GHS, CSIR-SARI and GES were acknowledged. Some donor funded projects such as WAAPP and N2 Africa as well as NGOs such as PRONET North, ADRA, and GWI had some links with the farmers in the community. At Ombo, two CBOs were identified along with several NGOs including CARE and MAP in addition to government institutions. About 5 CBOs were identified along with government and NGOs in Daffiama. The NGOs include WVI, OLAM, CARE, CRS and ADRA (Fig. 31). In Kalsegra, the main NGOs present were ADRO, ADRA, WVI, and ZOOMUON that are probably linked to the 3 CBOs identified. Activities of government agencies such as CSIR-SARI, MoFA, GES and GHS were also reported to be linked to the CBOs in each community.

Table 7: Names of Community Based Organizations identified in Upper West Region

District	Community	Name of Community Based Organizations (CBO)
Nadowli	Tabiase	1.Sungwuli group 2.Sungmenga farmers group. 3 Sungbala group
	Goriyiri	Not listed
	Ombo	1.Langbari farmers group 2.Sungwuli farmers group
	Daffiama	1.Suntaaa Nuntaa 1&2 2.Kamyin 1&2 3.Trekando 4.Mambo 5.Sunado
	Kalsegra	1.Mother to mother 2.Tietaa 3. Kimtialo.

Wa East	Kpalinye	1.Mwin Sumbo, 2. Samgbawietaa, 3. Sumgtaa
	Naaha	1.Sungrala 2. Sunlaa Wamlaa 3. Kwinilaa Sumbu 4.CHLPS 5.Swazal-lakpoliye
	Zinnye	1.Zinnye Posee 2.Zinya Saazu 3.Sungbaala Women group
	Loggu	1.Kanyili Sunla Women 2.Summanhi Men 3.Ajan Suma 4.Outgrowers Wuchanya farmers
	Bulenga	1.Malitar group 2.Sun Suna group 3.Dry season farmers 4.Numbu farmers 5.Tibaraka group 6.Sunsalle group

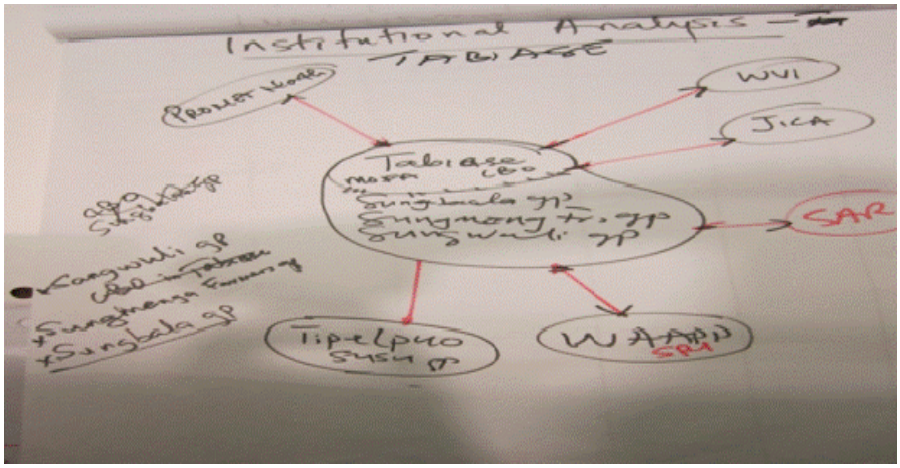

Figure 30. Venn diagram of CBO in Tabiase in Nadowli district

Figure 31. Venn diagram of CBO in Daffiama in Nadowli district

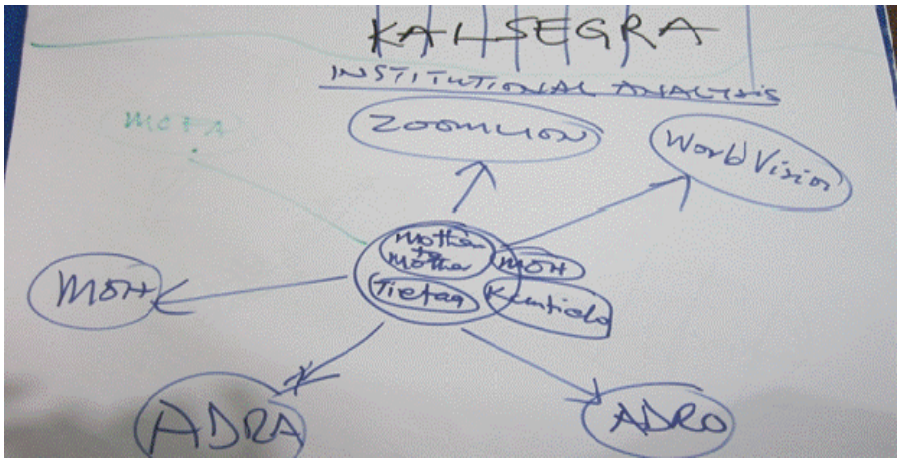

Figure 32. Venn diagram of CBO in Kalsegra in Nadowli district

The propenderance of the CBOs and NGOs in Wa East also showed that in Kpalinye, 3 CBOs were identified along with RAAP, FSC, ADRA and the traditional government institutions. Also 5 CBOs were identified in Naaha that may have links with PLAN GH, ADRA, OLAM, FSC and WFP (Fig. 33). In Zinnye, 3 CBOs were identified and the main NGOs present include SILDEP, Masara Na'arziki and OLAM along with government institutions (Fig. 34). There were 5 CBOs identified in Loggu and the following NGOs: Africa 2000 Network, Cotton Company, RAAF, ACDEP and ADVANCE (Fig. 35). The situation in Bulenga showed 5 CBOs (Table 7) and several NGOs including TUDRIDEP, YARO, ADVANCE, Masara Na Arziki, OLAM, PDL, ADRO and the government institutions (Fig. 36). It is apparent that there are more NGOs in the Upper West region than the other two regions. This could be a recent happening as Blench (2006b) reported very few NGOs in the region and rated the region as having the least number of NGOs in the recent past. However, the purpose and strengths of the CBOs identified cannot be ascertained as SWOT analysis was not conducted for any one of them as at the time of the study.

Figure 33. Venn diagram of CBO in Naaha in Wa East district

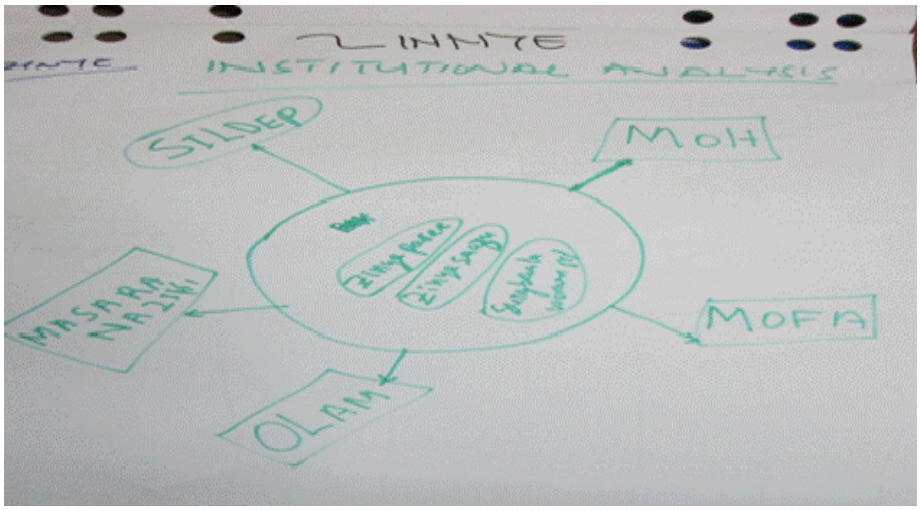

Figure 34. Venn diagram of CBO in Zinnye in Wa East district

Figure 35. Venn diagram of CBO in Loggu in Wa East district

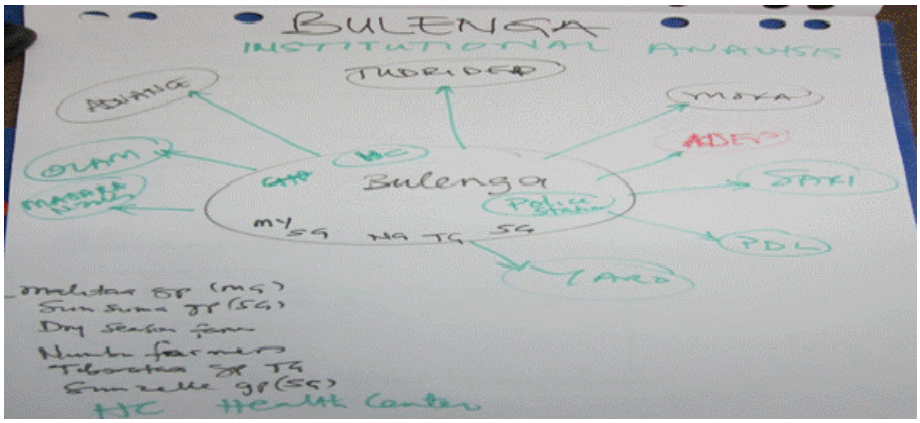

Figure 36: Venn diagram of CBO in Bulenga in Wa East district

General discussion

Biophysical Characteristics and Agroenvironment

The climate of the three regions that constitute the project area is relatively dry, with a single rainy season that begins in April and ends in October. The amount of rainfall recorded annually varies between 900 mm and 1200 mm thus indicating a semi-arid climatic regime. The vegetation is characteristically northern guinea in northern region and sudano-sahel in the extreme Upper East region. The soils are typically sandy loam with some gravel across some areas. There are several ethnic groups but there is no *lingua franca* that serves as an effective medium of intercommunication. However, Hausa and Waali readily come to the rescue in the Upper East and Upper West regions, respectively while Dagbanli and Hausa provide similar media for intercommunication in the northern region. This diversity presumably reflects the acephalous social structure characteristic of many peoples of the three regions (Blench, 2006b).

The low population pressure and under cultivation of land in Upper West and Northern regions is an advantage towards sustainable land management provided such practices are initiated early. The semi-arid climatic condition and fragile soils that has hitherto been supporting millet – based farming system will need consistent amelioration to support the emerging maize-based system. One of the characteristics of semi-arid climate or the savanna is the unpredictability of onset and establishment of rainfall. This is further confirmed by the fact that erratic rains have often been mentioned by farmers as a priority problem among the arrays of problems identified in the project area. The project activities should therefore focus on interventions that will improve the soil conditions and increase moisture availability during greater part of the rainy season.

Existing Farming System, Problem Analysis and Coping Strategies

Pearl millet and sorghum constituted the major crops grown in the Upper East and Upper West region in the recent past as reported by Blench (2006a and 2006b) and SRID (2010). However, maize is replacing sorghum and pearl millet in the project area as observed from the trends during the community analyses. The promotion of improved crop management practices such as use of fertilizers and improved varieties; and increased income from maize are the major catalysts for increase in maize production. Farmers realize higher yields and income from maize than from sorghum or millet. However, millet and sorghum are considered as veritable means of food security because they can thrive in poor soils and under low moisture regimes. The gradual shift towards maize will therefore change the farming system and the dimension of food security in the regions. Therefore, the best alternative to improve food security is to promote the production of extra-early and early maturing maize varieties along with legumes. The trend in the production of legumes such as groundnut, cowpea and soybean is on the increase and this provide immediate succor for cereal-legume integration to improve crop productivity and diversity.

The production of preferred livestock species such as poultry, sheep, goats, pigs and cattle is also on the increase as these provide both food and cash. Another dimension to improving the farming system is the promotion of crop-livestock interaction with a view towards flow of manure from livestock to crop farms and crop residue from crop farms to serve as livestock feeds. The use of cattle and donkey for animal traction should be encouraged and

improved upon to solve the main problem of lack of land preparation equipment in the project area, another dimension to bio-resource flow in an integrated production system. The system integration of crops and livestock production could be *in-situ* or *ex-situ*. *In-situ* integration is where the same farmer produces both crops and livestock and ensures the flow or resources between the enterprises; while *ex-situ* is where crops and livestock are produced by different farmers, but production resources are exchanged among their individual enterprises. The lease of land by crop farmers to serve as kraal to Fulani herders immediately after harvest is a good example of *ex-situ* integration. The practice provides immediate feed to Fulani cattle, while soil fertility is increased and *Striga* infestation is reduced by the animal droppings.

Diverse crop and livestock production problems, which can mainly be categorised into biophysical and socieconomic have been limiting the productivity of the farming system. Crop production constraints include erratic rainfall, lack of land preparation equipment, *Striga* infestation, declining soil fertility and lack of improved seeds. Livestock production constrainst include prevalence of diseases, lack of adequate feeds and housing, prevalence of endo- and ecto-parasites and inadequate veterinary services. These constraints should be incorporated into the community action plan developed together with the farmers yearly to generate solutions. Farmers have also proffered some coping strategies which should be evaluted along with other improved practices in on-farm demonstrations to generate sustainable solutions. Apart from domestic consumption, there is less contribution of value addition to livelihoods, as the current skills in processing and marketing are essentially traditional and subsistent. There is lack of machinery and skills for processing most crops, especially soybean.

Resource Analysis and Opportunities

There is clear indication that competition for use of natural resources is on the increase as shown by increase in incidences of shocks such as floods, drought, bush burning and activities of the small miners that destroy the top soils and charcoal gathers that increase the rate of deforestation. The persistent decline in soil fertility and increase in *Striga* infestation across all regions is an indication of increase in continuous cultivation, probably as a result of increase in population or shortage of community land. The fact that shortage of grazing land was mentioned as major reason for the decline in production of cattle and donkeys is a clear indication of land shortage. The farmers crave for fertilizers is also a clear indication that most of the cultivated soils in the project area have been depleted of their natural fertility. A casual observation across the regions however indicate that there is large expanse of land especially in the northern and Upper West regions which are still laying fallow with high level of natural fertility. Blench (2006b) has aptly described this zone as being under populated and under cultivated. This expanse of land will be readily available for food production as competition for community lands become more acute and crop yields continue to decline in the areas that are presently habited, which are becoming progressively marginal.

