

**The Study on Upper West
Integrated Agricultural Development
in the Republic of Ghana**

Final Report

**Part I
Main Report**

March 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

**KAIHATSU MANAGEMENT CONSULTING, INC.
CTI ENGINEERING INTERNATIONAL CO., LTD.**

GNO

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**Ministry of Food and Agriculture
The Republic of Ghana**

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Integrated Agricultural Development
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Preface

In response to the request from the Government of Ghana, the Government of Japan decided to conduct the Study on Upper West Integrated Agricultural Development and entrusted the study on Japan International Cooperation Agency (JICA).

JICA Selected and dispatched a study team headed by Mr. Hiroshi OKABE of Kaihatsu Management Consulting, Inc. between May 2008 to March 2010.

The team held a series of discussions with the officials concerned of the Government of Ghana and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of the plan and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Ghana for their close cooperation extended to the study.

March 2010

Eiji HASHIMOTO,
Vice President
Japan International Cooperation Agency

March 2010

Mr. Eiji HASHIMOTO
Vice President
Japan International Cooperation Agency
Tokyo, JAPAN

Letter of Transmittal

Dear Sir,

We are pleased to submit herewith the Final Report of the Study on Upper West Integrated Agricultural Development in the Republic of Ghana. The Final Report was prepared based on the results of the Study conducted from May 2008 to March 2010.

The objectives of the Study are to (1) formulate a Master Plan which consists of guidelines for the development and dissemination of agricultural technologies as well as proposals for agricultural development projects, and (2) enhance the capacity of Ghanaian counterpart personnel, partner organizations, and community-based organizations, for contributing to assure food security and increase income for the farmers in the area.

In the Study, a project for staple food production has been proposed in the Master Plan since it is considered to bring substantial effects on food security in the area by using appropriate technologies. Moreover, the considerable amounts of food will be produced as the surplus, which will turn into the incomes of the producers. In addition, the projects related to cash crop production, livestock development and processing have also been proposed in the Master Plan for increasing the income of the people in the area.

The Study was conducted based on continual partnership of the Ministry of Food and Agriculture Headquarters, Upper West Regional Office including the officers and the extension agents in the district offices, farmers and other stakeholders. Their opinions and intensions were incorporated in the Final Report.

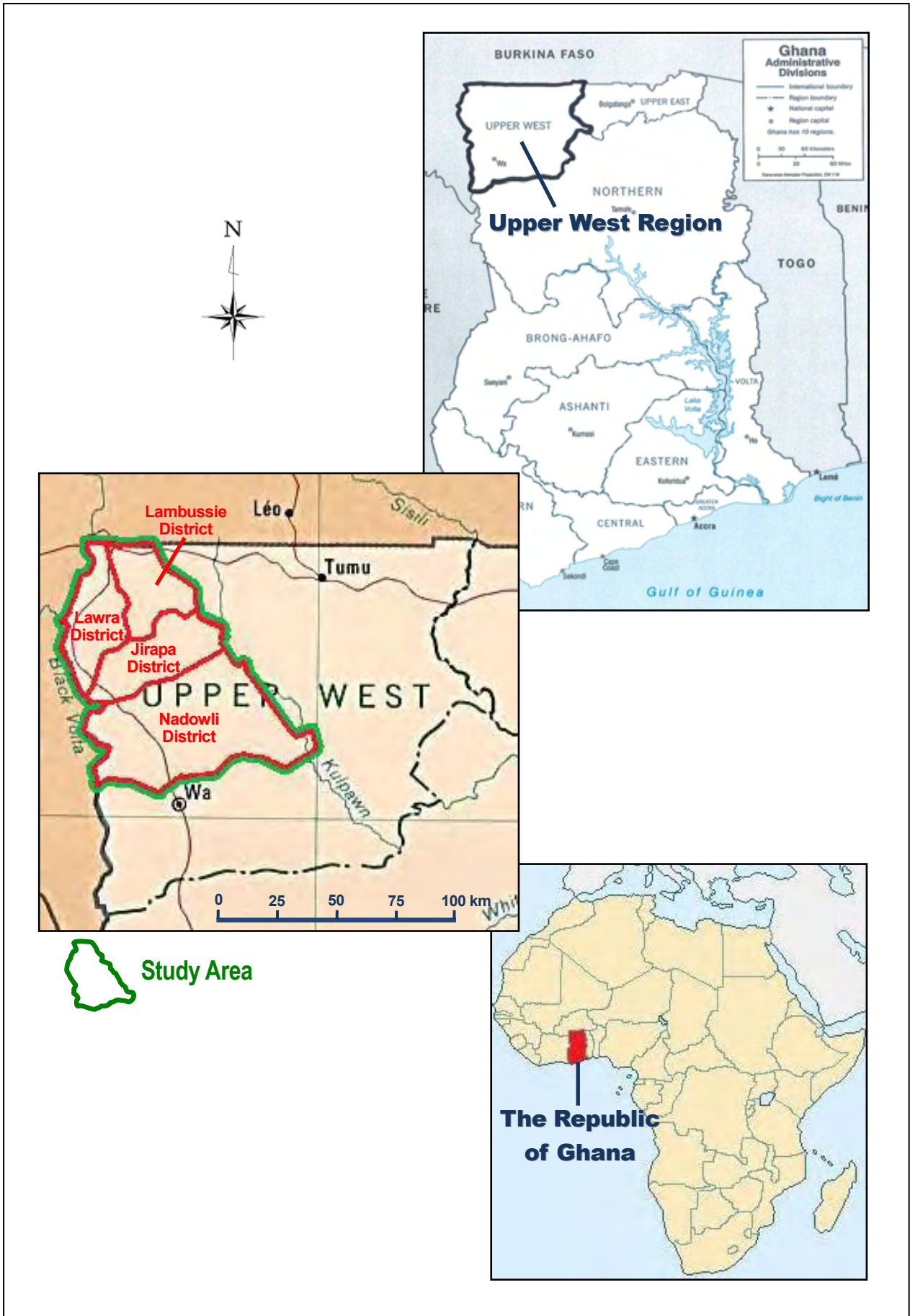
We wish to express our deep appreciation and sincere gratitude to the officials concerned of your Agency and the Ministry of Foreign Affairs of the Government of Japan for the courtesies and cooperation kindly extended to us. We would also like to express our gratitude to the officials concerned of the JICA Ghana Office, the Embassy of Japan in Ghana, the Ministry of Food and Agriculture, Upper West regional and district governments, and other stakeholders for close cooperation and various forms of assistance extended to us during the field investigations and studies in Ghana.

Finally, we hope that the Ministry of Food and Agriculture will execute the Master Plan and the proposals for agricultural development projects envisaged in the Final Report for improving livelihood of the people in the Upper West Region.

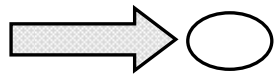
Very truly yours,

Hiroshi Okabe
Team Leader of the Study Team for the Study
on Upper West Integrated Agricultural
Development in the Republic of Ghana

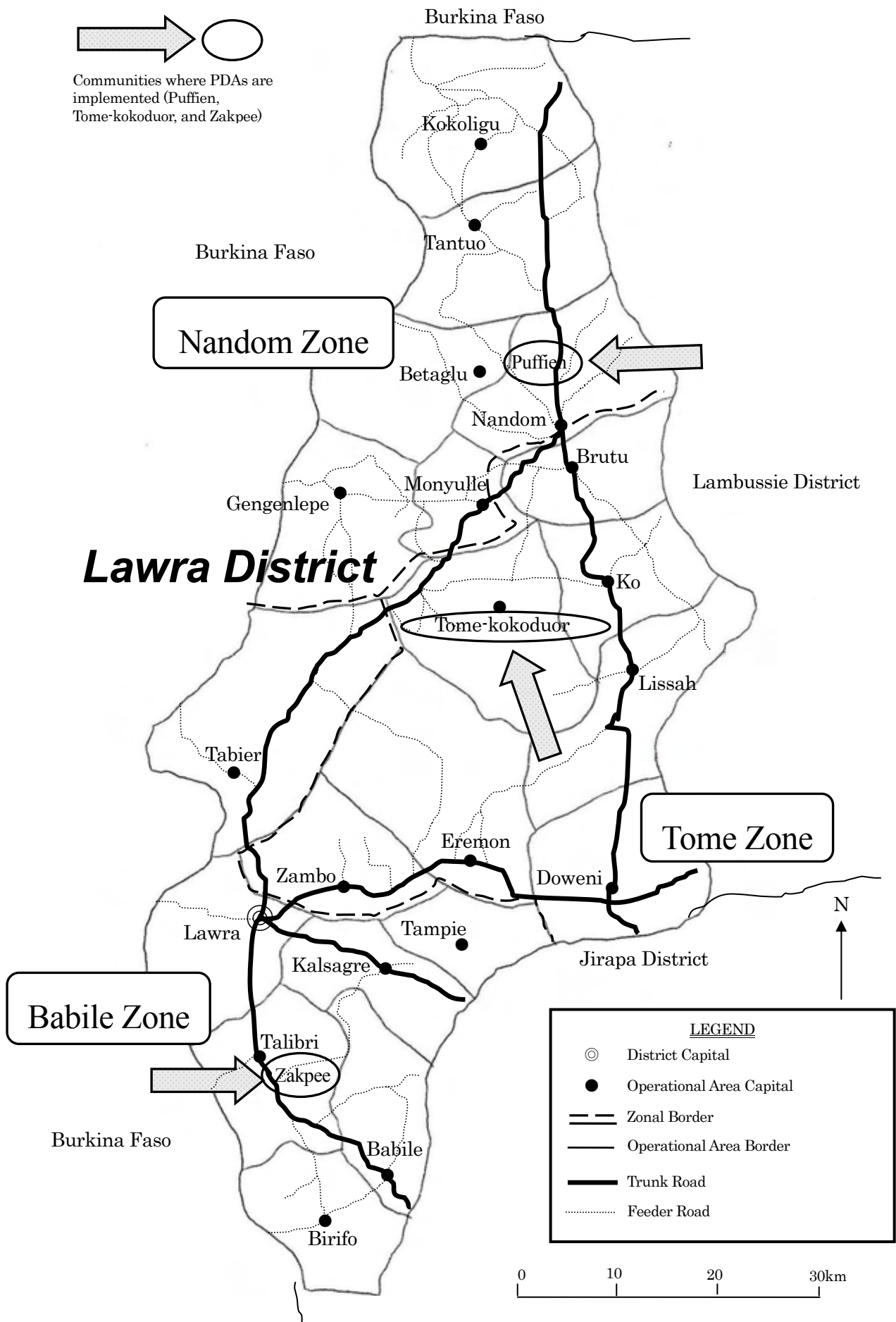
Location Map



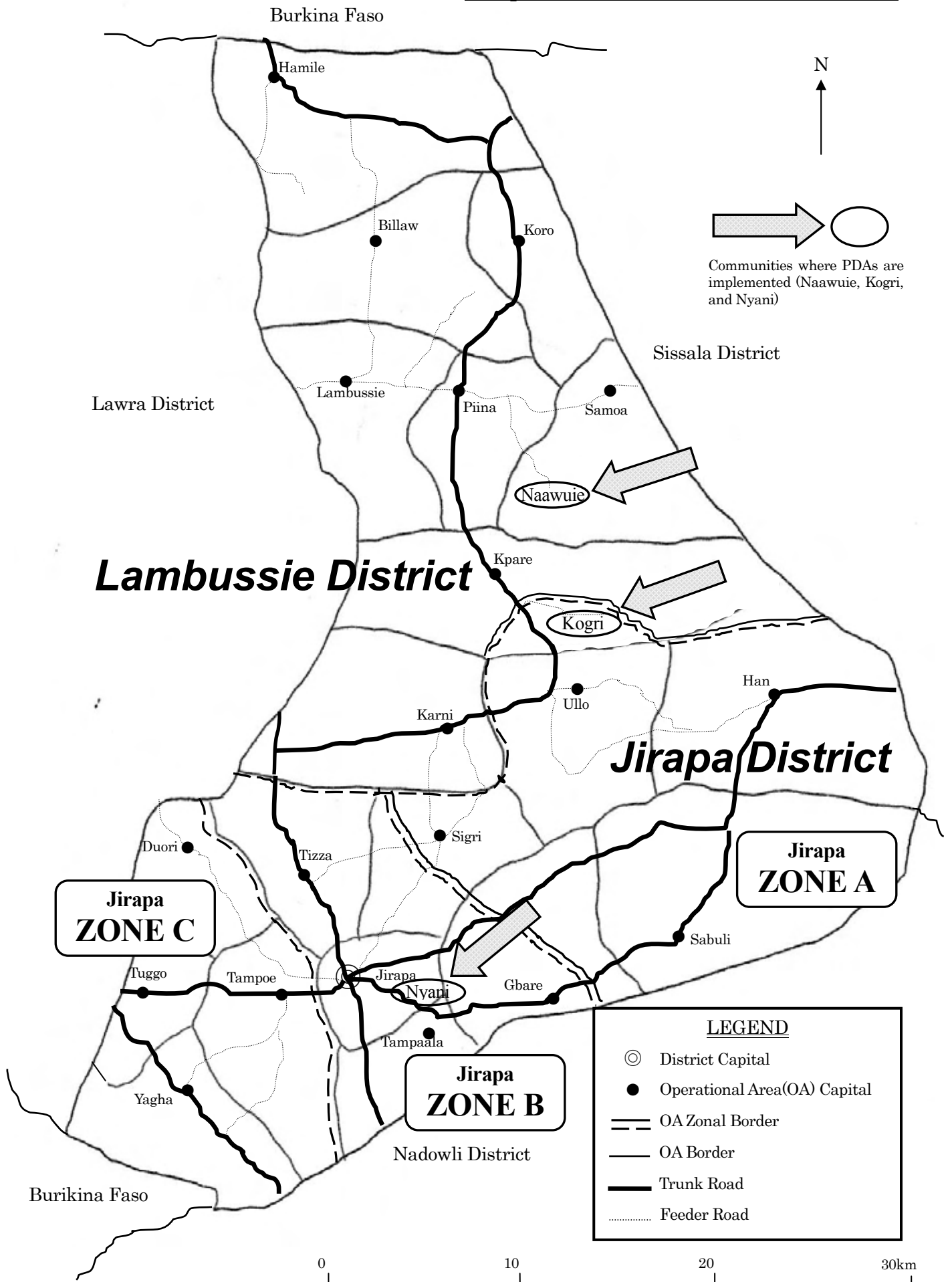
MOFAUWR Operational Areas in Lawra District



Communities where PDAs are implemented (Puffien, Tome-kokoduor, and Zakpee)



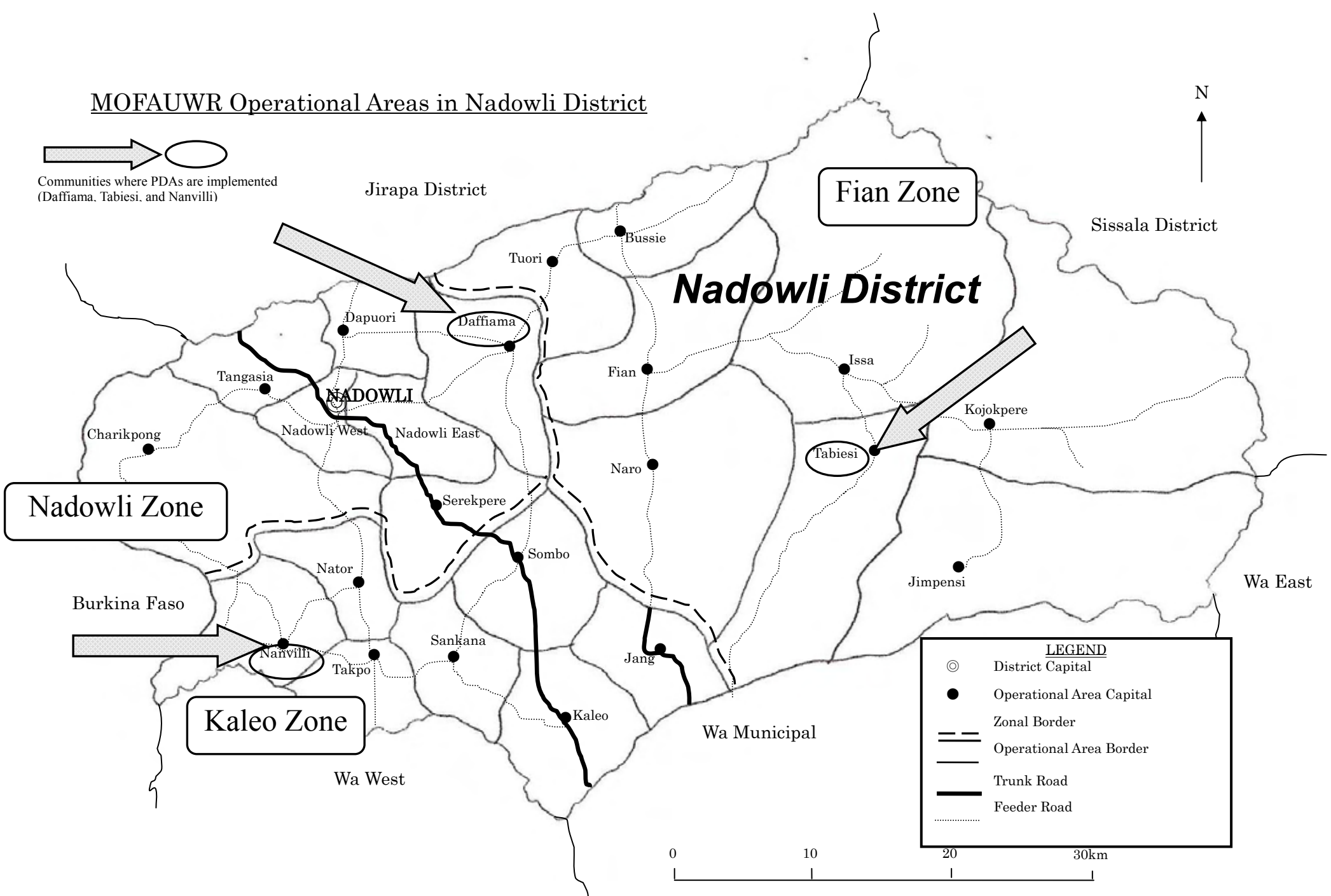
MOFAUWR Operational Areas in Jirapa District and Lambussie District



MOFAUWR Operational Areas in Nadowli District



Communities where PDAs are implemented (Daffiama, Tabiesi, and Nanvilli)



LEGEND

- ⊙ District Capital
- Operational Area Capital
- Zonal Border
- - - Operational Area Border
- Trunk Road
- Feeder Road



Executive Summary

1 Background of the Study

The Study on the Upper West Integrated Agricultural Development (the Study) has been conducted to formulate a Master Plan (M/P) which consists of guidelines for the development and dissemination of agricultural technologies as well as proposals for agricultural development projects. The M/P will be the basis for the agricultural development model that is most appropriate for the area, and the dissemination of that model will help farmers increase their incomes. The Study concentrated on the four districts of the Upper West Region (UWR); namely Lawra, Jirapa, Lambussie, and Nadowli (the Study Area).

2 The Major Problems in the Study Area

2.1 Summary of the Problems

The major problems identified in the Study Area can be summarized as follows:

(1) Unstable Rainfall

The amount of rainfall in the Study Area is less than that in the other areas of the country, and also the current trend of rainfall is more unreliable, irregular and unpredictable. The duration of rain has become shorter, and the amount of the precipitation at one time is frequently either too much (flooding) or too little (drought).

(2) Low Soil Fertility

The soil quality is generally poor in the Study Area. In particular, upland soils are shallow and gravelly, light textured at the surface, and dry up quickly after rainfall. Due to population pressure, the fallow period has become shorter, which further deteriorates soil fertility. The Study Area mostly consists of marginal and fragile land, and therefore low soil fertility is a major constraint for crop cultivation.

(3) Soil Erosion

As a result of the expansion of crop production areas, the vegetation in the area has been degrading. In particular, the northern part of the UWR, where slopes are steeper and population pressure is higher than in other parts, soil erosion is a more serious problem.

(4) Traditional Technologies

The farming practices are traditional methods such as mound ridge, and they are further constrained by the lack of inputs. A small quantity of certified seeds is produced in the area, but they are seldom used. Little chemical fertilizer is used because the prices are beyond the farmer's reach. Organic materials such as animal dung are available but not sufficient in quantity, and also due to lack of awareness, organic fertilizer is not used. As a result, crop productivity remains low.

(5) Huge Post-harvest Loss

The harvested crops are dried on various materials or even directly on the ground, and then the crops are stored before they are adequately dried or without properly sealing the storage facilities. As to storage, the problem of weevils is also often seen, particularly for cowpea. Those facts result in huge post-harvest losses of the crops. According to a MOFA document, “post-harvest losses of agricultural produce in Ghana have been estimated conservatively to be between 10 and 20%.” Thus the issue of post-harvest loss should be taken into account if the food shortage problem is to be solved.

(6) Low Production of Main Food Crops

The main food crops cultivated are drought-resistant, such as sorghum, millet, etc., which are generally less productive than the other food crops prevailing in the country. The cultivation areas, the production volumes, and productivity of sorghum and millet have been decreasing. In addition, rainfall and its patterns fluctuate every year, which significantly affects crop production volumes in an unpredictable way.

(7) Low Selling Prices of the Products

The farmers receive a low price for their products at harvest time, and later have to pay much higher prices when they buy food. The farmers are usually in need of cash, and therefore cannot afford to wait until a favorable moment to sell their products comes.

(8) Low Profits from Livestock

Livestock is important as an income source, and also for various socio-economic aspects. Most of the people however regard livestock rather as a safety net than as an income source. Sufficient attention is therefore not given for rearing livestock, which leads to low profits from the sales of livestock. The number of livestock has recently decreased, and the main reasons may be lack of feed and water in the dry season, diseases such as swine fever, theft and inadequate technical training.