Similarly, some communities have resource endowments which have not been fully exploited. These include low lying lands or inland valleys that can be utilized for rice production and irrigation farming; burrow pits or dug outs for fish production and animal watering points, and inaccessible land and kraal land that can be handy for land rotation and crop livestock interaction among other resources. Presently, the vegetation in the Northern and Upper West regions is experiencing intensive exploitation from the charcoal gathers and this may pose a big threat to environmental sustainability.

The issue of increase in land degradation is more acute in the Upper East region where the population is relatively high and the vegetation and soils have been depleted by frequent bush burning and continuous cultivation. Thus land management practices will be essential for sustaining agricultural productivity in the fragile ecosystem in the Upper East region and the human endangered ecology in the Upper West and Northern regions. This is because environmental sustainability is more crucial for the success of sustainable agriculture which focus on system integration; species diversity, ecological friendliness, equity, humaneness, adaptation; economic viability and social justice among the members of the ecosystem. The main goals of sustainable agriculture are conservation of natural resources and satisfaction of human needs through poverty alleviation and increase in food security at household levels, as articulated by the project objectives.

Market Network and Channels

Organized markets are virtually non-existent across many communities. There is less incentive to produce more because of low prices attracted by the farm produce which are often taken to distant markets along poor roads that attract high transport fare. The present global focus of market-driven agriculture cannot progress profitably in the regions without processing and marketing skills and infrastructure. There is the need to link farmer groups with input and output market to improve the market channels. There is also the need to liaise with the policy makers to establish community markets and provide market infrastructures such as roads to improve access. Although improvement in crop yields and linkage to input and output markets could improve farmer income, there is the need to link farmers to credit institutions that could provide interest-free or low interest loans. This is because inadequate credit has also been ranked as a top priority constraint that prevent farmers from paying for inputs and farm operations. This major problem was especially identified among women and youths that have low economic base and therefore more vulnerable than men in the regions.

Capacity strengthening of community members in value addition through training on end use of soybean that is emerging as a cash crop across the regions will improve its utilisation, housheold nutrition and income. The lack of knowledge or skills for soybean processing and the low price it attracts presently in some communities are major limiting factors for its production. If maize will emerge as the major food and cash crop among the cereals, then soybean production should follw suit to augment soil fertility and reduce *Striga* infestation which are the major challenges that will emerge subsequently. Maize can be grown in rotation or as an intercrop with soybean to suatain land productivity. Oil processing and feed millers in larger towns of Tamale, Bolgatanga or Wa can be linked to soybean producing communities for ready market. Both middlemen and processors can provide ready market for farm produce at the community level provided the level of production is high and can suatain apprecaible level of economies of scale for the buyer.

Community Based Institutions, Linkages and Capabilities to Resolve Problems

The presence of both non governmental and government institutions in the communities is high. It has been observed that these institutions presently have or had some links with the farmer groups in most of the communities in the three regions. Although other sectors apart from agriculture are also being patronized by these institutions, farmers also had a fair share of their services. Several community based organisations were identified during the study in almost every community. The PREA approach which adopts the farmer to farmer dissemination of proven technologies has so far been initiated starting from year one (Yr 1) of the project with selection of lead farmers and community seed producers by the CBOs. These lead farmers are expected to conduct on-farm demonstrations to generate solutions to the production problems identified; while the community seed producers will produce certified seeds of improved crop varieties to mitigate the challenges of lack of improved seeds that has often been mentioned across the three regions. These crop varieties which could be multi-stress resistant (resistant to drought, *Striga*, pests and diseases) extra-early or early maturing and high yielding will be sourced from both natioanl and international research institutes for inclusion in the project programme.

Recommendations

From the forgoing results of the community analysis, the following recommendations are made to achieve the project objectives:

Crop production and soil management interventions

- Promote sustainable land management practices to reverse land degration and sustain system productivity;
- Test the farmers coping strategies along with other best practices in on-farm demonstrations to generate solutions to the problems identified;
- Promote community – based seed production schmes to make improved seeds available at the community level;
- Source improved soil management and improved crop varieties that are early or extra early maturing, *Striga and/or* drought tolerant and disease/pest resistant from research institutes and test on farm after validating on-station in mother trials;
- Link community seed producers to private seed companies to enhance availability of improved seeds across all regions of Ghana and ensure sustainability;
- Promote cereal – legume integration through intercropping and rotaion to improve system productivity;
- Promote crop-livestock interaction for system integration and bioresouce flow;
- Conduct trainings on improved crop management practices, pesticide use and *Striga* control for participating farmers at community level.

Livestock production interventions

- Source improved breeds of poultry, sheep and goats from research institutes for multiplication and upgrading of local breeds;
- Promote poultry, sheep and goat multiplication and share scheme especially among women and youths to improve their economic base;
- Encourage the activities of community livestock workers to supplement veterinary services at the community level;
- Conduct training on improved livestock management practices for participating farmers at community level.

Processing and Market interventions

- Conduct trainings on processing of soybean for women groups at community level;
- Link farmers groups to input-output market, especially for soybean and maize;
- Conduct trainings for farmers groups on processing and marketing skills;
- Collect and share market information, especially price, among farmer groups;

Advocacies and policy issues

- Liaise with traditional leaders and policy makers to reduce the activities of small miners, charcoal gathers and bush burners to reverse land degradation;
- Liaise with policy makers to improve market infrastructure and market days;
- Involve both government and NGOs in project implementaion and capacity building activities of the project.

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Annex 1: Biophysical characteristics of the project communities in Northern Region

District	Community	Population/ settlement	Comun. Hierarchy /ethnic groups	Agro-ecolo./ Vegetation	Soil type	No. present		
						M	F	Total
West Gonja	Busunu (38 km from Damongo District Capital (DC)	2461 (1205 M, 1256 F)/clustered	Chief, Tanaduwarea/ Gonja, Akan, Fulani, Dagarti	Northern Guinea/semi deciduous	Sandy loam	30	24	54
	Sori No.1 (14 km from DC)	290 (138 M, 152 F)/Scattered	Chief, assemblyman/ Bimoba, Gonja, Dagomba, Frafra, Mamprusi	Northern Guinea/semi-deciduous	Sandy loam	27	21	48
	Damongo Zongo (0 km)	3000 (1261 M, 1739 F) clustered	Chief, assemb/Gonja, Dagarti Dagomba, , Gousi, Sisala, Moshie, Frafra,	Northern Guinea/semi-deciduous	Sandy loam	30	35	65
	Jonokponto (22 km from DC)	520 (253 M, 267 F)/clustered	Chief, Assemblyman/ Gonja,Wala Dagomba, Dagarti,	Northern Guinea/semi-deciduous	Sandy loam	23	33	56
	Frafra No.4 (132 km from DC)	180 (88 M, 92 F) scattered	Gonja Chief, Youth Leader/Gonja	N.G./semi-deciduous	Sandy loam	16	14	30
Savelugu/ Nanton	Duko (14 km from DC)	1011 (234 M, 777 F), clustered	Chief, Walana/ Dagomba, Fulani	Northern Guinea/shrubs	Sandy gravel	70	16	86
	Libga (6 km from DC)	2000 (953 M,1047 F), clustered	Chief, Wulana /Dagomba, Ewe	Northern Guinea/shrubs	Sandy gravel	26	17	43
	Kanshegu	2231(1070M,	Chiefs, Wulana,	Northern	Sandy	54	91	145

	(1 km from DC)	1161 F)clustered	/Dagomba, Ewe, Moshe, Fulani	Guinea/shrubs	gravel			
	Jana (16 km from DC)	407 (155 M, 253 F) clustered	Chief, Wulana, /Dagomba, Moshe, Fulani, Mamprusi	Northern Guinea/shrub	Sandy gravel	28	28	56
	Manguli (20 km from DC)	260 (123 M,137 F) Clustered	Chief, Wulana, /Dagomba, Fulani	Northern Guinea/shrubs	Sandy gravel	28	13	41
Talon/Kumbungu	Dundo (10 km from DC)	850/ clustered	Chief, Kpalana, Dagomba, Frafra, Builsa, Dagarba, Ashanti and Gonja	Northern Guinea/trees	Sandy loam	25	22	47
	Kpachi (12 km)	577/clustered	Chief, Kpalana/Dagomba, Akan, Ewe, Kasina	Northern Guinea/trees	Sandy loam	43	78	121
	Tingoli (12 km from DC)	2595/clustered	Chief, Kpalana/ Dagomba	Northern Guinea/trees	Sandy loam	29	9	38
	Zugu (-)	3850/clustered	Chief, Kpalana, Dagomba, Fulani	Northern Guinea/trees	Sandy loam	70	81	151
	Sabegu (2 km from DC)	1088/clustered	Chief, Kpalana/Dagomba	Northern Guinea/trees	Sandy loam	67	74	141
Yendi	Zang (4 km)	532/clustered	Chief, Kpalana/ Dagomba, Fulani	Northern Guinea/trees	Sandy loam	28	43	71
	Zakoli (6 km)	186/clustered	Chief, Kpalaana /Dagomba, Kokomba, Fulani	Northern Guinea/trees	Sandy loam	10	15	25
					Total	604	614	1218

Annex 2a: Community involvement, relative importance and trends in the production of major crops grown in West Gonja and Savelugu/Nanton Districts in Northern Region

District	Community	Crops grown	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
West			Men	Women	Youths	Food	Cash		
Gonja	Sori No.1	1.Maize	10	8	10	50	50	I	Staple food/ income
		2.Sorghum	3	4	5	100	0	S	Low soil fertility/rain
		3.Rice	5	8	3	10	90	S	Source of income
		4.Cowpea	5	6	10	5	95	S	High cost of spray
		5.Groundnut	5	7	6	5	95	S	Low yields
		6.Soybean	2	0	4	0	100	S	No seed available
		7.Bambara groundnut	10	5	3	100	0	S	Home use
	Damongo	1.Maize	10	9	10	80	20	I	Staple food/income
	Zongo	2.Sorghum	10	6	4	100	0	I	Low Intercrop
		3.Rice	10	0	10	100	0	D	Few farmers grow
		4.Millet	0	7	10	30	70	D	Animals destroy
		5.Groundnut	8	9	7	20	80	I	Source of income
		6.Cowpea	6	6	4	10	90	I	Source of income
		7. Bambara groundnut	10	5	6	100	0	D	For home use
		8.Soybean	0	8	5	5	95	D	No seed available
	Jonokponto	1.Maize	8	9	10	60	40	D	Low soil fertility
		2.Sorghum	4	0	4	20	80	D	Low soil fertility

I =

		3.Millet	3	2	3	20	80	D	Lack of labour,
		4.Rice	0	0	5	30	70	D	Lack of input
		5.Groundnut	8	8	5	20	80	D	Lack of labour
		6.Cowpea	10	0	4	10	90	D	Lack of labour
		7.Soybean	10	5	3	90	10	D	Low soil fertility
		8. Bambara groundnut	6	7	10	30	70	D	Low soil fertility
Savelugu/	Duko	1.Maize	10	6	9	60	40	I	Improved support
Nanton		2. Sorghum	2	2	4	100	0	D	Low soil fertility
		3. Rice	9	0	10	10	90	1	External support
		4. Groundnut	10	7	10	10	90	I	External support
		5. Cowpea	6	3	5	100	0	S	Ready market
		6. Soybean	6	8	8	10	90	I	Improved practice
	Manguli	1.Maize	10	2	10	100	0	I	Main staple food
		2. Sorghum	5	1	0	100	0	S	Domestic use
		3. Rice	10	2	10	20	80	I	Source of cash
		4. Groundnut	3	0	0	100	0	I	Available market
		5. Cowpea	0	6	4	100	0	D	Insect damage
		6. Soybean	0	8	3	100	0	I	Population rise
		7.Bambara groundnut	10	5	0	100	0	S	Insect damage
	Jana	1.Maize	10	5	10	90	10	I	Main staple food
		2. Sorghum	10	6	4	100	0	D	Low interest
		3. Rice	70	2	1	40	60	I	Improved technol.
		4. Millet	0	5	4	50	50	D	Low interest
		5. Groundnut	8	8	1	20	80	D	Low interest
		6. Cowpea	0	6	5	60	40	D	Drought

Increasing, S = Static, D = Decreasing

Annex 2b: Community involvement, relative importance and trends in the production of major crops grown in Tolon/Kumbungu and Yendi Districts in Northern Region

District	Community	Crops grown	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
Tolon/			Men	Women	Youths	Food	Cash		
Kunbumgu	Tingoli	1.Maize	7	9	0	80	20	I	Yields increasing
		2. Rice	8	8	2	15	85	I	Yields improving
		3. Sorghum	10	5	0	80	20	D	Erratic rains
		4. Millet	10	0	0	80	20	D	Yields decreasing
		5. Groundnut	7	9	8	10	90	I	Women livelihood
		6. Soybean	6	9	5	10	90	I	Women livelihood
		7. Cowpea	6	5	6	20	80	I	Insect pests
		8. Bambara groundnut	10	0	0	90	10	I	Food security
		9. Pigeon pea	10	0	0	100	0	I	Food security
	Zugu	1.Maize	7	8	0	85	15	I	Staple food
		2.Rice	6	7	0	5	95	D	Cumbersome
		3.Sorghum	8	0	0	90	10	I	Staple food
		4. Millet	1	0	0	90	10	D	Low yields
		5.Groundnut	6	9	0	5	95	I	Cash crop
		6.Soybean	0	6	0	40	60	I	Women livelihood
		7.Cowpea	7	4	0	80	20	I	High returns
		8. Bambara groundnut	8	4	0	85	15	I	Domestic use
		9. Pigeon pea	10	0	0	80	20	I	Domestic use
	Sabegu	1.Maize	7	5	9	100	0	I	Staple food
		2.Rice	10	7	10	90	10	I	Cash for youths
		3.Sorghum	10	4	8	100	0	D	Low yield
		4.Millet	10	0	0	100	0	D	Erratic rains