(9) Limited Income Sources

It is estimated that over 80% of the economically active population is engaged in the agriculture sector in the Study Area. The majority of agricultural production comes from small-scale farmers since more than 60% of the farm-holders farm less than two hectares. Other industries or other income sources are seriously underdeveloped.

(10) Extremely Limited Extension Services

Although the core of agricultural extension is MOFA and the AEAs, their services are extremely limited. The main problems are: (i) the number of the AEAs is far below needed; (ii) there is a lack of resources for extension activities; (iii) the access to necessary information is limited for the AEAs; and (iv) the AEAs are rarely trained for acquiring updated skills and knowledge.

(11) Food Shortages

Thirty-four percent of the population in the UWR is food insecure, which refers to those who have “very limited access to sufficient and nutritious food necessary for an active and healthy life”. The ratio for the UWR is the highest among the regions in the country. In addition, the incidence of poverty has been increasing only in the UWR and Upper East region. Poverty can therefore be considered in relation to people’s inability to obtain enough food to meet their nutritional requirements.

(12) Low Incomes

As a result of the above problems, the income level of the UWR is the lowest in Ghana. The national average annual household income is GHS 1,217 and the national average annual per capita income is GHS 397. On the other hand, those figures for the UWR are GHS 606 and GHS 106, respectively. In particular, the UWR’s per capita income is less than a third of the national average per capita income.

2.2 Links among the Problems

The cause-effect relationships of the above-mentioned problems can be linked as shown in Figure 2.1. From the figure, the core problems in the Study Area are interpreted as food shortages and low incomes.

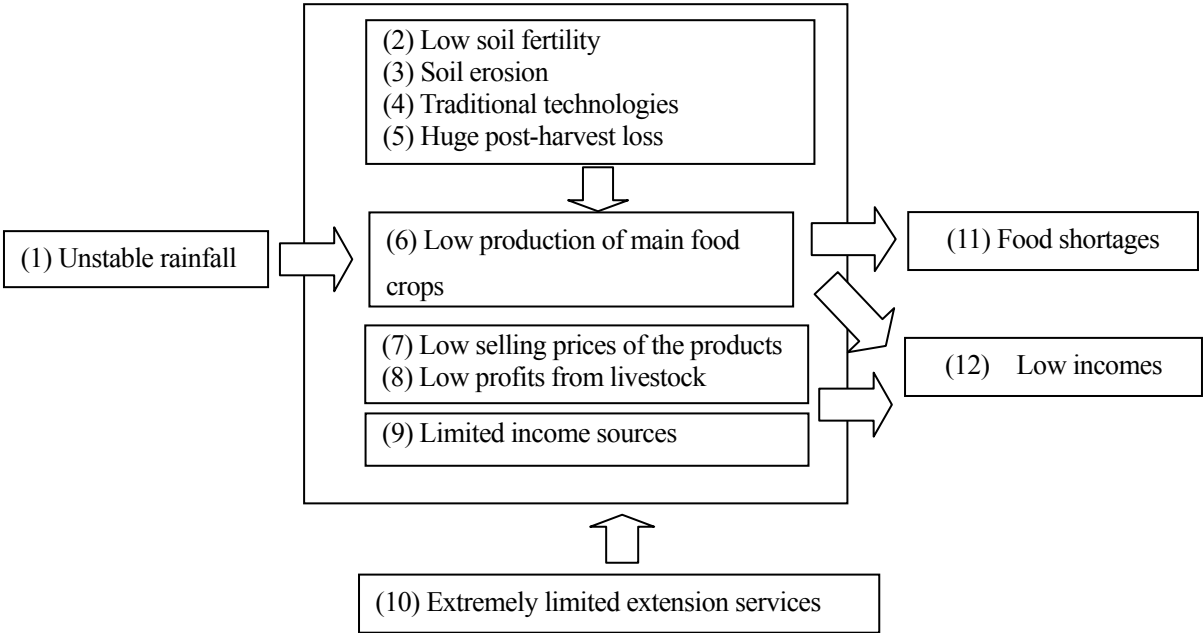


Figure 2.1 Links of the Problems Identified

3 Basic Framework of the Master Plan

3.1 Preparation of the Master Plan

The M/P for agricultural development of the UWR has been prepared in the following sequence:

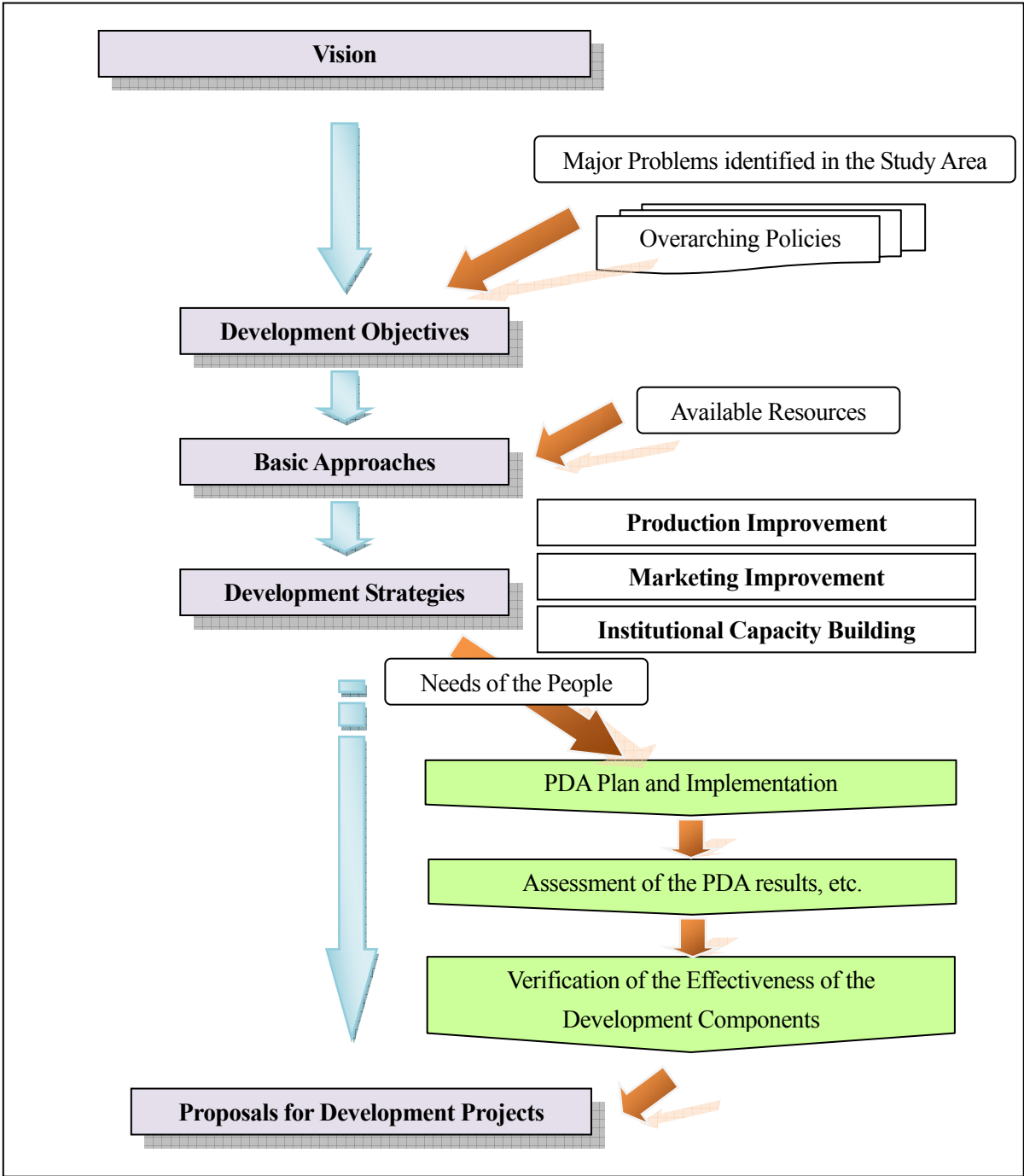


Figure 3.1 Flow of the Master Plan Preparation

As shown in the above figure, the M/P has been prepared, being composed of guidelines for the development and dissemination of agricultural technologies as well as proposals for agricultural development projects; that means the vision, development objectives, basic approaches, development strategies, proposed technologies and measures, and proposals for development projects. The development strategies are composed of the strategies for production improvement, marketing improvement, and

institutional capacity building. The proposals for the development projects have been made based on the assessment on the results of the PDA implementation, related documents and knowledge of the Study Team and the counterparts. The effectiveness of the development components have been verified, and the results have been reflected in the proposals for the development projects.

3.2 Vision for Agricultural Development

For the preparation of the M/P, the vision for agricultural development has been set as follows, coinciding with the vision of the Regional Agricultural Development Unit (RADU) - UWR:

Improve livelihood of farmers through transfer of appropriate technologies

3.3 Overarching Policies

The overarching policies for the M/P can be found in (i) the Growth and Poverty Reduction Strategy II (GPRSII) (2006-2009), and (ii) the Food and Agriculture Sector Development Policy II (FASDEPII) (2007). Food security and increasing income levels are the central focus of those policies. Each MOFAUWR district office accordingly prepares the district agricultural development plan.

3.4 Development Objectives and Basic Approaches

3.4.1 Development Objectives

The UWR is the region with the highest level of poverty incidence in Ghana, and has an extremely large number of households that cannot produce enough foods for themselves. The agricultural development for the UWR needs therefore to focus directly on both ensuring food security and increasing people’s incomes. Thus those two issues, namely food security and increasing incomes, are considered as the development objectives. It can be interpreted that “improving the livelihood of farmers” as stated in the Vision means to help farmers secure enough food and increase their income.

Development Objectives
1. Food Security
2. Increased Income

Improvement of Livelihood =
Securing Food and Increasing Income

3.4.2 Basic Approaches

Based on the major problems and available resources in the Study Area, the vision, and the overarching policies, the basic approaches to be taken for attaining the development objectives are as follows:

(1) Food Security

- a) Food will be made available by increasing the production of staple food crops.
- b) Production will also be increased by reducing post-harvest loss of the crops.
- c) The crops to be focused on in the M/P will be selected based on the production efficiency and preference of the people in the area.
- d) The production area for the crops will be mainly the upland area, where low-productive and other economic activities are not easily possible.
- e) The production volume, which should be increased, will aim to meet the volume required by the people in the area, taking the average consumption level in the country into consideration.
- f) The food security issue will be emphasized more for the northern side of the Study Area, where less rainfall, lower fertility, and less productive than other parts.

(2) Increased Income

- a) The income will be increased from the current income sources, namely crop production, livestock and processed items.
- b) For the income generating activities to be focused on in the M/P the following will be selected:
 - for crop production, the current soil-crop suitability and potential for improvement of productivity and marketability will be emphasized. The potential to expand cash crop production at the fertile area and/or with irrigation where possible in the dry season will be considered.
 - for livestock, diversification of animals to be reared will be considered as a precaution against the outbreak of diseases. For the selection of the animals, the potential for improvement of efficiency of fattening and breeding of the animals will be emphasized.
 - for processed items, the potential for improvement of productivity and value added to the products by improving agro-processing technologies will be emphasized.
- c) The degree of potential income increases will be discussed based on the current per capita income of the regions, i.e. GHS 106.
- d) The issue of increasing incomes will be more emphasized for the southern side of the Study Area.

3.4.3 Target Years

The final target year of the M/P has been set at 10 years after the commencement of the implementation. The period is divided into two phases, the mid-term (5 years) and the long-term (10 years) for making the development schedules and goals clear. To coincide with the plans described in the Agricultural Sector Plan 2009-2015 of MOFA, the year 2015 should be considered as the target year for the mid-term development goal of the M/P. Therefore, the target year for the long-term goal should be 2020.

3.5 Agricultural Development Strategies

Based on the above-mentioned basic approaches, agricultural development strategies have been developed for attaining the development objectives. These strategies are intended to make clear the technologies and measures to be introduced or extended in the Study Area for crop production, livestock development, processing, and marketing improvement. The agricultural development strategies also indicate the institutional capacity necessary for smooth implementation of the M/P.

3.5.1 Strategy for Food Security

The following two strategies have been developed to enhance food security for the people:

(1) Stabilization of Crop Production

Issues: Crop production in the Study Area has been largely affected by recent climate changes, particularly irregular rainfall. The upland area is especially vulnerable to drought since the soils are sandy and water retention level is low. Countermeasures against the irregular rainfall should be made for stabilizing crop production.

Strategies: The technologies that can help stabilize crop production should be applied. Those technologies include introduction of drought-tolerant varieties, environmentally-sound farming systems, water harvesting systems, etc.

(2) Reduction of Post-harvest Loss

Issues: Most of the farmers cultivate crops for their own consumption. The harvested crops should be kept until the next harvest time. It is however observed that the farmers do not pay much attention to post-harvest loss, which is generally huge.

Strategies: The technologies for the proper drying and storage of their foods should be applied.

With the above strategies, it is expected that the farmers increase the total volume of crops that they can produce, consume and obtain for surpluses. Part of such surpluses can be sold and thus generate income for the farmers.

3.5.2 Strategy for Increasing Incomes

The following three strategies have been developed to increase income for the people:

(1) Increase of Productivity

Issues: The area is generally characterized by low crop productivity because of traditional farming practices, low soil fertility and erratic rainfall. The hydromorphic zone and the valley bottom area should receive more focus for increasing productivity since soil fertility and access to irrigation water are better than in the upland area.

Strategies: Technologies to improve productivity such as appropriate cultivation methods and crops, introduction of marketable crops or varieties, etc. should be applied.

(2) Diversification of Income Sources

Issues: Most of the community people in the area rely on limited agriculture-related income sources. Since agriculture depends on rainfall, the income of the people fluctuates and is unstable. It is necessary to diversify income sources whatever possible for the people.

Strategies: As it is difficult to generate much income from the production of staple crops, the focus should be placed on the technologies related to vegetable production, livestock development and processing.

(3) Improvement of Marketing

Issues: The agricultural products and livestock are usually sold at the local markets if they are not sold to middlemen coming to or residing in the communities. At those markets, the prices fluctuate significantly depending on the seasonal balance of supply and demand. Most of the community people sell their products immediately after harvesting when the prices become low, or sell their livestock in case of emergency regardless of the prices, since they cannot afford to wait until the prices become favorable to them. In addition, the people are not generally skilled in negotiating with middlemen. As a result, the people are forced to sell their products or livestock at low prices. The ways of marketing should therefore be improved.

Strategies: The improvement of marketing should be carried out by providing market information more systematically to the producers, organizing the producers into groups, etc.

3.5.3 Strategy for Institutional Capacity Building for Implementation

(1) Capacity Enhancement of MOFAUWR office

Issues: Under the current decentralization policy, the authority for decision-making, including for the planning and implementation of the projects, has been delegated to the districts. Accordingly, the regional office is expected to take the role of coordination and supervision, and the district offices are responsible for technical issues. To ensure that the proposed projects in the M/P are implemented smoothly and the development objectives are attained, the roles of MOFAUWR office at the regional and district levels should be made clear and the capacity of the concerned officers for project management should be enhanced.

Strategies: The roles should be made clear in the Plan of Operations (PO) when a project is to be implemented, and the implementation and management capacity of the concerned officers should be enhanced through the training on the related subjects and also the on-the-job-training (OJT) in the project implementation.

(2) Extension Improvement

Issues: The current extension of agricultural technologies is mainly undertaken by MOFA through the AEAs and DAOs. MOFA's extension services, however, have serious constraints as mentioned. Nevertheless, the initiative for the extension services should be taken by MOFA. If that is difficult, the community leaders should instead be responsible for the extension activities in their own communities with the assistance of the AEAs. There are only 32 AEAs in the four districts while

there are about 550 communities that need to be covered. Therefore, the capacity building of the AEAs and the community leaders, and the improvement of the current extension system are strongly needed.

Strategies: The capacities of the AEAs and the community leaders necessary for disseminating the technologies should be enhanced through the training on the related subjects and also the on-the-job-training (OJT) for the AEAs as well as on-the-farm-training (OFT) for the community leaders in the extension activities. The current extension system should be improved by developing the ways to utilize the community leaders as well as the people more effectively.

3.6 Key Concept of the Master Plan

Based on the discussion above, the key concept of the M/P can be visualized as shown in Figure 3.2.

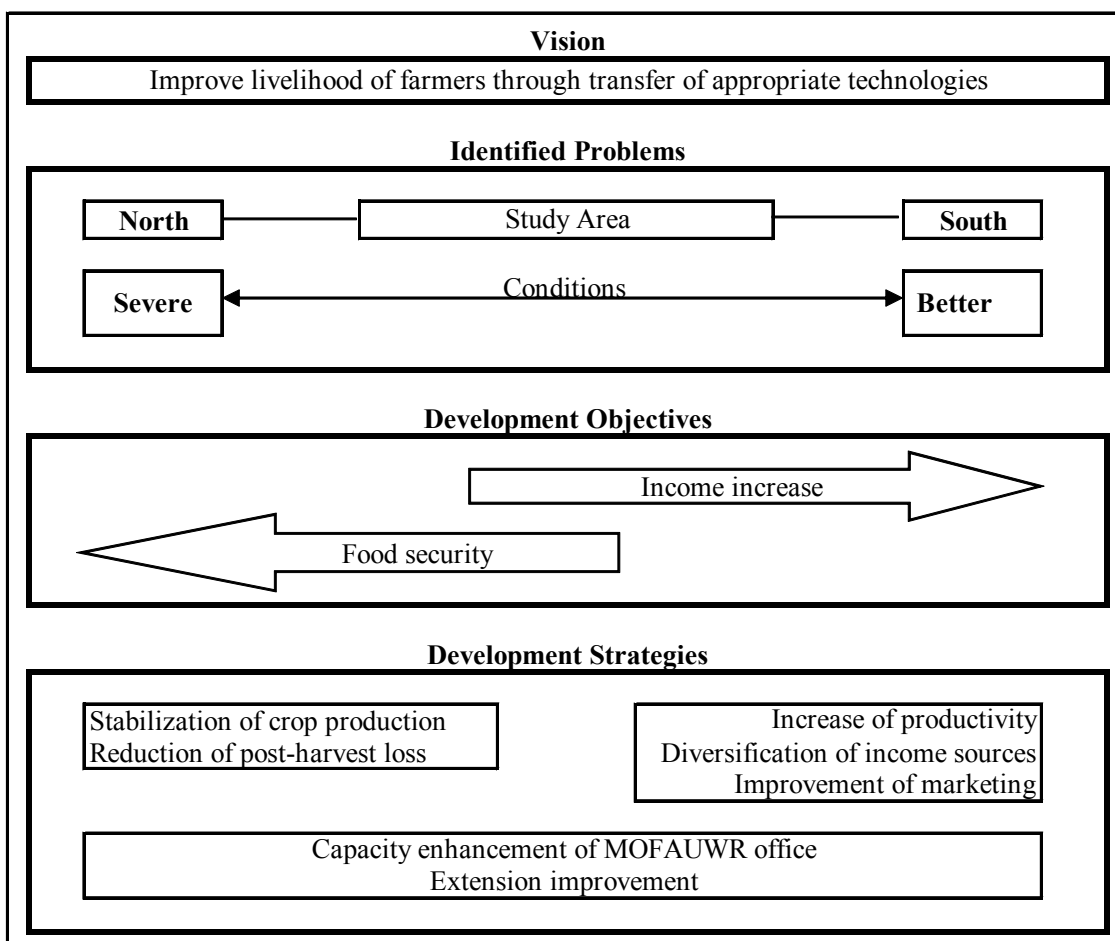


Figure 3.2 Key Concept of the Master Plan

4 Main Development Components in the PDAs

The PDAs were planned and implemented in 9 communities. The main development components included in the proposed PDAs are summarized in Table 4.1 in relation to the development objectives and strategies.

Table 4.1 Main Components in the Proposed PDAs

Development Objectives	Development Strategies	Main Development Components included in the Proposed PDAs
Food security	Stabilization of crop production	- Production of staple food crops
	Reduction of post-harvest loss	- Post-harvest loss reduction
Increase of Incomes	Increase of productivity	- Compost making
	Diversification of income sources	- Production of vegetables in dry season as cash crops (with small-scale irrigation) - Promotion of locally-characterized products (with small-scale irrigation) - Pig breeding and fattening - Small animals and birds rearing - Processing agricultural and forest products
	Improvement of marketing	- Organization of the farmers into groups
Institutional capacity building	Capacity enhancement of MOFAUWR office	- Clarification of roles and responsibilities - Monitoring and evaluation
	Extension improvement	- Involvement of community people in PDA implementation

5 Verification of the Development Components

Based on the assessment on the results of the PDA implementation, the related documents, and the empirical knowledge of the Study Team and the MOFA counterparts, the proposed development components are verified particularly to what extent each component will be able to contribute for attaining the development objectives in the M/P.

5.1 Expected Results by the Implementation of the Development Components

5.1.1 Staple Food Crop Production

Table 5.1 Expected and Achievable Yields of the Staple Food Crops
(unit: kg/ha)

Crops	Lawra	the Other Districts	Condition
Expected yields in the short term			
Sorghum	1,000	1,200	Non-application of either compost or chemical fertilizer
Cowpea	500	600	
Lowland Rice	2,500	2,500	Application of chemical fertilizer (15-15-15 at 133kg/ha)
Achievable yields*			
Sorghum	1,500	1,500	Application of chemical fertilizer
Cowpea	1,250	1,250	
Lowland Rice	3,500	3,500	

(Source *: Agriculture Sector Plan 2009-2015, MOFA 2009)

Based on the results of the PDAs, the staple food crops to be included in the M/P should be sorghum, cowpea, and lowland rice. As shown in Table 5.1, the expected yields of those crops, which can be attained within the short-term (5years) by the implementation of the development components at the

farms in the Study Area, are estimated. The expected yields of sorghum and cowpea should be different between Lawra and the other three districts since the climate condition in Lawra is harsher than that in the other districts. The achievable yields, considered as the maximum level that can be obtained with the use of chemical fertilizer, are also indicated in the table.