		5.Soybean	7	7	4	10	90	I	High returns
		6.Groundnut	5	7	10	10	90	I	High returns
		7.Cowpea	10	5	8	20	80	D	Pests/diseases
		8. Bambara groundnut	10	4	0	100	0	S	Low yields
Yendi	Zang	1.Maize	70	5	6	60	40	D	Low soil fertility
		2.Rice	10	0	6	10	90	D	Declining fertility
		3.Sorghum	10	6	4	80	20	D	Declining fertility
		4. Millet	10	0	6	100	0	D	Declining fertility
		5. Groundnut	8	8	6	10	90	I	Ready market
		6.Soybean	5	9	6	10	90	I	Ready market
		7.cowpea	10	7	4	30	70	I	Ready market
		8. Pigeon pea	1	0	4	20	80	I	Border crop
	Zakoli	1.Maize	7	5	10	80	20	I	Staple food crop
		2. Rice	10	1	6	10	90	D	Declining fertility
		3. Sorghum	9	0	6	70	30	D	Low yield
		4. Millet	10	0	2	70	30	I	Staple food crop
		5.Groundnut	7	9	6	30	70	I	Women livelihood
		6.Soybean	5	10	10	10	90	I	Easy to produce
		7.Cowpea	7	3	10	10	90	D	Pests/diseases
		8. Pigeon pea	10	0	4	60	40	D	Pests/diseases
		9. Bambara groundnut	10	0	0	80	20	D	Pests/diseases

Annex 2c: Community involvement, relative importance and trends in production of major livestock types in West Gonja and Savelugu/Nanton districts in Northern Region

District	Community	Livestock	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
West			Men	Women	Youths	Food	Cash		
Gonja	Sori No. 1	Sheep	4	6	10	5	95	I	Source of income
		Goats	4	5	8	5	95	I	Income/ceremony
		Poultry	10	7	10	10	90	I	Home use/income
		Cattle	10	2	3	0	100	D	Increase in theft
		Dogs	0	0	10	10	90	S	Few people rear
		Pigs	0	3	7	5	95	S	Resist diseases
	Jonokponto	Sheep	8	8	5	10	90	I	Source of income
		Goat	8	7	5	10	90	I	Source of income
		Cattle	1	2	1	0	100	D	Poor kraals
		Poultry	10	9	10	30	70	D	Diseases
	Damongo	Sheep	7	5	1	10	90	I	Source of income
	Zongo	Goat	8	7	10	10	90	I	Source of income
		Poultry	9	8	10	40	60	I	Source of income
		Cattle	4	0	2	0	100	D	Poor kraal/theft
	Frafra No.4	Cattle	10	0	1	10	90	D	Theft
		Sheep	8	2	4	10	90	I	Income/ceremony
		Goat	6	4	3	10	90	I	Income/ceremony
Savelugu/	Duko	Cattle	3	0	0	0	100	D	Increased theft
Nanton		Poultry	10	8	5	50	50	I	For rituals/food
		Sheep	10	4	1	10	90	I	Festivals/rituals

		Goat	10	4	1	10	90	I	Paying bride price
	Manguli	Goat	0	3	10	5	95	I	Source of income
		Sheep	0	6	10	5	95	I	Source of income
		Poultry	0	4	6	10	90	I	Source of income
	Jana	Poultry	1	7	1	60	40	I	For sale
		Cattle	5	0	1	5	95	I	For consumption
		Sheep	0	5	8	5	95	I	Good price
		Goats	10	6	8	0	100	I	Good price

I = Increasing, S = Static, D = Decreasing

Annex 2d: Community involvement, relative importance and trends in the production of Livestock in Tolon/Kumbungu and Yendi districts in Northern Region

District	Community	Livestock	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
			Men	Women	Youths	Food	Cash		
Tolon/	Dundo	1.Cattle	8	0	4	0	100	S	Source of income
Kunbumgu		2.Sheep	9	0	6	10	90	I	Income/ceremony
		3. Goats	1	0	8	20	80	I	Income/ceremony
		4. Poultry	10	0	8	60	40	I	Food/income
	Kpachi	1.Cattle	10	0	5	10	90	I	Source of income
		2.Sheep	8	0	8	10	90	I	Source of income
		3.Goats	8	0	7	10	90	I	Source of income
		4. Poultry	7	0	7	20	80	I	Food/income
	Tingoli	1.Sheep	8	2	0	20	80	I	Source of income
		2.Goat	8	2	0	20	80	I	Source of income
		3.Poultry	6	3	0	50	50	I	Food/income
	Zugu	1.Sheep	6	0	0	10	90	I	Source of income
		2.Cattle	9	0	0	10	90	I	Source of income
		3. Goat	6	0	0	10	90	I	Source of income
		4. Poultry	10	0	0	60	40	I	Food/income
	Sabegu	1.Cattle	10	0	4	10	90	I	Savings
		2.Sheep	8	0	6	10	90	I	Savings
		3.Goat	8	0	8	10	90	I	Savings
		4. Poultry	7	0	8	20	80	I	Food/savings

I =	Yendi	Zang	1.Cattle	10	0	4	10	90	I	Livelihood improvement.
			2.Sheep	9	2	6	10	90	I	Livelihood improvement.
			3.Goat	9	2	6	10	90	I	Livelihood improvement.
			4.Poultry	8	3	4	80	20	I	Livelihood improvement.
		Zakoli	1.Cattle	7	0	8	30	70	I	Savings
			2. Sheep	6	0	10	40	60	I	Savings
			3.Goat	8	0	10	50	50	I	Savings
			4. Poultry	7	0	10	70	30	D	Diseases

Increasing, S = Static, D = Decreasing

Annex 3a: Community involvement and trends in the processing and marketing of major crops grown in West Gonja and Savelugu /Nanton district in Northern Region

District	Community	Crops	Processing		Marketing	
			Involvement (1-10)	Trends and reason	Involvement (1-10)	Trends and reasons
West	Sori No.1	1.Cowpea	7	S, many uses	6	Ready market
Gonja		2.Groundnut	8	S, used for cakes	7	Good market price
		3. Bambara groundnut	5	S, low harvest	5	Low yield
		4.Maize	8	S, many use	8	Ready market
		5.Sorghum	4	S, low yield	4	Low yields
		6.Rice	7	S, children prefer	6	Good market price
	Jonokponto	1.Soybean	4	D, low produce	8	I, ready market
		2. Bambara groundnut	7	I, easy to process	5	S, many uses
		3. Groundnut	8	I, ready market	7	I, high price
		4. Maize	9	I, ready market	9	I, ready market
		5. Millet	4	D, low produce	4	D, domestic use
	Damongo	1.Groundnut	8	I, several forms	8	I, good price
	Zongo	2. Cowpea	7	S, low produce	7	I, good price
		3. Soybean	4	D, lack skills	4	I, ready market
		4. Bambara groundnut	6	D, lack skills	5	D, low produce
		5. Maize	9	I, ready market	8	I, ready market
		6. Millet	6	D, low produce	5	D, low produce
		7. Sorghum	4	D, low produce	6	D, low produce
Savelugu/	Duko	1.Maize	7	I, ready market	7	I, ready market

Nanton		2. Millet	4	I, low produce	4	I, but small produce
		3. Rice	0	S, no machinery		
		4. Groundnut	7	I, ready market	8	I, good market
		5. Cowpea	4	I, but limited uses	4	I, pest damage
		6. Soybean	8	I, many uses	7	I, good market
	Manguli	1.Maize	4	D, low patronage	2	I, good market price
		2. Sorghum	3		3	S, domestic use
		3. Rice	0	I, has many uses	8	I, ready market
		4. Cowpea	5	S, limited uses	6	D, small produce
		5. Soybean	2	I, ready market	4	I, ready market
		6.Bambara groundnut	5	D, lack knowledge	4	D, small produce
	Jana	1.Maize	8	I, easy to process	60	I, ready market
		2. Sorghum	5	I, source of income	20	D, low produce
		3. Rice	5	I, easy to process	60	I, good price
		4. Millet	6	I, high patronage	30	D, low produce
		5. Groundnut	7	D, domestic use	70	I, good price
		6. Cowpea	6	D, high value crop	80	I, good price

I = Increasing, S = Static, D = Decreasing

Annex 3b: Community involvement and trends in the processing and marketing of major crops grown in Tolon/Kunbumgu and Yendi districts in Northern Region

District	Community	Crops	Processing		Marketing	
			Involvement (1-10)	Trends and reason	Involvement (1-10)	Trends and reasons
Tolon/	Dundo	1.Maize	6	I, rise in population	6	I, youths sell
Kunbumgu		2. Rice	8	I, ready market	8	I, youths sell
		3. Sorghum	6	I, staple food	9	I, youths sell
		4.Groundnut	8	I, many forms	8	I, ready market
		5.Soybean	8	I, increased produc.	9	I, commercial crop
		6. Cowpea	8	I, many forms	10	I, ready market
	Tingoli	1.Maize	5	I, ready market	6	I, youths sell
		2. Rice	8	I, ready market	8	I, women sell
		3. Groundnut	7	I, ready market	2	I, source of income
		4. Soybean	0	Lack skills	10	I, ready market
		5. Cowpea	0	Lack skills	3	I, ready market
	Zugu	1.Rice	7	I, women process	-	-
		2. Millet	4	I, women process	-	-
		3. Soybean	2	S, women process	-	-
		4.Groundnut	7	I, women process	-	-
	Sabegu	1.Sorghum	4	I, staple food	5	I,
		2. Maize	8	I, staple food	6	I,
		3. Rice	8	I, women process	9	I, regular market
		4. Groundnut	7	I, women process	9	I, ready market
		5. Soybean	2	I, more forms	1	I, high value

Yendi	Zang	1.Sorghum	5	I, women process		No local market
		2. Maize	9	I, women process		
		3.Groundnut	9	I, women process		
		4. Soybean	9	I, ready market		
	Zakoli	1.Sorghum	6	I, youths involved	8	I, youths sell
		2. Maize	-	-	9	I, men and women
		3. Rice	7	I, women and youth	-	-
		4. Millet	-	-	9	I, men and youth
		5. Groundnut	6	I, women	8	I, all in community
		6. Soybean	6	I, many forms	9	I, source of income

I = Increasing, S = Static, D = Decreasing

Annex 3c: Community involvement and trends in the processing and marketing of livestock in West Gonja and Savelugu/Nanton districts in Northern Region

District	Community	Livestock	Processing		Marketing	
			Involvement (1-10)	Trends and reason	Involvement (1-10)	Trends and reasons
West	Sori No. 1	Goat	5	S, Do not process	9	S, Income for farming
Gonja		Cattle	2	S, Do not process	9	S, Income for farming
		Poultry	7	S, Home use	10	S, Income for farming
		Pigs	3	S, Do not process	8	S, Income for farming
		Sheep	6	S, Funeral/ ceremony	9	S, Income for farming
		Dog	0		1	S, Periodic market
	Jonokponto	Goat	6	S, low patronage	6	I, good market price
		Sheep	7	I, funerals/ceremony	7	I, good market price
		Cattle	4	D, expensive	7	I, good market price
		Poultry	9	I, many processing	8	I, ready market
	Damongo	Goat	3	D, low patronage	4	D, low patronage
	Zongo	Sheep	4	D, low patronage	3	D, low patronage
		Poultry	8	I, easy to process	8	I , ready market
Savelugu/	Duko	Goat	40	I, disease reduce production	8	I, good price
Nanton		Sheep	3	I, disease reduce production	4	S, low patronage
		Poultry	8	I, easy to process	9	I, good patronage
	Manguli	Poultry	7	I, ready market	4	D, disease increase
		Sheep	8	I, ceremonies	6	I, ready market

I =

		Goat	6	I, ready market	8	I, ready market
	Jana	Poultry	8	S, low production	6	I, ready market
		Sheep	7	I, high cost to consumers	4	I, ceremonies
		Goats	6	I, high cost to consumers	5	I, good price
		Cattle	0	-	2	I, good price

Increasing, S = Static, D = Decreasing

Annex 4: Crop and livestock census and ranking by gender in Northern Region

District	Community	Sori No.1			Jonokponto			Damongo Zongo		
West					Ranking by gender					
Gonja	Cereals/Legumes	M	W	Y	M	W	Y	M	W	Y
	1.Maize	1st	1st	1st	1st	1st	1st	1st	1st	1st
	2.Sorghum	2nd	3rd	2nd	2nd	5th	2nd	2nd	-	3rd
	3. Rice	6th	4th	3rd	3rd	-	4th	-	-	-
	4. Millet	-	-	-	-	6th	3rd	3rd	2nd	2nd
	1. Groundnut	3rd	4th	2nd	1st	1st	1st	1st	1st	1st
	2.Cowpea	4th	2nd	1st	2nd	4th	3rd	2nd	-	2nd
	3.Soybean	7th	-	3rd	-	3rd	2nd	3rd	2nd	3rd
	4.Bambara groundnut	7th	6th	4th	3rd	7th	5th	4th	3rd	4th
	Livestock									
	1.Goat	2nd	2nd	2nd	2nd	1st	2nd	2nd	2nd	2nd
	2.Sheep	3rd	1st	6th	3rd	3rd	3rd	3rd	3rd	3rd
	3.Poultry	1st	3rd	1st	1st	2nd	1st	1st	1st	1st
	4.Cattle	4th	5th	5th	4th	-	4th	4th	4th	4th
	5.Pig	-	4th	3rd	-	-	-			
	Community	**Doku**			**Manguli**			**Jana**		
Savelugu/	**Cereals/Legumes**	**M**	**W**	**Y**	**M**	**W**	**Y**	**M**	**W**	**Y**
Nanton	Maize	1st	3rd	2nd	2nd	2nd	2nd	1st	1st	1st
	Sorghum	3rd	-	3rd	3rd	5th	-	3rd	6th	3rd
	Rice	2nd	1st	1st	1st	1st	1st	2nd	-	2nd
	Groundnut	3rd	4th	3rd	1st	2nd	2nd	1st	2nd	1st
	Cowpea	2nd	5th	1st	-	-	-	-	2nd	3rd
	Soybean	1st	2nd	2nd	-	2nd	1st	2nd	2nd	2nd
	Livestock									
	Goat	3rd	3rd	3rd	3rd	3rd	3rd	3rd	2nd	2nd
	Sheep	2nd	2nd	2nd	1st	1st	2nd	2nd	3rd	3rd