5.1.2 Post-harvest Loss Reduction

The results of the PDAs are yet to be known. Nevertheless, the sort of simple but improved technologies adopted in the PDAs are expected to have a certain impact on the reduction of post-harvest loss compared with the traditional methods employed by the farmers. In sum, this component will consist of the following activities:

- Harvested and dried gains are to be stored in a double-layered sack consisting of a polythene inner sack that is sealable and a fertilizer sack as an outer cover.
- Before storage, two treatments are to be made to the grains. The grains for food should be sterilized by solar heat on polythene sheets, and the grains for seeds are to be enclosed with a fumigant in a sack.
- Those sacks are to be kept in the existing individual granaries.

5.1.3 Vegetable Production

Based on the results of the PDAs related to vegetable production and the average and achievable yields in documents, the expected and achievable yields for the vegetables are indicated in Table 5.2.

Table 5.2 Expected and Achievable Yields (ton/ha)

	Average Yield in Ghana (2007)*	Yield in Dry Season 2009	Yields in the PDAs (control plot)	Expected Yields	Achievable Yields***
Tomato	5.29	9.52**	18.53	16.2	35.0
Pepper	0.63	-	4.54****	1.1	15.0
Eggplant	3.75	-	8.10	6.4	15.0
Okra	5.54	-	-	9.4	-
Onion	7.68	-	-	11.0	-

(Source *: FAOSTAT 2007, **: Estimated from a tomato garden in Daffiama community, ***: Agriculture Sector Plan 2009-2015, MOFA 2009, ****: fertilizer and pruning)

The expected profit is calculated for tomatoes assuming that a farmer cultivate tomatoes in the average-sized area of 100 m² with the improved technologies. As the current yield (with the current cultivation method) of tomatoes was 9.52 ton/ha at a tomato garden in Daffiama community, the farmer should be able to harvest 95.2 kg of tomatoes a year. The average price of tomatoes in January 2008 was GHS 26.3 per crate (52 kg), which means that the farmer can produce tomatoes equivalent to GHS 48.2 a year. When the expected yield, 16.2 ton/ha, is achieved, the income will be increased to GHS 82. The difference in income is GHS 34. This indicates that the break-even point will be at the fourth year; a total income increase of GHS 136 versus total costs of GHS 130 for 4 years.

5.1.4 Melon Production

A farmer can generate a net profit of GHS 792 a year from producing melons in a cultivation area of 864 m². It is estimated that the initial cost of GHS 1,082 and the variable costs will be recovered by the third year from the sale of melons.

5.1.5 Pig Breeding and Fattening

(1) Community-based Pig Breeding

Assuming 1 boar and 3 sows are provided, and each sow delivers 8 offsprings every 6 months as experienced by the Babile Pig Breeding Station, this sort of pig breeding will reach the breakeven point after 5 and a half years from the commencement. A profit of GHS 460 can then be accrued every year.

(2) Household-based Pig Breeding and Fattening

If 1 boar and 2 sows are provided for breeding and the litter size is expected to be 8, it is expected that it will reach the breakeven point in 6 and a half years after the commencement, and then an average profit of GHS 240 a year can be expected. If the pigs are to be fattened, feed efficiency needs particular attention. Based on the PDAs, the feed efficiency was found to be 33%. This means the weight of a pig will reach 30kg at 180 days if 0.5kg of feed is given every day. The gross profit from selling a pig will be about GHS28.

5.1.6 Small Animals and Birds Rearing

(1) Guinea Fowls

The gross profits of about GHS 360 for 3 years or about GHS 120 per year can be expected from the guinea fowl rearing with the assumptions below.

- A female guinea fowl hatches 75 eggs (25 eggs x 3 times) per year. A guinea fowl can lay eggs at least for 3 years.
- An adult guinea fowl eats 350g of the compounded feed per week.
- A young guinea fowl eats an average of 200g of the compounded feed per week for 6 months until it is ready for hatching eggs or for sale. 85% of the hatched fowls survive.
- A quarter of the hatched guinea fowls are grown for sale.

(2) Rabbits

The gross profits of about GHS 240 for 3 years or GHS 80 per year can be expected from the rabbit rearing with the following assumptions:

- A female rabbit delivers offsprings at least 3 times a year with a litter size of 8 to 10 at each time. It continues to deliver offsprings at least for 3years.
- An adult rabbit eats 350g of the compounded feed per week.
- After the weaning period, a young rabbit eats an average 200g of the compounded feed per week for 3 months until it is ready for pregnancy or for sale. 85% of the young rabbits survive.
- A half of the offsprings are grown for sale.

5.1.7 Agricultural and Forest Product Processing

As for groundnut oil production, it is still not yet clear whether processing groundnut into oil and kurikuri is profitable or not. Regarding shea soap making, it is expected that a women's group can generate about GHS 40 per week. As can be seen, the expected profit from shea soap is not significant, thus, it should be considered as a secondary income source for the women that they can obtain by making use of their spare time.

5.2 Necessary Marketing Improvement

Based on the results of the PDAs, the improvements in the farmers' marketing capabilities to be included in the M/P are described below.

(1) Systematic Consolidation and Provision of Market Information

MOFAUWR's current system for collecting and providing information to the farmers should be strengthened. The regional officers at the Monitoring and Evaluation Unit, the district Monitoring and Information System Officers (DMISO), the marketing enumerators, DAOs, and AEAs should be trained in the areas of market structures, marketing analysis and strategies, market networking, etc. In addition to the above, more intensive exploration of new market channels should be facilitated by communicating with the related agencies, private-sector actors, NGOs, etc.

(2) Organization of the Farmers into Groups

Organizing the farmers into groups will increase the production volume of certain crops. It will then become easier to attract traders to come to the communities, or for the farmers to collect and transport their crops to markets. In addition, if a group is strongly united, there are still other advantages; for example, farmer-to-farmer extension will be much smoother, conflict management will be much easier, financial management will be more secure, technologies and knowledge will be shared within the group, etc.

(3) Improvement of Negotiation Skills of the Producers

The farmers need to be equipped with skills to negotiate with traders (both buyers and suppliers) so that they may increase their gains from transactions.

5.3 Effects on Food Security

With appropriate agricultural technologies, the yields of sorghum, lowland rice, and cowpea can be increased. Those technologies include the use of improved seeds, ridging, appropriate crop density, etc. When the technologies are spread into the whole Study Area, the effects will be seen in the increase of the production, which can be indicated as kg per capita per year. The group of the activities intending to increase the production of sorghum, lowland rice, and cowpea is called "the project for staple food production".

With the project, the average cereal production in the Study Area is expected to increase from 70.2 to 164.5 kg/capital/year, which will be much higher than the average consumption in Ghana. The

average production, including pulses, will be increased from 132.6 to 246.5 kg/capita/year, which will be double the average consumption in Ghana. Particularly in Lawra, where the food security issue is more serious than in other areas, the effect of the project on production increases will be more significant as it is indicated that the increase will be from 93.9 to 184.6 kg/capita/year. Therefore, it can be assessed that the project will eventually bring substantial effects on food security.

5.4 Effects on Income Increase

5.4.1 Project for Staple Food Crop Production

(1) Effects on the Study Area

The effects of the said project on income increases are estimated with the assumption that the increased production of the above crops is entirely sold. The prices of each crop are the average prices in 2008 at the markets in the Study Area, and the other data is based on the results of the Baseline Survey. As a result, the average income obtained from crop production will increase GHS 71 per capita and from GHS 90.3 to 161.3 in the Study Area.

(2) Effects on the Communities

To assess the effects of the project at the community level, the communities are classified into the types according to their characteristics based on the data obtained from the Baseline Survey. With the implementation of the project, in all the communities except for one type where crop productivities are at the lowest in the Study Area, the per capita production of the crops will exceed the average consumption of the country, 124.6kg/capita/year. Thus, it can be said that for the communities where crop productivities are at the lowest, the project is not able to bring per capita production up to the national consumption level although it will increase crop production by 50%. Those communities will need additional interventions, such as the provision of chemical fertilizer, to stimulate crop production. Nevertheless, for any other communities, it can be expected that crop production will be increased by 80 to 150%. It will ensure food sufficiency of the communities, and moreover, the surpluses can be sold and turned into income for the farm households. The surpluses will also be used for the production of pito or other agro-processing products, animal feed, compost, etc.

5.4.2 Project for Cash Crop Production

The effects of the “project for cash crop production”, which includes vegetable and melon production, are assessed by income increases of the farmers cultivating vegetables in the Study Area. The planted area of the vegetables was estimated based on the cultivable areas. The expected yield of tomatoes is 16.2 ton/ha with the project, and if this is achieved, income will be increased by GHS 34. The number of the farm households cultivating vegetables is about 1,300, or 3% of the total farm households in the Study Area. They will be the beneficiaries of the project. Another project component is melon production. If a farmer grows melons successfully on a one-quarter-acre farm, a gross profit of GHS 962 per year will be generated.

5.5 Assessment for Institutional Capacity of MOFAUWR

For smoothly implementing the M/P and ensuring that the above effects are realized, the institutional capacities of the MOFAUWR regional and district offices need to be strengthened as follows:

5.5.1 Project Implementation and Management Capacity

To effectively implement and manage the projects proposed in the M/P, there are several issues that need to be focused in the MOFAUWR office. The following is the issues and the countermeasures for them:

(1) Streamlining of Roles and Responsibilities

The roles and responsibilities of the MOFAUWR office should be streamlined. The regional office should focus more on supervision as well as coordination of the district offices and the other related agencies, and the district offices should concentrate more on directly assisting the communities. The concept of decentralization should be explained by MOFA Headquarters' responsible officers, and then the officers and AEAs of MOFAUWR should discuss practical ways to streamline their roles and responsibilities.

(2) PDCA Cycle

A project always requires monitoring, reporting and taking necessary actions. The MOFAUWR office should have such system, and therefore strengthen its capacity for properly executing the plan-do-check-action (PDCA) cycle and taking immediate action in the project implementation. All the related MOFAUWR offices should allow the officers and AEAs to take necessary actions immediately when they become necessary. Awareness of the concerned officers and AEAs should also be established for enabling that. Through the training and discussions, an appropriate PDCA-cycle system should be established, and in addition, the budget for transportation necessary for project implementation should be prepared.

(3) Communication

The MOFAUWR office and concerned officers and AEAs should be well informed and coordinated for the implementation of the projects. It should be remembered that lots of livestock brought into the communities died particularly at the initial stage. This would have been avoided if communication between the responsible officers and AEAs within MOFAUWR had been smoothly made. To make sure that it is, communication between the offices, and between the offices and the AEAs should be facilitated by assigning the responsible officers for communication at the regional office and each of the district offices.

(4) Participatory Development

The concerned officers and AEAs should develop their capacity as the promoters of participatory development, that is, the facilitators for mobilizing the community people for planning, implementing, monitoring, and other necessary actions for the proposed projects.

5.5.2 Extension Improvement

Through the Baseline Surveys, the questionnaire survey to AEAs, and the PDA implementation, the ways to improve the current extension services have been identified as described below.

(1) Main Actors of Extension

AEAs should be the main actors for the dissemination of agricultural technologies. In addition to AEAs, the community leaders should also be main actors for extension. Through the PDA implementation, it was confirmed that the involvement of the community leaders was effective and essential for transfer of the technologies.

(2) Extension Approach

In the current extension services, MOFAUWR officers and AEAs usually contact some selected farmers for disseminating agricultural technologies to the people in the communities. The farms of those farmers are basically used as the demonstration plots and trainings are given to them. They are called as the cooperating farmers. To disseminate the technologies wider and faster to the community people, the people themselves should be involved more actively in the extension activities. To realize this, a more effective extension approach should be considered, which can be applied to any community regardless of whether AEAs are stationed there or not. Such an approach should also contain the farmer-to-farmer extension, which was verified as being effective in the PDA, to overcome the problems of the shortage of AEAs and funds. In this respect, the proposed approach can be called a “community approach” since it will focus more on the whole community rather than on the selected beneficiary farmers.

As the results of the PDA implementation indicate, the role of the community leaders is crucial for mobilizing the community people. To secure the active involvement of the leaders, it is recommended to organize them into a committee for managing the activities of the community people. It can be named as an “Agricultural Committee” to be responsible for the agricultural development of the community.

(3) Extension Methods

As far as the MOFAUWR is concerned, the demonstration farms and radio broadcasting are the main methods for disseminating agricultural technologies and information to the farmers. Those methods are also well acknowledged by the community people as the means of receiving information on farming technologies and agricultural policies. The demonstration farms have been used commonly for on-farm training (OFT) of the farmers. It is therefore recommended to maintain those methods for the extension though there should be some improvements to enhance their effectiveness. For example, under the current methods, AEAs and demonstration farms are not very visible to most of the community people because of the ways to contact the farmers and set up the demonstration farms. In addition, although AEAs are making efforts to meet as many of the community people as possible, some people have never met the AEA. This suggests that the ways to meet the community people and set up the demonstration farms need to be reconsidered and realized with the funds available.

(4) Effective Use of AEA

MOFAUWR sometimes assigns an AEA to two OAs to be responsible for coping with the problem of the lack of AEA. In such a case, it is difficult for the AEA to take care of two OAs equally, and therefore it is suggested that an AEA take care of the assigned OAs alternatively as the main OA (OA fully in-charge of development process) and the sub OA (OA partly in-charge of development process) from time to time so that all the communities can benefit from the AEA equally. Even if an AEA is assigned to only one OA, the same manner should be applied to the communities in such OA. Furthermore, the management of the MOFAUWR district offices should be improved so that DDAs may manage DAOs and DAOs may manage AEA more effectively.

(5) Capacity Development of AEA, Community Leaders, and Farmers

To ensure the effective functioning of the above approach, the participatory development method should be adopted. AEA need to be familiar with the participatory method, but more than 40% of the AEA, especially younger ones, had not received any training on the participatory method and about 20% had only heard of the term. It is therefore necessary to give them training on this topic. Furthermore, essential subjects such as agricultural technologies, monitoring and evaluation, marketing, etc. should also be included in the trainings. For involving the community people, trainings for the community leaders on the same subjects as above are also important. In addition, training regarding the basics of agriculture should be provided to the volunteer farmers who will be the core persons for the farmer-to-farmer extension in the community. Besides the above training, the capacity building of AEA and community leaders should be considered along with any project activities so that they can learn their roles and responsibilities in a more practical sense.

(6) Incentive Generation for the Farmers

For smooth dissemination of agricultural technologies, it is desirable for farmers to have a natural interest in such technologies and accept them. If the number of interested farmers increases, the technologies will be spread without the need for heavy assistance from the government. It is difficult to keep farmers motivated without incentives, that is, an expectation for generating income. The successful case of introducing onions in the Upper East region suggests that utilizing an attractive local product or technology is a good way for the farmers to be motivated. It is noted that an idea for an attractive local product is unlikely to come out merely from discussions among the community people. It is recommended that the promotion of such product be initiated by MOFAUWR.

6 Proposals for Development Projects

6.1 Major Contents of the Master Plan

The major contents of the M/P are as shown in Figure 6.1.

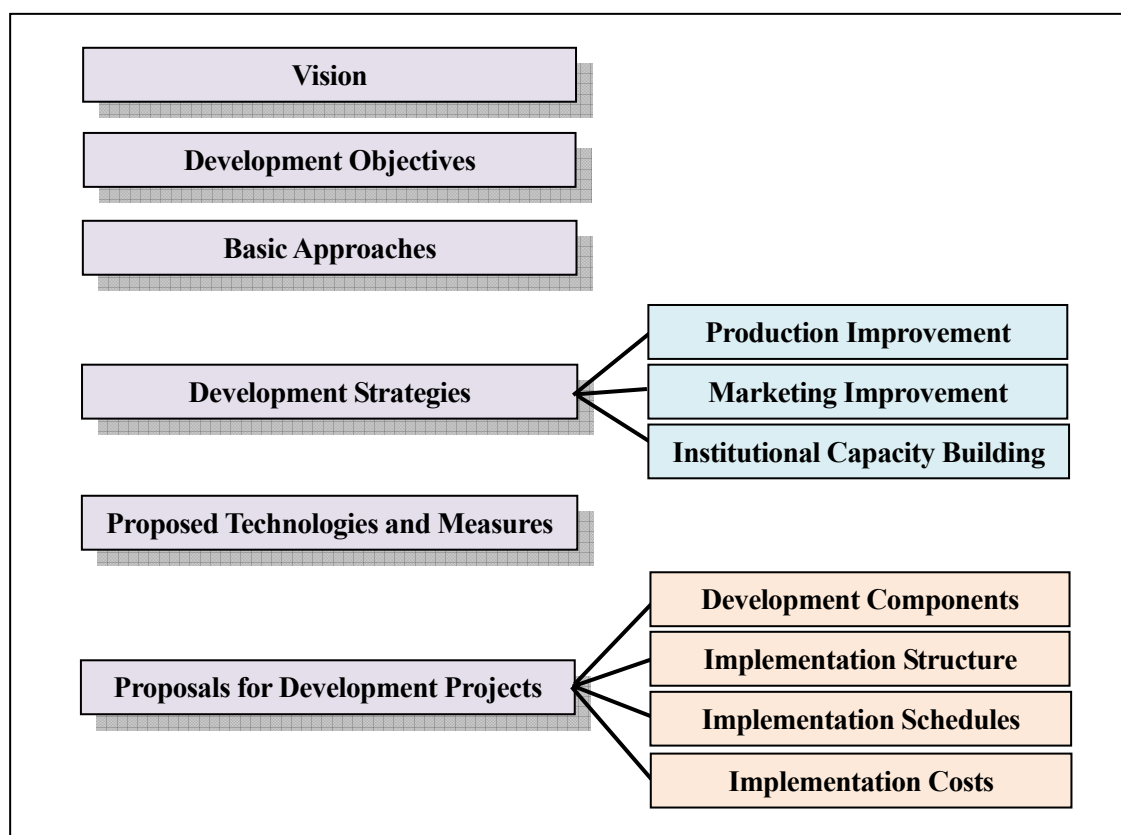


Figure 6.1 Major Contents of the Master Plan

6.2 Summary of the Project Components

The development components to be included in the proposed projects are summarized in Tables 6.1 and 6.2. The development components are divided into three main categories according to their nature: technical, marketing, and institutional. As indicated, some of the technical components are regarded as supplementary since their objective is to support other technical components to enhance their effectiveness. The technical and marketing components aim at either increasing food security or increasing income levels. Each of them should be applied based on the needs of the community people and their agricultural development potential by using a development menu as explained in 6.4.3.

Table 6.1 List of Technical and Marketing Components

Category	Development Component	Description
Technical Component	T-1. Staple Food Production	To increase the production of sorghum, cowpea, and lowland rice, which are staple foods of the area. Such crops are more adapted to the area's climate and are more fertilizer-sensitive than the other staple foods.

Category	Development Component	Description
	T-2. Post-harvest Loss Reduction	To reduce post-harvest loss and eventually increase production volumes by improving crop drying and storing methods
	T-3. Vegetable Production	To increase the production of marketable vegetables such as tomatoes, peppers, okra, onion, etc.
	T-4. Melon Production	To promote the production of melon as a specially characteristic UWR product
	T-5. Community-based Pig Breeding	To promote pig breeding at the community level as a community business
	T-6. Household-based Pig Rearing	To promote pig breeding or fattening at the household level
	T-7. Guinea Fowls and Rabbit Rearing	To promote the rearing of guinea fowls and rabbits
	T-8. Shea Nut Processing	To promote processing activities turning shea nut into shea soaps
Supplementary Technical Component	S-1. Compost Making	To promote the production and use of compost as an alternative to chemical fertilizer
	S-2. Small-Scale Irrigation	To enable small-scale supplemental irrigation using manual operation or simple machines in the areas where possible
Marketing Component	M-1. Marketing Improvement	To enhance marketing capacities by making market information more accessible to the producers, organizing producers into groups, improving negotiation skills, etc.

Among the above, the components aiming to increase incomes are supposed to be implemented with the Benefit Revolving System (BRS). This assumes that MOFA or a development partner principally bears the initial costs necessary to start the project activities while the beneficiaries borrow and purchase the necessary inputs for the activities and then repay the community. By continuing this way, the benefits are expected to revolve within the community.

For the implementation and supervision of the technical components, as well as the dissemination of the appropriate technologies to the other people and areas in the UWR, the following are proposed as the institutional components to be simultaneously planned and implemented with the technical and/or marketing components.

Table 6.2 List of Institutional Components

Category	Development Component	Description
Institutional Component	I-1. MOFAUWR Office Capacity Enhancement	To enhance the capacity of MOFAUWR office for effective implementation and management of the projects
	I-2. Extension Improvement	To facilitate the dissemination of agricultural technologies effectively and efficiently to the communities by enhancing the capacity of AEAs and the community leaders and promoting the community approach

6.3 Project Plans

To effectively achieve the development objectives, the development projects should be formulated and implemented by grouping some of the above-mentioned development components. The following four projects are proposed:

6.3.1 Project for Staple Food Production

The project for staple food production includes the components of staple food production and post-harvest loss reduction. The components of MOFAUWR office capacity enhancement and extension improvement are also included. The objective of the project is food security of the people in the Study Area.