M = Men, W = Youths

	Poultry	1st	1st	1st	2nd	2nd	1st	1st	1st	1st
	Cattle	4th	-	4th	-	-	-	4th	-	4th
		Tingoli			**Zugu**			**Zakoli (Yendi district)**		
Tolon/	**Cereals/Legumes**	**M**	**W**	**Y**	**M**	**W**	**Y**	**M**	**W**	**Y**
Kumbungu	1.Maize	1st	1st	1st	1st	1st	1st	1st	1st	1st
	2.Sorghum	3rd	4th	3rd	3rd	-	3rd	3rd	-	2nd
	3. Rice	2nd	2nd	2nd	2nd	2nd	2nd	2nd	2nd	4th
	4. Millet	4th	3rd	4th	4th	-	4th	4th	-	3rd
	1. Groundnut	1st	1st	1st	1st	1st	1st	4th	2nd	2nd
	2.Cowpea	2nd	3rd	3rd	4th	3rd	3rd	1st	3rd	3rd
	3.Soybean	3rd	2nd	2nd	2nd	2nd	2nd	2nd	1st	2nd
	4.Bambara groundnut	4th	4th	4th	3rd	4th	4th	3rd	-	
	5.Pigeon pea	5th	5th	5th	5th	-	-	-	-	4th
	Livestock									
	1.Goat	2nd	-	2nd	3rd	-	3rd	2nd	2nd	2nd
	2.Sheep	1st	-	1st	2nd	-	2nd	1st	1st	1st
	3.Poultry	1st	-	3rd	1st	-	1st	4th	3rd	3rd
	4.Cattle	3rd	-	5th	4th	-	4th	3rd	-	4th

Women, Y =

Annex 5: Problem census and prioritization by gender and farmer coping strategies in Northern Region

Community	Problem	Rank			Coping strategy/advantage Disadvantages/%involved	Trend (I/D/S)
Dundo/ Kpachi/	**Crop Production**	**M**	**W**	**Y**		
Zang	1.high cost of fertilizers		2nd			
	2. Weeding costly		5th			
	3. High cost of land preparation		1st			
	4. No improved Seeds		3rd			
	5. Inadequate land		4th			
	6. Low soil fertility			2nd	6.1. Use chemical fertilizer, increases yield, 100%	I
					6.2 Animal manure, increase yield, increase weeds, 40%	I
	7. No credit			5th	7.1 Personal savings, 80%	I
	8. Erratic rainfall			1st	8.1 Early maturing varieties, increase yield, 40%	I
					8.2 Drought tolerant varieties, difficult to get seeds, 60%	I
					8.3 Earth bunds, conserves water, increase gullies, 40%	S
	9. *Striga* infestation			3rd	9.1 Legume + cereal intercrop., control *Striga*, 60%	I
	10. Soil acidity			4th		
Tingoli/Zugu	**Crop Production**					
	1.Weed infestation	2nd	6th	5th		
	2.Pesticides costly		5th			
	3.Fertilizer costly		2nd			
	4.High cost of seeds		4th	4th		
	5.*Striga* infestation	3rd	4th			

	6.Land scarcity		3rd			
	7. Low soil fertility	1st		2nd	7.1 Use chemical fertilizer, increases yield, 100%	I
					7.2 Animal droppings, increase yield, difficult to transport, 30%	I
	8. Inadequate tractor	2nd		1st		
	9. Inadequate credit			3rd		
Sabegu/Aibos	**Livestock**					
	1.Ticks and worms	1st		1st		
	2. Inadequate vet./drugs	3rd		2nd		
	3. Anthrax/swelling	2nd		5th		
	4. Diarrhea/pneumonia	1st				
	5. Newcastle	4th				
	Marketing/processing					
	1.Low prices	1st	1st	1st		
	2.Low demand	2nd				
	3. Inadequate transport	3rd	2nd			
	4. Lack of grinding mills					
	5. Lack of shellers/dryers					
	6. Lack of local market					

M = Men, W = Women, Y = Youths

Annex 6: Biophysical characteristics of project communities in Upper East Region

District	Community	Population/ settlement	Commun. hierarchy /ethnic groups	Agro-ecology/ Vegetation	Soils	No. present		
						M	F	Total
Talensi/	Sakote	60% F, 40% M/scattered	Chief, queen mother, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	39	25	64
Nabdam	Winkogo	6,860	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	29	22	51
	Balungu	1, 988 (60% F, 40% M)	Chief , assemblyman	Sudan savanna/grassland	Sandy loam/gravel	55	54	109
	Baare	40% M and 60% F	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	45	24	69
	Sheaga	NA	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	44	46	90
Bongo	Gowrie	130 households	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	34	33	67
	Beo Moshe.	539 (322 F, 217 M)	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	33	30	63
	Soe Yidongo	1500 (30 M, 70% F)	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	41	34	75
	Namoo Abass.	NA	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	21	33	54
	Dua	539 (322 F, 217 M)	Chief, assemblyman	Sudan savanna/grassland	Sandy loam/gravel	58	95	153
Bawku West	Binaba (22 km from District capital (DC)	7,815 (3750 M, 3840 F	Chief, sub chief, headmen, assembly/ Kusasi, Busasi, Fulani Moshie	Sudan savanna/grassland	Sandy loam/gravel	63	133	199
	Tilli (10 km from DC)	1200	Chief, sub-chief, Tindaana, Elders/ Kusasi,	Sudan savanna/grassland	Sandy loam/gravel	64	36	100

			Fulani, Hausa, Zabarrma					
	Tanga (5km from DC)	2815 (1252 M, 1563 F)	Kusasi, Mamprusi, Moshie, Frafra, Fulani	Sudan savanna/grassland	Sandy loam/gravel	35	33	68
	Yarigu (6 km from DC)	3289 (1332 M, 1957 F)	Chief, sub-chief, queen mother, assembly/ Kusasi, Moshie	Sudan savanna/grassland	Sandy loam/gravel	89	45	134
	Googo (12 km from DC)	1449 (687 M, 762 F)	Sub-chief, Elders, Tindana, assembly/Kusasi	Sudan savanna/grassland	Sandy loam/gravel	83	75	158
Bawku	Binduri	NA	NA	Sudan savanna/grassland	Sandy loam/gravel	78	63	141
Municip.	Nayorko-1(5 km from DC)	1233	Sub-chief, elders, Tindana, assembly/ Bisa Kusasi,Moshie, Fulani	Sudan savanna/grassland	Sandy loam/gravel	45	98	143
	Ninkogo (8 km from DC)	673	Chief, sub-chief, elders, assembly	Sudan savanna/grassland	Sandy loam/gravel	69	118	187
	Kaade (18 km from DC)	1105	Chief, sub-chief, elders, assembly/Kusasi	Sudan savanna/grassland	Sandy loam/gravel	45	41	86
	Nafkolga (28 km from DC)	505	Sub-chief, elders, Tindana/Kusasi, Bisa	Sudan savanna/grassland	Sandy loam/gravel	45	39	84
					Total	1015	1077	2092

Annex 7a: Community involvement, relative importance and trends in the production of major crops grown in Talensi/Nabdam and Bongo districts in Upper East Region

District	Community	Crops grown	Involvement (1-10)			Relative importance(1-100)		Trend (I/D/S)	Reason
Talensi/			Men	Women	Youths	Food	Cash		
Nabdam	Sakote and	1.Early/late millet	2	2	2	90	10	D	Low soil fert./pests/rains
	Bolungu	2.Sorghum	2	4	4	50	50	D	Declining fert./rains
		3.Maize	2	4	2	40	60	I	New crop/fertz.inputs
		4.Rice	6	6	6	20	80	D	Declining fert/rains
		1.Groundnut	8	4	4	40	60	D	Dise., fert., loc. vars.
		2.Cowpea	6	6	6	40	60	D	Pests, local vars.,fert.
		3. Bambaranut	4	6	4	40	60	D	As above
		4. Soybean	10	10	10	10	90	D	As above
	Winkogo and	1.Rice	6	6	4	50	50	D	Declining fert./rains
	Sheaga	2.Early /late millet	2	2	2	90	10	D	As above and pests
		3.Sorghum	2	2	2	50	50	S	As above
		4.Maize	2	6	2	40	60	I	High yield/market
		1.Groundnut	8	4	6	40	60	D	Disease., fert., loc.vars.
		2.Cowpea	6	6	6	60	40	D	As above and pests
		3. Bambara groundnut	4	6	6	60	40	D	As above
		4. Soybean	8	4	6	10	90	D	Lack processing. Skills
	Baare	1.Rice	6	6	6	20	80	D	Declining fert./rains
		2.Early/late millet	2	2	2	90	10	D	As above and pests
		3.Sorghum	2	4	4	50	50	D	As above
		4.Maize	2	4	2	40	60	I	New crop/needs fert.
		1.Groundnut	8	4	4	40	60	D	Dise., fert., loc.vars.
		2.Cowpea	6	6	6	40	60	D	Pests, fert., loc.vars.
		3. Bambara groundnut	4	6	4	40	60	D	Pests, fert., loc.vars.
		4. Soybean	10	10	10	10	90	D	Disease., fert., loc.vars.
Bongo	Goweri and	1.Rice	4	6	2	50	50	D	Declining fert./rains
	Namoo Abb.	2.Early/late millet	2	2	2	90	10	D	As above and pests

		3.Sorghum	2	2	2	50	50	D	As above
		4.Maize	2	6	2	60	40	I	High yield/unit area
		1.Groundnut	4	2	6	50	50	D	Dise., fert., loc.vars.
		2.Cowpea	6	6	6	70	30	D	Pests, fert., loc.vars.
		3. Bambara groundnut	4	6	6	80	20	D	Pests, fert., loc.vars.
		4. Soybean	8	4	6	10	90	D	Lack process. Skills
	Beo M. and	1.Rice	4	6	2	80	20	D	Lack impro. Varieties
	Dua	2.Early/late millet	2	2	2	100	0	D	As above/low fert.
		3.Sorghum	2	2	2	90	10	D	As above
		4.Maize	8	10	6	80	20	I	High yield/needs fert.
		1.Groundnut	2	4	2	90	10	D	Dise., fert., loc.vars.
		2.Cowpea	6	2	4	90	10	D	Pests, fert., loc.vars.
		3. Bambara groundnut	4	6	6	80	20	D	Pests, fert., loc.vars.
		4. Soybean	10	6	6	10	90	D	Lack process. Skills
	Soe Yidongo	1.Rice	6	8	8	40	60	D	Declining fert./rains
		2.Early millet/late	2	2	2	100	0	D	As above/pests
		3.Sorghum	2	4	4	50	50	D	Declining fert./rains
		4.Maize	4	6	4	40	60	I	New crop/high yield
		1.Groundnut	8	4	4	50	50	D	Dise., fert., loc.vars.
		2.Cowpea	6	6	6	70	30	D	Pests, fert., rains
		3Bambara groundnut	4	6	4	80	20	D	Dise., fert., loc.vars.
		4. Soybean	10	10	10	10	90	D	Dise., fert., loc.vars.

I = Increasing, S = Static, D = Decreasing

Annex 7b: Community involvement, relative importance and trends in the production of major crops grown in Bawku West in Upper East Region

District	Community	Crops grown	Involvement (1-10)			Relative importance (1-100) (M/W/Y)		Trend (I/D/S)	Reason
			Men	Women	Youths	Food	Cash		
Bawku	Binaba	1.Maize	6	6	2	70/70/50	30/30/50	I	High yield/market
West		2.Sorghum	3	6	1	30/30/0	70/70/100	D	*Striga*/poor yields
		3.Millet	8	1	1	80/80/90	20/20/10	D	Poor yields
		4.Rice	2	5	5	30/30/40	70/70/60	D	Inadequate rains/soils
		1.Cowpea	2	6	2	60/60/20	40/40/100	I	Food/Cash crop
		2. Soybean	2	0	8	50/50/60	50/50/40	I	High cash/nutrients
		3.Groundnut	1	1	7	60/60/10	40/40/90	D	Poor yields/rains/diseas.
		4. Bambara groundnut	1	2	7	70/70/60	30/30/40	I	Good yields
		5. Sesame	0	0	10	0/50/0	0/50/0	I	Good yield/soup
		6. *Neri*	0	0	10	0/60/0	0/40/0	D	Poor yields
	Yarigu	1.Maize	10	2	10	90/20/50	10/80/50	I	Ready market
		2.Sorghum	10	0	5	90/0/1	10/0/99	D	Late/inadequate rains
		3.Millet	10	1	10	90/100/100	10/0/0	D	Poor soil fertility
		4.Rice	6	7	7	10/60/25	90/40/75	S	Insufficient rains
		1.Cowpea	10	6	10	20/20/10	80/80/90	I	Many new uses
		2. Soybean	4	7	10	0/60/1	100/40/99	I	Good yields
		3.Groundnut	5	6	5	20/80/3	80/20/97	D	Late rains/poor soils
		4. Bambara groundnut	8	0	0	30/0/0	70/0/0	D	Many diseases
	Tanga	1.Maize	10	2	10	80/60/50	20/40/50	I	High yields
		2.Sorghum	10	1	9	100/90/0	0/10/100	D	Poor yield/rains
		3.Millet	8	2	9	100/60/100	0/40/0	S	Poor yields
		4.Rice	7	6	5	10/30/10	90/70/90	I	High market value
		1.Cowpea	5	3	10	50/20/30	50/80/70	I	High yielding
		2. Soybean	8	7	10	20/20/10	80/80/90	I	High cash value/nutrient
		3.Groundnut	4	4	9	20/60/30	80/40/70	D	Poor yields/diseases