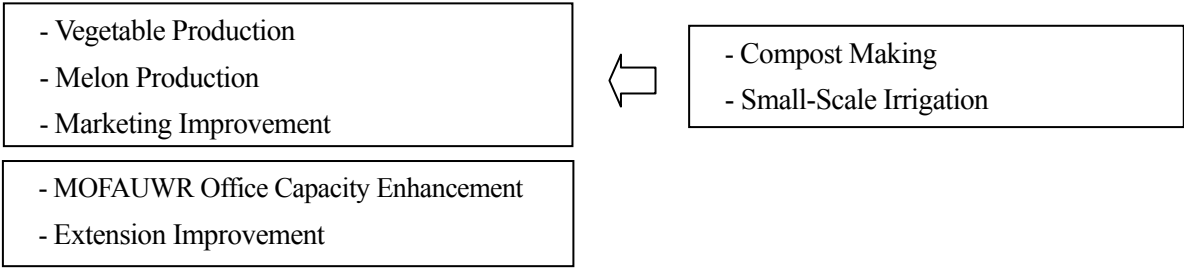
- Development Project 1: Staple Food Production by packaging the following development components:

- | |
|--|
| <ul style="list-style-type: none"> - Staple Food Production - Post-Harvest Loss Reduction |
| <ul style="list-style-type: none"> - MOFAUWR Office Capacity Enhancement - Extension Improvement |

6.3.2 Project for Cash Crop Production and Marketing

The project for cash crop production and marketing is comprised of the components for vegetable production and melon production. The components of MOFAUWR office capacity enhancement and extension improvement are also included in the same way as the project for staple food production. In addition, the component for marketing improvement is also included, and the components for compost making and small-scale irrigation are considered, depending on the necessity of the communities, as the supplementary components. The objective of the project is to increase the income levels of the people in the Study Area.

- Development Project 2-1: Cash Crop Production and Marketing Project by packaging the following development components:



6.3.3 Project for Livestock Development and Marketing

The project for livestock development and marketing includes the components for pig breeding and fattening, and guinea fowl and rabbit rearing. The pig-related components are divided into two: one for community-based pig breeding and the other for household-based pig rearing. The community-based pig breeding is regarded as a community business while the household-based pig rearing is intended for the profits of the individual households. The components of marketing improvement, MOFAUWR office capacity enhancement, and extension improvement are also included as well. The objective of the project is to increase the income levels of the people in the Study Area.

- Development Project 2-2: Livestock Development and Marketing Project by packaging the following development components:

- Community-based Pig Breeding
 - Household-based Pig Rearing
 - Guinea Fowl and Rabbit Rearing
 - Marketing Improvement
-
- MOFAUWR Office Capacity Enhancement
 - Extension Improvement

6.3.4 Project for Shea Nut Processing and Marketing

The project for processing and marketing consists of the component for shea nut processing into soaps since it was only the processing activity identified as profitable. The components for marketing improvement, MOFAUWR office capacity enhancement, and extension improvement are also included as well. The objective of the project is to increase the income levels of the people in the Study Area.

- Development Project 2-3: Processing and Marketing Project by packaging the following development components:

- Shea nut Processing
 - Marketing Improvement
-
- MOFAUWR Office Capacity Enhancement
 - Extension Improvement

6.4 Implementation Structure

6.4.1 Overall Structure

In the implementation structure for the proposed development projects, most of the stakeholders and their functions are the same as the ones for the regular operations of MOFAUWR. The improvement of the current project implementation structure is institutionally needed from two aspects: one for MOFAUWR office's capacity enhancement related to project implementation and management and the other for extension improvement as explained below.

6.4.2 MOFAUWR Office Capacity Enhancement

As mentioned, it is pointed out that MOFAUWR office needs some improvement to effectively implement and manage the projects proposed in the M/P. The following is the main issues for the component:

- 1) Streamlining of Roles and Responsibilities
- 2) Establishment of the PDCA Cycle
- 3) Facilitation of Communication within MOFAUWR office
- 4) Promoting of Participatory Development

6.4.3 Extension Improvement

The extension improvement are proposed as below.

(1) Community Approach

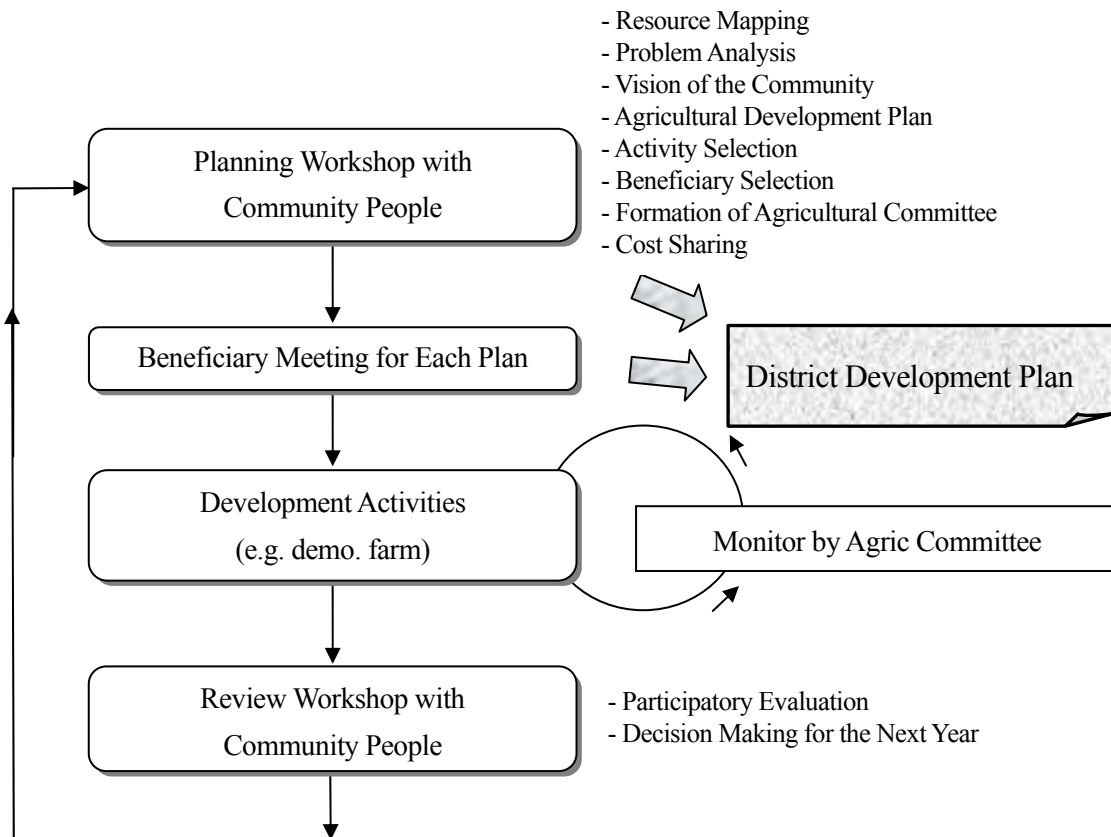


Figure 6.2 Development Process with Community Approach

It is proposed that the below-mentioned community approach be adopted in the extension activities. However, the community approach may not be universally applicable to the communities, and even if it is applicable, the adoption will take place gradually. Therefore, the current extension approach and the community approach may be used concurrently. The community approach is used for the communities that decide to take the process mentioned in Figure 6.2. Otherwise, the current extension approach, the extension through the cooperating farmers, will be applied.

The development process of the community approach is shown in Figure 6.2. The process should be almost uniform in the communities regardless of whether AEAs are stationed there or not. What is different is how to run or manage the development activities such as demonstrations. Where an AEA is stationed, the demonstration activities require the AEA to frequently visit the sites. If an AEA is not stationed in the community, the activities should be run by the community leaders. For any case, the involvement of DAOs and AEAs in the other activities such as the planning workshop, the beneficiary meeting, and the review workshop is essential, and the Agricultural Committee should always be involved in the whole process.

(2) Agricultural Committee

As mentioned, an Agricultural Committee will be established. The members of the Committee will be leaders and others of the community as mentioned above and selected or elected by the community people. The roles of the committee are to host the workshops, manage the demonstrations, and take care of the BRS.

(3) Ways of Extension by OAs

Assuming that an AEA is assigned to work for two OAs and that he or she is stationed in a community in one of the OAs, this OA is considered as the OA fully in-charge (called as “main OA”) and another OA as the OA not fully in-charge (called as “sub OA”). For a community in the main OA, the demonstration farms and the field days will be taken care of by the AEA, while for a community in the sub OA, where the regular visit of the AEA cannot be expected, the demonstration farms and the field days will be managed by the farmers and the Agricultural Committee. In the latter case, it is still important for the AEAs to maintain communication with the community people, for example, by mobile phone, etc.

(4) Use of the Development Menu

While discussing the vision for the community or the technologies required, the community people may find it difficult to ensure that the options appropriately meet their needs since their access to technical information is limited. It is therefore recommended that MOFAUWR, particularly the district offices, present a “development menu” to the communities, as done in the PDAs, so that the community people may select the options from the menu.

(5) Extension Methods

The methods for the technology transfer from AEA to farmers will be mainly the OFT (on-farm-training) conducted at the demonstration farms and on the “field days”. The trainings on the “field days” will be delivered mainly by AEA, though RAOs and DAOs should also take part, especially until the AEA become familiar with the community approach. RAOs who have participated in the trainings in Japan should provide the trainings to AEA.

6.5 Implementation Schedule

6.5.1 Principles of Implementation

The implementation of the proposed development projects intends to (i) disseminate appropriate agricultural technologies to the community people through the proposed extension methods, and eventually (ii) achieve the development objectives, either food security or the increase of incomes with such technologies. It is recommended that the development projects be implemented at the community level, and that the project duration be basically for five years. The reasons are as follows:

- 1) The proposed agricultural technologies should be disseminated to the people through extension efforts, by combining the current extension approach and the “community approach” as explained. Both approaches intend to work directly with the communities.
- 2) It is considered that it takes at least three to five years for the community people to understand, accept and become able to use any of the proposed agricultural technologies transferred through the development projects. Since the proposed projects contain several technologies, it will take a longer time for them to be effectively disseminated than the case for a single technology. On the other hand, there are about 550 communities in the Study Area to be covered by 32 AEA. One AEA should be responsible for 17 communities on average. Taking into account the balance between the necessity to cover as many communities as possible and the current capacity for extension of MOFAUWR, the project period in one community should be limited to five years.

Through the proposed planning workshops, the community people themselves should identify the problems, make an agricultural development plan of their community, and from the menu, select agricultural technologies or development activities to be introduced to their community. The development plan of the community should be incorporated into the respective district agricultural development plans.

6.5.2 Implementation Schedule

The project implementation schedule is greatly affected by the implementation capacity of MOFAUWR, particularly AEA, since they are the ones who are responsible for the project implementation as well as the dissemination of the agricultural technologies on the ground. In this regard, the schedule of the project implementation and extension should be considered as a package.

(1) Schedule of Extension Activities

When an AEA is assigned for two OAs, it is suggested that the AEA take care of such OAs alternatively with different levels of involvement. The implementation schedule for such case has been prepared in the M/P, but should be applied only after MOFAUWR district offices make trials of the community approach in some communities and become accustomed to it. It is considered that at least a couple of years will be needed for that.

It is assumed that an AEA work in a total of 16 communities since 8 communities are normally located in an OA. The main and the sub OAs are switched at 4-year intervals. The reason why a 4-year interval is suggested is because it will take three to five years for agricultural technologies to take root in a community. With this schedule, all the communities will benefit from MOFAUWR at the earliest time possible.

(2) Implementation Schedules for the Proposed Project

The implementation schedule for the proposed projects should be considered as described below.