		4. Bambara groundnut	7	6	8	30/90/20	70/10/80	D	Inadequate farmland
	Googo	1.Maize	10	2	10	70/60/90	30/40/10	I	Use fertiliz. /high yields
		2.Sorghum	10	0	5	90/0/0	10/0/100	D	Erratic rains/no bullock
		3.Millet	10	3	10	100/80/100	0/20/0	D	Poor/erratic rains
		4.Rice	7	5	10	20/70/30	80/30/70	S/I	High cost of operations
		1.Cowpea	6	2	6	50/30/70	50/70/30	S/I	Use local varieties/yields
		2. Soybean	9	0	10	20/0/20	80/0/80	I	No use of fertilizer
		3.Groundnut	3	5	8	20/40/40	80/60/60	D	Poor soil fertility/no vars
		4. Bambara groundnut	4	5	5	10/60/90	90/40/10	D	Low soil fertility/rains
	Tilli	1.Maize	10	1	10	60/60/40	40/40/60	I	High yields
		2.Sorghum	10	1	4	30/70/4	7030/96	D	Low yields
		3.Early millet	10	1	9	50/90/90	50/10/10	D	Maize replacing
		4. Late millet	10	1	9	50/90/90	50/10/10	D	Maize replacing
		5.Rice	6	5	10	40/20/4	60/80/96	I/D	Cash crop/high cost
		1.Cowpea	10	2	7	20/20/20	80/80/80	I	Improv. vars. Available
		2. Soybean	8	3	7	10/20/3	90/80/97	I	Cash crop
		3.Groundnut	3	3	5	40/30/20	60/70/80	D	Poor yields/no new seeds
		4. Bambara groundnut	3	3	5	20/10/90	80/90/10	D	Poor yield/no new seeds

I = Increasing, S = Static, D = Decreasing, M= Men, W = Women, Y = Youths

Annex 7c: Community involvement, relative importance and trends in the production of major crops grown in Bawku Municipal in Upper East Region

District	Community	Crops grown	Involvement (1-10)			Relative importance (1-100) (M/W/Y)		Trend (I/D/S)	Reason
			Men	Women	Youths	Food	Cash		
Bawku	Kaade	1.Maize	10	2	8	90/60/70	10/40/30	S	Require fertile soils
Municipal		2.Sorghum	10	0	6	90/0/0	10/0/100	D	Poor yield/*Striga*
		3.Millet	10	1	10	90/90/90	10/10/10	D	Poor yields/drought
		4. Rice	10	4	5	20/70/30	80/30/70	D	Poor soils/rains
		1.Cowpea	6	3	5	30/60/50	70/40/50	D	Pests//costly chemicals
		2. Soybean	6	6	5	20/50/30	80/50/70	I	High cash/nutritive
		3.Groundnut	2	3	0	30/70/0	70/30/0	D	Poor yields/rains/disease
		4. Bambara groundnutt	4	6	5	10/70/30	90/30/70	I	No adequate land
	Nafkolga	1.Maize	10	1	10	80/20/90	20/80/10	D	Low soil fertility
		2.Sorghum	10	0	5	80/0/40	20/0/60	D	Low soil fertility
		3.Millet	10	1	10	80/10/80	20/90/20	D	Downey mildew
		4. Rice	7	5	7	20/40/20	80/60/80	D	Poor soil fertility
		1.Cowpea	10	2	3	50/40/30	50/60/70	I	Timely spraying
		2. Soybean	10	5	10	10/30/30	90/70/70	I	Intercropped with maize
		3.Groundnut	1	6	7	50/30/50	50/70/50	D	Diseases
		4. Bambara groundnut	2	7	3	70/60/80	30/40/20	D	Poor yields
	Nayoko	1.Maize	10	3	10	60/30/50	40/70/50	I	High yields/use fertilizer
		2.Early millet	10	3	10	80/30/50	/2070/50	D	Low yields/maize replac.
		3. Late millet	10	0	0	60/0/0	40/0/0		
		4. Rice	7	2	8	10/20/0	90/80/100	D	Low soil fertility
		5. Sorghum	10	0	5	20/0/40	80/0/60		Replaced by maize
		1.Cowpea	10	2	10	20/20/60	80/80/40	D	Pests/low yields/rains
		2. Soybean	10	2	8	40/30/80	60/70/20	D/I	Low fertility/low input
		3.Groundnut	3	5	1	20/40/60	80/60/40	D	Poor yields/vars./rain

		4. Bambara groundnut	6	2	10	40/70/80	60/30/20	D	Poor rains/yields/vars.
	Binduri	1.Maize	10	3	9	70/40/80	30/60/20	I	High yields
		2.Early millet	10	2	10	80/80/100	2020//0	D	Maize replacing it
		3. Late millet	10	0	0	90/0/0	10/0/0	D	
		4. Rice	6	6	6	10/30/20	90/70/80	D	Erratic rains
		5. Sorghum	10	0	8	40/0/70	60/0/30	D	
		1.Cowpea	10	2	10	90/10/50	10/90/50	I	Poor yields
		2. Soybean	10	6	8	20/10/20	80/90/80	I	Low input/new varieties
		3.Groundnut	3	4	2	10/30/20	90/70/80	D	Low yields
		4. Bambara groundnut	7	4	4	30/50/20	70/50/80	I	Poor yields
	Ninkogo	1.Maize	10	5	10	70/80/60	30/20/40	I	Fertilizer available
		2.Sorghum	10	0	10	70/0/10	30/0/90	D	
		3.Millet	10	2	10	90/90/75	10/10/25	D	Drought
		4. Rice	5	3	3	10/20/40	90/80/60	I	Heavy rainfall
		1.Cowpea	10	8	10	10/10/15	90/90/85	D	Diseases/pests
		2. Soybean	10	3	10	0/10/20	100/90/80	I	No chemicals required
		3.Groundnut	2	3	3	10/20/10	90/80/90	D	Diseases
		4. Bambara groundnut	5	1	4	10/60/15	90/40/85	D	No land for Bambara groundnut

I = Increasing, S = Static, D = Decreasing, M = Men, W =Women, Y = Youths

Annex 7d: Community involvement, relative importance and trends in the production of major livestock in Talensi/Nabdam and Bongo districts in Upper East Region

District	Community	Livestock	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
Talensi			Men	Women	Youths	Food	Cash		
Nabdam	Sakote and	1.Poultry*	2	5	40	30	70	D	NCD, worms, mortality
	Baare	2. Cattle	2	10	4	10	90	D	Declining grazing land
		3. Sheep	2	8	4	30	70	D	As above, destroy crops
		4. Goat	6	2	2	30	70	D	As above
		5. Pig	8	6	4	20	80	D	High cost of feed/drugs
		6. Dog	2	8	6	50	50	D	High cost of food/rabies
		7.Donkey	6	2	6	10	90	D	Declining grazing land
	Winkogo and	1.Poultry	2	2	2	20	80	I	Dowry, rituals, festivals
	Sheaga	2. Cattle	2	8	4	5	95	D	Declining grazing land
		3. Sheep	2	4	2	10	90	D	Declining grazing land
		4. Goat	2	2	2	10	90	D	As above/destructive
		5. Pig	2	4	2	10	90	D	High cost of drugs/feed
		6. Dog	2	6	4	50	50	D	High cost of food/rabies
		7.Donkey	2	2	2	0	100	D	Declining grazing land
	Balungu	1.Poultry	2	4	2	20	80	S	NCD , worms, mortality
		2. Cattle	2	10	4	10	90	D	Declining grazing land
		3. Sheep	2	2	4	10	90	D	As above/destructive
		4. Goat	2	2	2	20	80	D	As above
		5. Pig	8	6	4	20	80	D	Poor housing/feed/drug
		6. Dog	2	10	6	50	50	D	High cost of food/rabies
		7.Donkey	6	4	6	10	90	D	Declining grazing land
Bongo	Gowrie and	1.Poultry	2	4	2	10	90	I	NCD, worms, mortality
	Beo Moshid.	2. Cattle	2	8	4	10	90	D	Declining grazing land
		3. Sheep	2	6	4	10	90	D	As above/destructive

		4. Goat	2	4	4	10	90	D	As above
		5. Pig	8	10	10	10	90	D	Poor housing/feed/drugs
		6. Dog	2	6	4	60	40	D	High cost of food/rabies
		7.Donkey	6	6	8	10	90	D	Declining grazing land
	Soe Yidongo	1.Poultry	2	8	4	30	70	D	NCD, worms, mortality
		2. Cattle	2	10	4	10	90	D	Declining grazing land
		3. Sheep	2	8	4	30	70	D	As above/destructive
		4. Goat	6	6	8	30	70	D	As above
		5. Pig	8	6	4	20	80	D	High cost of feed/drugs
		6. Dog	2	8	6	50	50	D	High cost of drugs/rabies
		7.Donkey	8	4	8	10	90	D	Declining grazing land
	Namoo	1.Poultry	2	4	4	20	80	I	NCD, worms, mortality
	Abbaskoma	2. Cattle	2	8	4	10	90	D	Declining grazing land
	And Dua	3. Sheep	2	4	2	10	90	D	As above/destructive
		4. Goat	2	2	2	20	80	D	As above
		5. Pig	2	4	2	10	90	D	Poor housing/feed/drug
		6. Dog	2	6	4	60	40	D	High cost of food/rabies
		7.Donkey	2	2	2	10	90	D	Declining grazing land

*Poultry = Local fowl, Guinea fowl, Duck and Turkey, I = Increasing, S = Static, D = Decreasing

Annex 7e: Community involvement, relative importance and trends in the production of major livestock in Bawku West district in Upper East Region

District	Community	Livestock	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
Bawku			Men	Women	Youths	Food	Cash		
West	Binaba	1.Cattle	3	1	8	0/0/20	100/100/80	D	Diseases/theft/no pasture
		2.Sheep	7	3	6	0/10/20	100/90/80	D	Theft/mortality
		3.Goat	10	1	10	0/20/40	100/80/60	I/D	Mortality
		4.Poultry	10	5	10	10/20	90/100	I/D	High keet mortality
		5.Pig	6	1	5	0/10	100/90	D	
		6.Donkey	4	3	7	0/0	100/100	D	
		7.Rabbit	2	0	1	80/0	20/0	D	Low market value
		7.Dog	0	0	10	0/0/30	0/0/70	D	Converted for security
	Yarigu	1.Cattle	6	0	3	0/0/1	100/0/99	D	Diseases/mortality
		2.Sheep	8	2	4	10/5/10	90/95/90	D/I	Theft/high cash value
		3.Goat	9	3	6	10/10/10	90/90/90	D/I	Diseases/high cash value
		4. Poultry	10	3	10	20/20/30	80/80/70	D/I	Diseases/easily sold
		5.Pig	4	0	3	0/5/50	100/95/50	D/I	Diseases/high cash value
		6. Donkey	0	0	7	0/0/10	0/0/90	D	Death/theft
		7.Dog	9	0	0	0/0/50	0/0/50	D	Overconsumption/theft
	Tanga	1.Cattle	5	1	5	0/0/0	100/100/100	I	Prestige and cash
		2.Sheep	8	2	6	10/0/20	90/100/80	I	Source of cash
		3.Goat	10	3	10	10/0/20	90/100/80	I	Source of cash
		4. Poultry	10	3	10	20/30/30	80/70/70	I	High cash/sacrifices
		5.Pig	9	9	8	10/0/10	90/100/90	I	Prolific
		6. Donkey	0	2	3	0/0/0	0/100/100	D/I	For traction
		7.Dog	0	0	10	0/0/30	0/0/70	I	
	Googo	1.Cattle	9	2	3	0/10/0	100/90/100	D	Theft/mortality
		2.Sheep	6	2	8	20/20/0	80/80/100	S/D	As above/mortality
		3.Goat	8	2	8	10/30/10	90/70/90	I/D	Source of income/theft
		4. Poultry	10	3	10	60/40/50	40/60/50	I/D	Ready market/mortality
		5.Pig	4	5	7	10/10/0	90/90/100	I	Prolific

		6. Donkey	0	8	4	0/20/40	0/80/60	I	Transportation
		7.Dog	0	0	9	0/0/30	0/0/70	I	High littering/security
	Tilli	1.Cattle	3	1	9	0/0/1	100/100/99	I/D	
		2.Sheep	4	1	5	10/10/10	90/90/90	I/D	Diseases
		3.Goat	10	3	10	10/20/10	90/80/90	I/D	Diseases
		4. Poultry	10	4	10	50/30/50	50/70/50	D	New Castle Disease
		5.Pig	5	8	4	10/10/10	90/90/90	D/I	Diseases/prolific
		6. Donkey	7	3	4	0/0/0	100/100/100	I	Animal traction/transport
		7.Dog	0	0	10	0/0/10	0/0/90	I	Security

I = Increasing, S = Static, D = Decreasing

Annex 7f: Community involvement, relative importance and trends in the production of major livestock in Bawku Municipal in Upper East Region

District	Community	Livestock	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
Bawku			Men	Women	Youths	Food	Cash		
Municipal	Kaade	1.Cattle	4	0	2	0/0/0	100/0/100	D	Mortality, theft, no water
		2.Sheep	6	0	3	10/0/20	90/0/80	S	No grazing area
		3.Goat	9	2	7	10/10/20	90/90/80	I	
		4.Poultry	10	2	10	20/10/50	80/90/50	S	High keet mortality
		5.Pig	2	8	1	0/5/0	100/95/100	D	
		6.Donkey	0	0	3	0/0/0	0/0/100	D	
		7.Dog	0	0	8	0/0/50	0/0/50	I	
	Nafkolga	1.Cattle	5	1	5	0/20/10	100/80/90	D/I	
		2.Sheep	9	2	6	0/10/15	100/90/85	D/I	Mortality, theft
		3.Goat	10	2	8	20/10/10	80/90/90	D/I	”
		4.Poultry	10	3	10	40/30/30	60/70/70	D/I	
		5.Pig	5	7	4	20/5/5	80/95/95	I	Ready market, income
		6.Donkey	6	1	5	0/0/0	100/100/100	I	Traction
		7.Dog	0	0	5	0/0/10	0/0/90	D	
	Nayoko	1.Cattle	6	0	5	0/0/0	100/0/100	I/D	Inadequate pasture
		2.Sheep	10	7	10	20/20/10	80/80/90	I	Prolific and easy to rear
		3.Goat	10	8	10	20/10/10	80/90/90	I	Prolific and easy to keep
		4.Poultry	10	6	10	50/40/50	50/60/50	I	Improved vaccination
		5.Pig	3	8	3	0/10/0	100/90/100	I	
		6.Donkey	3	0	4	0/0/0	100/0/100	I/D	Inadequate pasture
		7.Dog	0	0	3	0/0/0	0/0/100	D	
		8.Rabbit	4	0	3	0/40/30	0/60/70	D	
	Binduri	1.Cattle	5	2	5	0/0/10	100/100/90	D	
		2.Sheep	8	3	7	50/10/30	50/90/70	I	Prolific
		3.Goat	8	2	7	50/10/30	50/90/70	I	Prolific

		4.Poultry	10	3	10	30/30/40	70/70/60	I	Prolific
		5.Pig	4	6	2	10/30/0	90/70/100	I	
		6.Donkey	5	1	5	0/0/0	100/100/100	I	Animal traction
		7.Dog	0	0	9	0/0/30	0/0/70		
	Ninkogo	1.Cattle	8	0	4	0/0/30	100/0/70	D	Inadequate grazing area
		2.Sheep	10	3	5	10/5/60	90/85/40	I	Prolific
		3.Goat	10	3	6	10/10/40	90/90/60	I	Prolific
		4.Poultry	10	3	7	30/30/60	70/70/40	S/I	Diseases/easy to rear
		5.Pig	5	1	3	0/0/10	100/100/90	I	Prolific
		6.Donkey	0	2	2	0/0/10	0/100/90	I	Work animal
		7.Dog	0	0	1	0/0/3	0/0/97		

I = Increasing, S = Static, D = Decreasing

Annex 8: Community involvement and trends in the processing and marketing of major crops grown in Upper East Region

District	Community	Crops	Processing		Marketing	
			Involvement (1-10) (M/W/Y)	Trends and reason	Involvement (1-10) (M/W/Y)	Trends and reasons
Talensi/	Sakote,	1.Maize	5/4/5	D, demand low	4/4/5	D, main food crop
Nabdam	Winkogo,	2. Sorghum	5/3/5	I, Pito/malt	5/3/5	D, low production
	Balungu	3. Millet	5/4/5	D, low demand	5/3/5	D, low production
		1.Groundnut	5/3/5	D, low production	5/4/5	D, low production
		2.Cowpea	5/3/5	S, occasional need	5/4/5	D, low production
		3.Soybean	5/4/5	D, new *dawadawa*	5/5/5	D, production
		4. Bambara groundnut	5/4/5	D, low production		
		Livestock				
Bongo	Gowerie	1.Poultry		S, Home use	2/2/2	D, worms, NCD
	Beo Moshid.	2.Goat		S, Home use	3/3/3	D, PPR, worms
	Soe Yidongo	3. Sheep		S, Home use	3/3/3	D, PPR, worms
		4.Cattle		S, Home use	1/5/2	D, decline grazing land
		5. Pig		S, Home use	5/5/5	D, high cost of product.
		6. Dog		S, Home use	5/4/5	D, pet and latter sold out
Bawku	Binaba	**Crops**				
West		1.Maize	1/6/3	I, Food processing	2/5/3	I, food and cash
		2.Sorghum	1/9/0	I, Pito/malt	1/8/1	Malt
		3.Rice	1/8/1	I, High mkt. value		
		1.Soybean	1/7/2	I, *Dawadawa*/cash	1/6/3	I, Increased yield
		2.Cowpea	1/8/1		1/8/1	S, locally used
		3. Groundnut	1/7/2	I, Increase demand	2/6/2	S, low yields
		Livestock				
		1.Cattle		Not processed	10/0/0	Not commonly sold

		2.Goat	3/1/6	Sold whole/kebab	7/0/3	D, mortality
		3.Sheep	3/1/6	Sold whole/kebab	8/0/2	S, prestige/not eaten
		4.Poultry	3/4/3	Processed for sale	3/3/4	D, mortality
		5. Pig	1/2/7	Sold whole	1/6/3	I, prolific/easily sold
		6. Donkey			9/0/1	S, for farm work
	Yarigu	**Crops**				
		1.Maize	2/5/3	I, income/food	2/7/1	S, cash
		2.Sorghum	1/8/1	I,''	0/9/1	S, cash
		3.Millet	1/7/2	I,''	2/7/1	S, food and cash
		4.Rice			1/8/1	I, high production
		1.Soybean	1/7/2	I, for women	1/7/2	I, high production
		2.Cowpea	1/8/1	I, for women invol.	1/7/2	I, ''
		3. Groundnut	2/6/2	I, ''	2/6/3	D, low production
		Livestock				
		1.Cattle	1/0/0	Sold whole	9/0/1	D, theft
		2.Goat	2/3/5	Roasting and frying	7/1/2	
		3.Sheep	2/3/5	Sold whole	8/0/2	Death of animals
		4.Pig	1/6/3	Sold to butchers	1/6/3	Reared for cash
		5.Poultry	1/6/3	Roasting and frying	6/2/2	Cash and food
		6. Donkey	1/1/0	Sold whole	8/0/2	Draught animal

M = Men, W = Women, Y = Youths, I = Increasing, S = Static, D = Decreasing

Annex 9a: Crop and livestock census and ranking by gender in Talensi/Nabdam and Bongo districts in Upper East Region

District	Community	Sakote						Winkogo						Balungu					
Talensi/		Food			Cash			Food			Cash			Food			Cash		
Nabdam	**Cereals**	M	W		M	W		M	W		M	W		M	W		M	W	
	1.Maize	3rd	3rd		2nd	2nd		3rd	3rd					3rd	3rd		1st	1st	
	2.Sorghum	2nd	5th		1st	1st		5th	5th					2nd	5th		2nd	2nd	
	3. Rice	5th	4th		5th	3rd		4th	4th					5th	4th		3rd	3rd	
	4. Early millet	1st	1st		3rd	5th		1st	1st					1st	1st		5th	5th	
	5. Late millet	4th	2nd		4th	4th		2nd	2nd					4th	2nd		4th	4th	
	Legumes																		
	1. Groundnut	1st	1st		1st	1st		1st	1st					1st	1st		1st	1st	
	2.Cowpea	3rd	2nd		2nd	2nd		2nd	2nd					3rd	2nd		2nd	2nd	
	3.Soybean	4th	4th		4th	4th		4th	4th					4th	4th		4th	4th	
	4. Bambara groundnut	2nd	3rd		3rd	3rd		3rd	3rd					2nd	3rd		3rd	3rd	
	Livestock																		
	1.Goat	3rd	2nd		2nd	3rd		3rd	2nd		2nd	3rd		3rd	1st		3rd	3rd	
	2.Sheep	4th	3rd		4th	4th		4th	3rd		4th	4th		4th	2nd		5th	4th	
	3.Poultry	1st	1st		1st	1st		1st	1st		1st	1st		1st	3rd		1st	1st	
	4.Cattle	7th	6th		7th	7th		7th	5th		7th	7th		7th	7th		2nd	7th	
	5.Pig	5th	5th		3rd	2nd		5th	7th		3rd	2nd		5th	4th		4th	2nd	
	6. Dog	2nd	4th		5th	5th		2nd	4th		5th	5th		2nd	5th		6th	5th	
	7.Donkey	6th	7th		6th	6th		6th	6th		6th	6th		6th	6th		7th	6th	
Bongo	**Community**	Goweri						Beo Moshidaboroo						Soe Yidongo					
		Food			Cash			Food			Cash			Food			Cash		

	Cereals	M	W		M	W		M	W	Y	M	W		M	W		M	W	
	1.Maize	3rd	5th					3rd	3rd					4th	5th		2nd	2nd	
	2.Sorghum	1st	2nd					1st	1st					1st	2nd		1st	1st	
	3.Rice	5th	4th					5th	4th					5th	4th		5th	3rd	
	4. Early millet	2nd	1st					2nd	2nd					2nd	1st		3rd	5th	
	5. Late millet	4th	3rd					4th	5th					3rd	3rd		4th	4th	
	Legumes																		
	1.Groundnut	1st	1st					2nd	1st					3rd	2nd		1st	1st	
	2.Cowpea	2nd	2nd					1st	3rd					2nd	1st		2nd	2nd	
	3.Soybean	4th	4th					4th	4th					4th	4th		4th	4th	
	4. Bambara groundnut	3rd	3rd					3rd	2nd					1st	3rd		3rd	3rd	
	Livestock																		
	1.Goat				7th	7th		2nd	2nd		4th	2nd		2nd	2nd		2nd	3rd	
	2.Sheep				2nd	2nd		3rd	2nd		3rd	3rd		3rd	3rd		4th	4th	
	3.Poultry				1st	1st		1st	1st		1st	1st		1st	1st		1st	1st	
	4.Cattle				4th	4th		4th	5th		5th	6th		4th	4th		6th	6th	
	5.Pig				3rd	3rd		6th	6th		7th	5th		6th	6th		3rd	2nd	
	6.Dog				6th	6th		-	-		-	-		-	-		-	-	
	7. Donkey				5th	5th		5th	4th		6th	3rd		5th	5th		5th	5th	

M = Men, W = Women, Y = Youths

Annex 9b: Crop and livestock census and ranking by gender in Bawku West and Bawku municipal in Upper East Region

District	Community	Binaba						Yarigu						Googo					
		Food			Cash			Food			Cash			Food			Cash		
Bawku	**Cereals**	M	W	Y	M	W	Y	M	W	Y	M	W	Y	M	W			W	Y
West	1.Maize	2nd	1st	2nd	1st	2nd	2nd	2nd	1st	2nd	1st	2nd	1st	2nd	1st			2nd	1st
	2.Sorghum	4th	4th	4th	3rd	3rd	3rd	4th	4th	4th	3rd	3rd	3rd	3rd	4th			3rd	4th
	3. Rice	3rd	2nd	3rd	2nd	1st	1st	3rd	2nd	3rd	2nd	1st	2nd	4th	3rd			1st	2nd
	4. Early millet	1st	3rd	1st	4th	4th	4th	1st	3rd	1st	4th	4th	4th	1st	1st			4th	3rd
	5. Late millet	1st	3rd	1st	4th	4th	4th	1st	3rd	1st	4th	4th	4th	1st	1st			4th	3rd
	Legumes																		
	1. Groundnut	2nd	1st	3rd	4th	3rd	4th	2nd	1st	1st	3rd	3rd	2nd	4th	1st			3rd	1st
	2.Cowpea	4th	3rd	2nd	1st	1st	1st	4th	3rd	2nd	1st	1st	1st	1st	2nd			1st	2nd
	3.Soybean	3rd	4th	4th	2nd	2nd	3rd	3rd	2nd	3rd	2nd	4th	3rd	2nd	3rd			4th	3rd
	4. Bambara groundnut	1st	2nd	1st	3rd	4th	2nd	1st	4th	4th	4th	2nd	4th	3rd	4th			2nd	4th
	Livestock																		
	1.Goat	2nd	3rd	2nd	4th	4th	5th	2nd	3rd	2nd	2nd	1st	2nd	2nd	3rd			1st	4th
	2.Sheep	3rd	4th	4th	2nd	5th	4th	3rd	4th	3rd	1st	5th	4th	3rd	4th			5th	3rd
	3.Poultry	1st	1st	1st	7th	2nd	6th	1st	1st	1st	4th	2nd	6th	1st	1st			2nd	5th
	4.Cattle	4th	-	-	1st	-	1st	4th	-	6th	3rd	-	1st	3rd	-			-	1st
	5.Pig	6th	6th	3rd	3rd	1st	3rd	6th	6th	4th	5th	4th	3rd	6th	6th			4th	7th
	6. Dog	-	-	5th	-	-	2nd	-	-	5th	-	-	5th	-	-			-	2nd
	7.Donkey	5th	3rd	-	5th	6th	-	5th	5th	-	6th	6th	-	3rd	5th			6th	6th
Bawku	**Community**	Nayoko						Binduri						Ninkogo					
Municipal		Food			Cash			Food						Food			Cash		

	Cereals	M	W	Y		W		M		Y				M	W	Y	M	W	Y
	1.Maize	1st	1st	1st		2nd		1st		1st				2nd	1st	2nd	1st	2nd	1st
	2.Sorghum	4th	4th	4th		3rd		3rd		4th				4th	4th	4th	3rd	3rd	3rd
	3.Rice	5th	3rd	3rd		1st		5th		3rd				3rd	2nd	3rd	2nd	1st	2nd
	4. Early millet	2nd	2nd	2nd		4th		2nd		2nd				1st	3rd	1st	4th	4th	4th
	5. Late millet	3rd	2nd	2nd		4th		4th		2nd				1st	3rd	1st	4th	4th	4th
	Legumes																		
	1.Groundnut	3rd	1st	4th		4th		4th		4th				1st	2nd	1st	2nd	1st	3rd
	2.Cowpea	2nd	2nd	1st		2nd		1st		1st				2nd	1st	2nd	1st	2nd	2nd
	3.Soybean	1st	3rd	2nd		3rd		2nd		3rd				4th	3rd	4th	3rd	3rd	4th
	4. Bambara groundnut	4th	4th	2nd		1st		3rd		2nd				3rd	4th	3rd	4th	5th	1st
	Livestock																		
	1.Goat	2nd	3rd	2nd		1st		2nd		2nd				2nd	3rd	2nd	3rd	1st	3rd
	2.Sheep	3th	4th	3rd		2nd		3rd		3rd				4th	4th	3rd	2nd	2nd	1st
	3.Poultry	1st	1st	1st		4th		1st		1st				1st	1st	1st	5th	4th	4th
	4.Cattle	4th	7th	5th		7th		4th		4th				7th	-	6th	1st	-	5th
	5.Pig	7th	6th	4th		3rd		6th		5th				5th	5th	4th	4th	3rd	2nd
	6.Dog	-	-	6th		-		-		6th				-	-	5th	-	-	6th
	7. Donkey	5th	5th	7th		6th		5th		7th				6th	6th	-	6th	6th	-

M = Men, W = Women, Y = Youths

Annex 10: Problem census and prioritization spread and coping strategies in Upper East Region

District	Crop production problems	Spread	Coping strategy/advantage Disadvantages/%involved	Trend (I/D/S) and Reasons
All districts	1.Drought/unreliable rainfall/erratic	***	1.1 Use drought tolerant varieties 1.2 Early maturing varieties/high yield, early maturing, high value/high input cost/60%	I, many buy the improved seeds
	2.Low soil fertility	***	2.1use farm yard manure/high yield/inadequate access/90% 2.2 Composting of household sweeping 2.3 Intercropping of cereals with legumes	I, most farmers keep livestock
	3.Lack improved seeds	***		
	4. Inadequate land prep. Eqpt.	***	Use of animal traction/early land prep./ prep. Of heavy soils difficult/60%	I, farmers acquire traction team at Sheaga
	5.Pests, diseases and weeds	***	Spraying chemicals	
	6. *Striga* infestation	*		
	7.Postharvest losses	*		
	8.Animal destruction of crops	*	Reporting to local chief	
	9.High cost of agro-inputs	**		
	10.Low extension coverage	*		
	11. Poor storage		Use jute/polythene sacks	
	12. Flooding			
	Livestock problems			
	1.PPR	***	Early report, treatment and vaccination /mortality reduced/increased cost/70%	I, many farmers report to MoFA
	2. Mange	**		
	3. Anthrax	**		

	4.New Castle Disease	***		
	5.Poor housing	***		
	6. High keet mortality	***	Artificial brooding of guinea fowl keets/reduced mortality/increased cost/30%	I, many build brooding houses
	7. Low access to vet. Services	*		
	8.African swine fever	*		
	9.Worms and ticks	*		
	10. Theft		Enforcing security	
	11.Inadequate pasture			
	12.Inadequate watering points			
	Processing problems			
	1.Lack processing skills	***		
	2.Lack processing equipment	***		
	Marketing problems			
	1.Low produce price	***	1.Sell in neighbouring communities 2.Store until prices improve	
	2.Exploitation by middlemen	***		
Bongo/ Bawku West	Lack of credit	***	1.Money lending through susu/access to some money, increase yield/not enough, interest high/10% 2.Borrow from friends	D, interest rate high

*** = Very widespread, ** =Widespread, * = sporadic, I = Increasing, S = Static, D = Decreasing

Annex 11: Biophysical characteristics of the project communities in Upper West Region

District	Community	Population/ settlement pattern	Comun. Hierarchy /ethnic groups	Distance from DC	Agro-ecology/ vegetation	Soil type	Number present		
Nadowli							**M**	**F**	**Total**
	Tabiesi	2027 (1022 M, 1005 F), slightly dense	Dagaaba	45	Guinea savanna	Sandy loam	54	37	91
	Goriyiri	149 (76 M, 73 F), sparse	Dagaaba	2	Guinea savanna	Sandy loam	19	25	44
	Ombo	517 (259 M, 258 F), sparse	Dagaaba	36	Guinea savanna	Sandy loam	36	20	56
	Daffiama	3026 (1403 M, 1623 F) dense	Dagaaba	56	Guinea savanna	Sandy loam	44	67	111
	Kalsegra	797 (403 M, 394 F), sparse	Dagaaba	44	Guinea savanna	Sandy loam/ laterite	34	30	64
Wa East	Loggu	1098 (554 M, 544 F) clustered	Chief, Tindaana/ Waala, Lobbi	138	Guinea savanna	Sandy loam	27	39	66
	Bulenga	2392 (1139 M, 1253 F) clustered	Chakali, Waala	150	Guinea savanna	Sandy loam	28	17	45
	Kpalinye	345 (170 M, 175 F), scattered	Chief, Tindaana/ Dagaaba, Waala and Lobbi	140	Guinea savanna	Sandy loam	13	14	27
	Naaha	611 (286 M, 325 F) clustered	Chief,Tindana/ Waala	135	Guinea savanna	Sandy loam	106	77	183
	Zinnyea	244 (117 M, 127 F) sparse	Chief, Tindaana/ Dagaaba, Waala, Lobbi	-	Guinea savanna	Sandy loam	43	10	53
						Total	404	336	740

Annex 12a: Community involvement, relative importance and trends in the production of major crops grown in Nadowli district in Upper West Region

Community	Crops grown	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
		Men	Women	Youths	Food	Cash		
Tabiase	1.Sorghum	10			40	60	D	Erratic rains/low fert.
	2.Maize	10			40	60	I	High yield/fertz.resp.
	3.Millet	10			99	1	D	Erratic rains/low fert.
	4.Rice	10			20	80	D	Erratic rains/low fert.
	1.Cowpea	10			50	50	I	Early vars./pest contr.
	2.Groundnut	10			20	80	D	Erratic rains/low fert.
	3. Bambara groundnut	5			20	80	D	Erratic rains/low fert.
	4.Soybean	3			5	95	D	Erratic rains/low fert.
	5. Kersting nut	1			99	1	D	Low market/tedious
Goriyiri	1.Sorghum	10	0		40	60	D	Erratic rains/low fert.
	2.Maize	10	10		50	50	I	High yield/fertz. resp.
	3.Millet	5	0		99	1	D	Erratic rain/local var.
	4.Rice	8	8		40	60	I	Improved mgt. pract.
	1.Cowpea	10	5		30	70	I	Improved mgt. pract.
	2.Groundnut	10	10		20	80	D	Erratic rains/low fert.
	3. Bambara groundnut	8	10		30	70	I	Improved mgt. pract.
	4.Soybean	4	0		2	98	I	Improved mgt. pract.
Ombo	1.Sorghum	9			40	60	D	Erratic rains/low fert.
	2.Maize	10			40	60	I	Improved mgt.pract.
	3.Millet	7			50	50	D	Erratic rain/poor mgt.

	4.Rice	5			50	50	D	Erratic rain/poor mgt.
	1.Cowpea	10			50	50	I	Improved mgt.pract.
	2.Groundnut	10			10	90	D	Erratic rain/poor mgt.
	3. Bambara groundnut	10			50	50	I	Low labour requirem.
	4.Soybean	1			50	50	D	Erratic rain/low fert.
Daffiama	1.Sorghum	6			60	40	D	As above
	2.Maize	10			50	50	I	Improved mgt.pract.
	3.Millet	3			70	30	D	Erratic rain/poor mgt.
	4.Rice	10			60	40	D	As above
	1.Cowpea	10			95	5	I	Improved mgt.pract.
	2.Groundnut	10			10	90	D	Erratic rain/poor mgt.
	3. Bambara groundnut	10			90	10	I	Low labour input
	4.Soybean	1			2	98	D	Erratic rain/poor mgt.
Kalsegra	1.Sorghum	10			90	10	I	Increase in pito use
	2.Maize	10			60	40	I	Improved mgt. pract.
	3.Millet	5			99	1	D	Erratic rain/poor mgt
	4.Rice	10			50	50	I	Improved mgt. pract.
	1.Cowpea	10			80	20	I	As above
	2.Groundnut	10			20	80	I	As above
	3. Bambara groundnut	10			60	40	I	As above
	4.Soybean	3			10	90	D	Erratic rain/poor mgt.

I = Increasing, S = Static, D = Decreasing

Annex 12b: Community involvement, relative importance and trends in the production of major crops grown in Wa East district in Upper West Region

Community	Crops grown	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
		Men	Women	Youths	Food	Cash		
Kpalinye	1.Sorghum	10	0		60	40	D	Erratic rain/low fert./*Striga*
	2.Maize	10	0		70	30	I	Improved mgt. practices
	3.Millet	6	0		99	1	I	*Striga*/drought tolerant
	4.Rice	5	2		20	80	I	Improved mgt. practices
	1.Cowpea	9	5		10	90	I	As above
	2.Groundnut	9	9		20	80	I	Rotation/good price
	3. Bambara groundnut	4	7		10	90	D	Erratic rain/declining fert.
	4.Soybean	7	5		10	90	I	Rotation/good price
Naaha	1.Sorghum	2			40	60	D	Erratic rain/low fert./*Striga*
	2.Maize	10			20	80	I	Improved mgt. practices
	3.Millet	1			40	60	D	Erratic rain/declining fert.
	4.Rice	6			30	70	I	Improved mgt. practices
	1.Cowpea	7			50	50	I	As above
	2.Groundnut	10			20	80	D	Erratic rain/low fert./disea.
	3. Bambara groundnut	5			50	50	D	Erratic rain/low fert
	4.Soybean	10			50	50	I	Increased fert./high price
Zinnyea	1.Sorghum	6			100	0	D	High *Striga* infestation
	2.Maize	10			50	50	I	Increased fertilizer use
	3.Millet	5			100	0	D	Erratic rain/low fertility
	4.Rice	5			60	40	D	Erratic rain/low fertility
	1.Cowpea	6			20	80	D	High cost of insecticides

	2.Groundnut	9			3	97	I	Tolerant to drought
	3.Soybean	7			20	80	I	*Striga* control/fertility
Loggu	1.Sorghum	10			80	20	D	*Striga* infestation
	2.Maize	10			80	20	I	Use of fertilizer
	3.Millet	10			85	15	D	*Striga* infestation
	4.Rice	4			30	70	D	Erratic rain/declining fert.
	1.Cowpea	10			50	50	I	Improved mgt. practices
	2.Groundnut	10			2	98	I	Low cost of production
	3. Bambara groundnut	8			50	50	D	Labour intensive/low fert.
	4.Soybean	6			20	80	I	Improved mgt.practices
Bulenga	1.Sorghum	9			50	50	D	Low market price
	2.Maize	10			90	10	I	High use/income
	3.Millet	10			5	95	D	Low price/local varieties
	4.Rice	8			15	85	D	Erratic rain/high ferz cost
	1.Cowpea	10			20	80	I	High market value
	2.Groundnut	6			2	98	I	Low cost/high income
	3. Bambara groundnut	10			10	90	I	Good market price
	4.Soybean	8			10	90	D	Labour intensive/no markt

I = Increasing, S = Static, D = Decreasing

Annex 13: Community involvement, relative importance and trends in production of major livestock types in Upper West Region

District	Community	Livestock	Involvement (1-10)			Relative importance (1-100)		Trend (I/D/S)	Reason
			Men	Women	Youths	Food	Cash		
Nadowli	Tabiase	1.Goat	10			10	90	D	Diseases/mortality
		2.Cattle	10			1	99	I	Proper care
		3.Sheep	9			20	80	D	Diseases/mortality
		4.Poultry	10			50	50	D	Diseases/mortality
		5.Pigs	3			5	95	D	Diseases/mortality
		6.Rabbit	3			99	1	1	Improved care
	Goriyiri	1.Goat	10	0		10	90	D	Diseases/mortality
		2.Sheep	7	0		10	90	D	Diseases/mortality
		3.Poultry	10	0		50	50	D	Diseases/mortality
		4.Pigs	5	0		50	50	D	Diseases/mortality
		5.Donkey	1	0		0	100	I	Proper care/traction
	Ombo	I. Goat	10			10	90	D	Diseases/mortality
		2.Cattle	5			2	98	D	Diseases/mortality
		3.Sheep	10			10	90	D	Diseases/mortality
		4.Poultry	10			50	50	D	Diseases/mortality
		5.Pigs	9			5	95	D	Diseases/mortality
	Daffiama	1.Goat	8			3	97	D	As above
		2.Cattle	2			1	99	D	As above
		3.Sheep	6			3	97	D	As above
		4.Poultry	10			50	50	D	As above
		5.Pigs	9			3	97	D	As above
		6.Rabbit	1			99	1	D	High mortality
	Kalsegra	1.Goat	10			10	90	D	Diseases/mortality
		2.Sheep	5			10	90	D	Diseases/mortality
		3.Poultry	10			20	80	D	Diseases/mortality
		4.Pigs	8			5	95	D	Diseases/mortality
Wa East	Kpalinye	1.Goat	10	2		10	90	D	Diseases/mortality
		2.Cattle	4	0		10	90	I	Proper care

		3.Sheep	6	0		10	90	D	Diseases/mortality
		4.Poultry	10	4		60	40	I	Spiritual activities
		5.Pigs	5	3		10	90	S	Diseases/mortality
	Naaha	1.Goat	10			5	95	D	Diseases/mortality
		2.Cattle	5			1	99	D	Diseases/mortality
		3.Sheep	10			5	95	D	Diseases/mortality
		4.Poultry	10			20	80	D	Diseases/mortality
	Zinnye	1.Cattle	3			30	70	D	High theft
		2.Goat	7			10	90	D	High theft
		3.Sheep	3			10	90	D	As above
		4.Poultry	10			60	40	S	New castle diseas.
		5.Pigs	8			70	30	I	High price/no theft
	Loggu	1.Cattle	3			20	80	I	Vet services/feeds
		2.Goat	8			50	50	I	Pasture/high price
		3.Sheep	5			10	90	I	Pasture/high price
		4.Poultry	7			50	50	I	Vet services/feed
		5.Pigs	1			5	95	D	Poor mgt./attitude
	Bulenga	1.Cattle	7			1	99	D	Mortality/theft
		2.Goat	10			5	95	D	Theft
		3.Sheep	5			50	50	D	Mortality/theft
		4.Poultry	10			80	20	D	High mortality
		5.Pigs	3			10	90	D	High mortality

I = Increasing, S = Static, D = Decreasing

Annex 14a: Community involvement and trends in the processing and marketing of major crops grown in Nadowli district in Upper West Region

District	Community	Crops	Processing		Marketing	
Nadowli			Involvement (1-10)	Trends and reason	Involvement (1-10)	Trends and reasons
	Tabiase	1.Sorghum	10	I, consumption	10	I, high price
		2.Maize	10	I, consumption	10	I, high price
		3.Millet	10	I, consumption	2	I, high price
		4.Rice	10	I, consumption	10	I, high price
		1.Cowpea	10	I, many recipes	5	I, source of income
		2.Groundnut	1	D, low yield	10	I, source of income
		3. Bambara groundnut	10	S, low production	10	I, source of income
		4.Soybean	10	I, diverse recipes	10	I, source of income
		5. Kersting's groundnut	5	S, low production	1	D, low production
	Goriyiri	1.Sorghum	5	I, food/pito/cash	10	I, high price
		2.Maize	10	I, as above	10	I, high price
		3.Millet	1	D, low prod./yield	2	I, high price
		4.Rice	4	I, food/income	10	I, high price
		1.Cowpea	7	I, prod../ recipes	5	I, source of income
		2.Groundnut	7	I, prod./income	10	I, source of income
		3. Bambara groundnut	4	I, prod./food/cash	10	I, source of income
		4.Soybean	3	I, diverse recipes	10	I, source of income
	Ombo	1.Sorghum	5	I, food/cash	5	D, low production
		2.Maize	5	I, food/cash	8	I, high price
		3.Millet	8	I, food/cash	10	I, high price
		4.Rice	5	I, food/cash	2	S, low production
		1.Cowpea	10	I, diverse uses/cash	8	I, source of income

		2.Groundnut	1	I, source of income	10	I, source of income
		3. Bambara groundnut	7	I, food/cash	5	I, source of income
		4.Soybean	5	D, low price	1	D, low production
	Daffiama	1.Sorghum	6	I, food/pito	2	I, food/income
		2.Maize	3	I, food/income	2	I, food/income
		3.Millet	2	I, food/income	1	D, low production
		4.Rice	3	I, food/income	1	D, low production
		1.Cowpea	3	I, prod./recipes	2	I, food/income
		2.Groundnut	3	D, low production	2	D, low production
		3. Bambara groundnut	1	I, food/income	3	I, food/income
		4.Soybean	2	I, *dawadawa*	1	I, food/income
	Kalsegra	1.Sorghum	8	I, food/pito	6	I, high price/pito
		2.Maize	5	I, food	6	I, high price
		3.Millet	2	I, food	2	I, high price
		4.Rice	1	S, low production	5	I, high price
		1.Cowpea	5	I, recipes/food/cash	5	I, food/income
		2.Groundnut	1	S, low yield/skills	6	S, low production
		3. Bambara groundnut	1	S, low production	5	I, food/income
		4.Soybean	1	S, low production	1	S, low production

I = Increasing, S = Static, D = Decreasing

Annex 14b: Community involvement and trends in the processing and marketing of major crops grown in Wa East districts in Upper West Region

District	Community	Crops	Processing		Marketing	
Wa East			Involvement (1-10)	Trends and reason	Involvement (1-10)	Trends and reasons
	Kpalinye	1.Sorghum	10	I, increased consum	10	I, high price
		2.Maize	10	I, increased consum	10	I, high price
		3.Millet	5	I, increased consum	7	I, high price
		4.Rice	3	I, increased consum	10	I, high price
		1.Cowpea	8	D, low price	5	I, source of income
		2.Groundnut	1	D, low yield/skill	10	I, source of income
		3. Bambara groundnut	1	S, low production	10	I, source of income
		4.Soybean	1	D, low skill	10	I, source of income
	Naaha	1.Sorghum	4	I, consumption	10	I, food/income
		2.Maize	5	I, consumption	6	I, high market price
		3.Millet	5	D, low production	9	I, high market price
		4.Rice	5	I, consumption	7	I, high market price
		1.Cowpea	10	I, market available	7	I, food/income
		2.Groundnut	1	D, low yield/skills	7	I, source of income
		3. Bambara groundnut	2	D, low production	9	I, food/income
		4.Soybean	5	D, lack skills	8	D, low production
	Zinnyea	1.Sorghum	5	I, food/pito	1	
		2.Maize	1	D	1	
		3.Millet	1	D	1	

		4.Rice	1	D	1	
		1.Cowpea	6	I, consumption	2	D, no funds
		2.Groundnut	1	D, no skills	1	
		3.Soybean	1	D, no skills	1	
	Loggu	1.Sorghum	7	I, food/pito	Na	I, high market price
		2.Maize	5	I,food/income	Na	I, high market price
		3.Millet	4	I, consumption	Na	I, high market price
		4.Rice	8	I, consumption	Na	I, high market price
		1.Cowpea	5	I, recipes/income	Na	I, source of income
		2.Groundnut	4	I, food/income	Na	I, source of income
		3. Bambara groundnut	5	I, food/income	Na	I, source of income
		4.Soybean	2	I, food/*dawadawa*	Na	I, source of income

I = Increasing, S = Static, D = Decreasing. Na = not available

Annex 15: Community involvement and trends in processing and marketing of livestock in Nadowli and Wa East districts in Upper West Region

District	Community	Livestock	Processing		Marketing	
			Involvement (1-10)	Trends and reason	Involvement (1-10)	Trends and reasons
Nadowli	Tabiase	1.Goat	8	I, consumption	10	I, high demand/income
		2.Cattle	6	I, consumption	10	I, high demand/traction
		3.Sheep	8	I, consumption	10	I, high demand/income
		4.Poultry	1	I, consumption	10	I, high demand/income
		5.Pigs	5	I, consumption	5	I, income/high demand
		6.Rabbit	1	I, consumption	1	S, low production
	Goriyiri	1.Goat	1	D, theft/disease	10	I, high demand/income
		2.Sheep	1	D, theft/diseases	10	I, high demand/income
		3.Poultry	1	D, theft/diseases	10	I, high demand/income
		4.Pigs	10	I, consumption	5	I, high demand/income
		5.Donkey	1	D, theft/diseases	-	I, high demand/income
		6.Cattle	-	-	10	I, high demand/income
		7.Rabbit	-	-	1	S, low production
	Ombo	I. Goat	1	D, few animals	5	I, source of income
		2.Cattle	1	D, few animals	10	I, high demand/income
		3.Sheep	1	D, few animals	8	I, high demand/income
		4.Poultry	1	D, few animals	3	I, high demand/income
		5.Pigs	3	I, consumption	6	I, high demand/income
	Daffiama	1.Goat	3	D, few animals	1	D, low prod./theft
		2.Cattle	1	I, increased use	1	D, low prod./theft
		3.Sheep	3	D, few animals	1	D, low prod/theft
		4.Poultry	1	D, few animals	2	I, high demand/income
		5.Pigs	6	I, increased use	2	I, high demand/income
		6.Rabbit	1	D, low patronage	1	D, low production
	Kalsegra	1.Goat	1	S, few animals	1	D, low number
		2.Sheep	1	S, few animals	1	D, low number
		3.Poultry	1	S, few animals	1	D, low number
		4.Pigs	3	I, consumption	1	I, increased demand
Wa East	Kpalinye	1.Goat	1	I, consumption	10	I, demand/income

		2.Cattle	1	I, consumption	10	I, demand/income
		3.Sheep	1	I, consumption	10	I, demand/income
		4.Poultry	1	I, consumption	10	I, demand/income
		5.Pigs	3	I, consumption	5	I, demand/income
	Naaha	1.Goat	7	S, low number/theft	7	I, demand/income
		2.Cattle	1	D, few/death	6	I, demand/traction
		3.Sheep	7	S, low number/theft	5	I, demand/income
		4.Poultry	9	S, low number/death	7	I, demand/income
	Zinnye	1.Cattle	1	D	10	I, high demand
		2.Goat	1	D	1	D
		3.Sheep	1	D	1	D
		4.Poultry	1	D	1	D
		5.Pigs	3	1, high demand	3	I, demand/good price/prolific
	Loggu	1.Cattle	1	I, consumption	Na	I, demand/income
		2.Goat	5	I, consumption	Na	I, demand/income
		3.Sheep	5	I, consumption	Na	I, demand/income
		4.Poultry	2	I, consumption	Na	I, demand/income
		5.Pigs	2	D, attitude to pork	Na	D, attitude to pork

I = Increasing, S = Static, D = Decreasing, Na = not available

Annex 16a: Crop and livestock census and ranking in Nadowli district in Upper West Region

District	Community	Tabiase			Goriyiri			Ombo		
Nadowli					**Ranking**					
	Cereals	**All**	**Men**	**Women**	**Food**	**Cash**		**Food**	**Cash**	
	1.Sorghum	2nd	2nd	2nd	2nd	2nd		3rd	3rd	
	2.Maize	1st	1st	1st	1st	1st		1st	1st	
	3.Millet	4th	4th	4th	4th	4th		2nd	2nd	
	4.Rice	3rd	3rd	3rd	3rd	3rd		4th	4th	
	Legumes									
	1.Cowpea	1st	1st	2nd	1st	1st		1st	1st	
	2.Groundnut	2nd	2nd	1st	2nd	2nd		2nd	2nd	
	3.Bambara groundnut	3rd	3rd	3rd	4th	3rd		3rd	3rd	
	4.Soybean	4th	4th	4th	3rd	4th		4th	4th	
	5. Kersting's groundnut	5th	5th	-	-	-		-	-	
	Livestock									
	1.Goat	2nd	2nd	3rd	2nd	2nd		3rd	3rd	
	2.Cattle	1st	1st	-	-	-		1st	1st	
	3.Sheep	3rd	3rd	2nd	3rd	3rd		4th	4th	
	4.Poultry	4th	4th	1st	1st	4th		5th	4th	
	5.Pigs	5th	5th	-	4th	4th		2nd	2nd	
	6.Rabbit	6th	6th	4th	-	-		-	-	
	7.Donkey	-	-	-	5th	6th		-	-	
	Community	**Daffiama**			**Kalsegra**					
	Cereals	**Food**	**Cash**		**Food**	**Cash**				
	1.Sorghum	2nd	2nd		2nd	2nd				
	2.Maize	1st	1st		1st	1st				
	3.Millet	4th	4th		4th	4th				

	4.Rice	3rd	3rd		3rd	3rd				
	Legumes									
	1.Cowpea	1st	1st		1st	1st				
	2.Groundnut	3rd	3rd		2nd	2nd				
	3.Bambara groundnut	2nd	2nd		3rd	3rd				
	4.Soybean	4th	4th		4th	4th				
	5. Kersting's groundnut	-	-		5th	5th				
	Livestock									
	1.Goat	3rd	3rd		2nd	2nd				
	2.Cattle	5th	5th		1st	1st				
	3.Sheep	4th	4th		3rd	3rd				
	4.Poultry	2nd	2nd		4th	4th				
	5.Pigs	1st	1st		5th	5th				
	6.Rabbit	6th	6th		6th	6th				

Annex 16b: Crop and livestock census and ranking in Wa East district in Upper West Region

District	**Community**	**Kpalinye**			**Naaha**			**Zinnye**		
Wa East					**Ranking**					
	Cereals	**Food**	**Cash**		**Food**	**Cash**		**Food**	**Cash**	
	1.Sorghum	2nd	2nd		5th	2nd		2nd	2nd	
	2.Maize	1st	1st		1st	1st		1st	1st	
	3.Millet	4th	4th		4th	4th		3rd	3rd	
	4.Rice	3rd	3rd		3rd	3rd		4th	4th	
	Legumes									
	1.Cowpea	3rd	3rd		3rd	3rd		3rd	3rd	
	2.Groundnut	1st	1st		1st	1st		1st	1st	
	3.Bambara groundnut	4th	4th		4th	4th		-	-	
	4.Soybean	2nd	2nd		2nd	2nd		2nd	2nd	
	Livestock									
	1.Goat	2nd	2nd		2nd	2nd		3rd	3rd	
	2.Cattle	4th	1st		4th	1st		4th	4th	
	3.Sheep	1st	3rd		1st	3rd		5th	5th	
	4.Poultry	3rd	4th		3rd	4th		2nd	2nd	
	5.Pigs	5th	5th		-	-		1st	1st	
	Community	**Loggu**			**Bulenga**					
	Cereals	**Food**	**Cash**		**Food**					
	1.Sorghum	4th	4th		2nd					
	2.Maize	1st	1st		1st					
	3.Millet	3rd	3rd		4th					
	4.Rice	2nd	2nd		3rd					
	Legumes									
	1.Cowpea	2nd	2nd		2nd					
	2.Groundnut	1st	1st		1st					
	3.Bambara groundnut	4th	4th		4th					
	4.Soybean	3rd	3rd		3rd					

	Livestock									
	1.Goat	1st	1st		1st					
	2.Cattle	4th	4th		5th					
	3.Sheep	3rd	3rd		3rd					
	4.Poultry	2nd	2nd		1st					
	5.Pigs	5th	5th		4th					

Annex 17: Problem census and prioritization and farmer coping strategies in Upper West Region

District	Problem	Rank	Coping strategy/advantage Disadvantages/%involved	Trend (I/D/S)
Nadowli	**Crop Production**			
	1.Erratic rainfall	1st 4th 1st 4th	1.1.Early varieties/ higher yields/costly/50% 1.2.Early planting/higher yields/ high labour/100%	I, awareness I, awareness
	2.High cost of fertilizer	2nd 4th		
	3. *Striga* infestation	3rd 6th 5th 6th 5th		
	4. Lack land prep. Equipt.	4th 3rd 2nd 3rd	4.1.Animal traction/timely and better land prep./high cost and unavailability/70%	D, children go to school/no herders
	5. Inadequate credit	1st		
	6. Lack of improved seed	2nd 2nd 3rd 3rd	6.1,Use local varieties/cheap and time saving/low yield and late maturing/100%	D, new varieties coming up
	7.Declining soil fertility	5th 2nd 5th 1st	7.1.Fertilizer application/high yields /costly/60%	D, non availability
	8.Pests and diseases	1st 2nd	8.1.Insecticides/high yield/high cost, unsafe/100%	I, effective
	9.Weed infestation		9.1.Chemical weed control/effective/unsafe/ 20%	I, better control
	10.Inadequate storage	4th	10.1.PICS cowpea storage/safe/high cost /10%	I,effective/ quality
	Processing			
	1.Lack of machinery	4th		
	2.Lack of skills			
	3.Lack of storage facility	5th		
	Marketing			
	1.Lack of organized mkt.	2nd		
	2.Low produce prices	1st		
	3.Lack of transport	3rd		
	Livestock (Daffiama)			
	1.High mortality			
	2.Lack of improved breed			
	3.Theft of animals			
	4. Inadequate housing			

	5. Inadequate water					
	6. Inadequate vet					
Wa East	**Crop Production**					
	1.Lack of land prep.equip	1st 2nd 2nd			1.1Animal traction/as above/90%	I, efficient
	2.High cost of fertilizer	2nd 3rd				
	3.*Striga* infestation	3rd 1st			3.1Farmer /farmer sharing/reduce *Striga*/slow/90%	D, not effective
	4.Lack of improved seed	4th 2nd				
	5.Pests diseases/weeds	5th 5th 2nd			5.1 PICS cowpea storage/as above/10%	I, as above
	6.Low soil fertility	1st				
	7.Inadequate storage	6th				
	Livestock					
	1.Theft	1st				
	2.Diseases	3rd				
	3.Inadequate water	2nd				