1) Selection of the Communities for Project Implementation

There are about 20 OAs in each district, which will be too many for the district office and AEAs to implement projects at the same time. Thus, the target communities for the year of project implementation should be narrowed down, particularly at the initial period. In this regard, the first target communities for the implementation of any project should be the ones near the district offices since that will make it much easier for the offices to implement and monitor the project activities, and it will not require huge transportation costs.

2) Project for Food Security

The objective of the Development Project 1 for Staple Food Production is to increase the productions of sorghum, rice and cowpea at least until the per capita food intake reaches the level of the per capita consumption in the entire country. The MOFAUWR district offices are responsible for the project implementation. After the initial stage of project implementation, the project should be expanded particularly to the communities in the northern side of the Study Area as well as other areas where the people suffer from the shortage of staple food.

3) Projects for Income Increasing Income Levels

The Development Project 2-1 for Cash Crop Production and Marketing, the Project 2-2 for Livestock Development and Marketing, and the Project 2-3 for Shea Nut Processing and Marketing should be implemented based on the needs as well as the development potentials of the communities. In comparison with the Project 1, the community people as well the communities to benefit from the three Projects should be more targeted. It means that all the three Projects should consider the people who are self-sufficient in food and strongly motivated to generate income as the beneficiaries. In addition, the

potential for generating income, such as the access to markets, availability of water, soil conditions, etc., should be considered when selecting the communities.

6.6 Implementation Costs

6.6.1 Costs for Project Implementation

The implementation costs for each development component have been calculated at the community level and divided into three categories: material, training, and monitoring costs. The material and training costs are calculated per community based on the experience of the PDAs. The recurrent costs of MOFAUWR, and the fees of experts and the accompanying costs of a development partner are not included.

6.6.2 Cost Sharing and Benefit Revolving System

For the material costs of the projects for increasing incomes, the BRS should be applied. This means that the project beneficiaries should bear the costs of the materials to be supplied by the project, and repay them to the community where they reside. The community should manage the BRS, and provide the second beneficiaries with the same quantity of the materials as the first beneficiaries receive. If this system goes successfully, its effectiveness will be apparent in the reduction in the implementation costs of the M/P.

The Study on Upper West Integrated Agricultural Development in the Republic of Ghana

Final Report

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- H. Sociological Features of the PDA Communities
- I. Babile Pig Breeding Station
- J. Outcomes of the Workshops - Monitoring and Evaluation
- K. PDA Implementation: Designs, Results and Conclusions from the Pilot Trials, Other Suggestion and Lessons Obtained during the Implementation
- L. Benefit Revolving System
- M. Other Development Partners' Projects in the Area and Major Lessons for the Study
- N. Training Modules
- O. Possible Collaborations - JICA's Group Training Program "Sustainable Rural Development in Japan", and JICA's "Project for Strengthening Health System in UWR"
- P. Baseline Survey Final Report
- Q. Village Socio-Economic Survey Final Report

Part III Instruction Manuals for Agricultural Technologies and Tools (separate volume)

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Abbreviations

ABP	Ashanti Black Pig
AEA	Agricultural Extension Agent
AGD	Auditor General Department
APD	Animal Production Directorate
BRS	Benefit Revolving System
BS	Baseline Survey
CFSVA	Comprehensive Food Security and Vulnerable Analysis
C/P	Counterparts
CSIR	Council for Scientific & Industrial Research
DANIDA	Danish International Development Agency
DAO	District Agricultural Officer
DDA	District Director of Agriculture
DMISO	District Monitoring and Information System Officer
DP	Development Partner
DVO	District Veterinary Officer
EIC	Extension Information Centers
FAO	Food and Agricultural Organization
FASDEP	Food and Agriculture Sector Development Policy
FASDEPII	Food and Agriculture Sector Development Policy II
FC	Food Consumption
GHS	Ghana Cedis
GPRS	Ghana Poverty Reduction Strategy
GPRSII	Growth and Poverty Reduction Strategy II
H/Q	Headquarters
JICA	Japan International Cooperation Agency
JP	Japanese
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal
MISO	Management and Information System Officer
MOFA	Ministry of Food and Agriculture
MOFAUWR	Ministry of Food and Agriculture Upper West Regional Office
MOFEP	Ministry of Finance and Economic Planning
M/P	Master Plan
MSME	Micro, Small and Medium Enterprise
NGO	Non-Governmental Organization
OA	Operational Area
OFT	On-the-Farm-Training

OJT	On-the-Job-Training
OVOP	One Village One Product
PDA	Pilot Development Activities
PDCA	Plan-Do-Check-Action
PO	Plan of Operations
RADU	Regional Agricultural Development Unit
RAO	Regional Agricultural Officer
RDA	Regional Director of Agriculture
SARI	Savannah Agricultural Research Institute
SRID	Statistics Research and Information Directorate
TO	Technical Officer
T&V	Training and Visit
UN	United Nations
UWADEP	Upper West Agricultural Development Project
UWIAD	Upper West Integrated Agricultural Development
UWR	Upper West Region
VSS	Village Socio-Economic Survey
WIAD	Directorate of Women in Agricultural Development

Currency Exchange Rate

GHS 1 = JPY 63.284

(JICA Official Rate for March 2010)

Chapter 1

Present Situation and Major Problems Identified in the Study Area

Chapter 1 Present Situation and Major Problems Identified in the Study Area

1.1 Study Outline

1.1.1 Background of the Study

The Upper West Region (UWR) is located in a tropical savannah zone where the annual rainfall is low and unpredictable. Since soil degradation has been getting worse, the agricultural productivity of the UWR is not promising. As many farmers in the region can only rely on agricultural production during the yearly five-month-period of rain, their incomes are not sufficient, and, consequently, they are forced to earn second incomes. Moreover, post-harvest facilities, food processing facilities, and marketing networks for the products of the region are underdeveloped. Due to such a disadvantaged environment, many social and economic indicators for the UWR, such as amount of cash income, mortality rate, and primary school enrolment rate, generally show poorer performances than in other regions.

In its Country Assistance Strategy for Ghana 2005, Japan stated that its official development assistance to Ghana would aim at “economic growth with poverty reduction” and that Japan would intensify its assistance to the northern part of Ghana, where poverty is prevalent in various aspects. In particular, the UWR is currently the central focus for Japan’s assistance to Ghana.

In 2006, the Government of Ghana requested to the Government of Japan the formulation of the Study on the Upper West Integrated Agricultural Development (UWIAD). Ghana expects that the results of the Study will be the basis for the agricultural development model that is most appropriate for the area, and that dissemination of the model will help farmers increase their incomes. In response to the above request, JICA dispatched the Preparatory Study Team to Ghana in September 2007. In December 2007, the Governments of Japan and Ghana agreed to implement the UWIAD.

Based on the agreement, the Study Team, comprised of Kaihatsu Management Consulting, Inc. and CTI Engineering International Co., Ltd., was formed, and it has undertaken the Study since May 2008¹.

1.1.2 Purpose of the Study

The purpose of the Study is to undertake the following activities, which aim at increasing the income of the farmers.

- 1) To formulate a Master Plan which consists of guidelines for the development and dissemination of agricultural technologies as well as proposals for agricultural development projects.
- 2) To enhance the capacity of Ghanaian counterparts (C/P), partner organizations, and community-based organizations.

¹ All the related meeting minutes are attached in Appendix B.

1.1.3 Study Area

It was originally agreed that the Study Area should cover the following three of the seven districts in the UWR, namely, Lawra, Jirapa-Lambussie, and Nadowli Districts.

District	Area (km ²)	Population
Lawra	1,051.2	97,544
Jirapa-Lambussie	1,667.6	96,834
Nadowli	2,745.5	82,716
Study Area Total	5,464.3	277,094
UWR Total	18,000	580,000

(Source: MOFA District Offices, June 2008)

At the commencement of the Study, however, the Government of Ghana requested JICA to consider the Study Area as comprising four districts since Jirapa and Lambussie had been administratively separated according to the current decentralization policies. The total area remains the same.

1.1.4 Counterpart Organizations and Personnel

The following list shows the C/P organizations and the number of C/P personnel assigned for the Study.

Target Organizations or Personnel	Number
Ministry of Food and Agriculture Upper West Regional office (MOFAUWR)	about 15
MOFA personnel in Lawra, Jirapa-Lambussie, and Nadowli Districts	about 15
Local extension officers (Agricultural extension agents)	about 30
Farmers in the villages where Pilot Development Activities (PDA) are implemented	about 500

1.1.5 Schedule and Phases of the Study

The Study was started in May 2008 and will be continued until March 2010. The whole study period is divided mainly into two phases as shown below; Phase 1 from the commencement to September 2008 for collection of data, drafting the Master Plan (M/P), and drafting PDA proposals, and Phase 2 for the remaining period for the detailed planning, implementation and monitoring of the PDAs, and completion of the Final Report.

Phase	2008												2009												2010		
	JP Fiscal Year 2008												JP Fiscal Year 2009														
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
	Phase 1												Phase 2														

The records of the assignment, the report submission², and the main activities of the Study Team

² The pamphlets prepared by the Study Team are attached in Appendix C.

are provided in Appendix A.

1.2 Physical Features

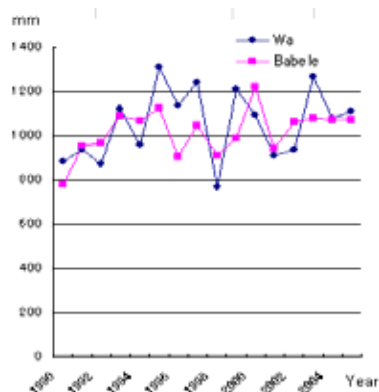
1.2.1 Vegetation

Ghana can be divided into four well-defined agro-ecological zones: coastal savanna, forest, forest-savanna transition and Guinea savanna. The Study Area is located in the Guinea savanna zone, which covers approximately 57% of the whole country. The vegetation is characterized by a higher density of pro-climate tree species, predominantly *Isoberina doka*, *Daniella spp.*, mahogany (*Khaya senegalensis*) and other *Khaya spp.*, ebony (*Diospyros mespilliformis*) as well as dawadawa (*Parkia clappertoniana*) and shea trees (*Butyrospermum paradoxum subsp. Parkii*). The last two are the most common in the area, as they are protected for their economic value. In the more densely populated areas they are almost the only wild trees that can be found. As a result of the expansion of the crop production areas, the vegetation in the area has been degrading. In the northern part of the UWR, where slopes are steeper and population pressure is higher than in other parts of the region, soil erosion is a more serious problem.

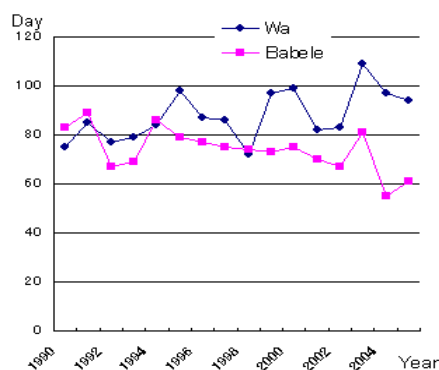
1.2.2 Rainfall and Temperature

In most parts of Ghana there are two distinct rainy seasons, one from April to June and the other from September to November. However, the Guinea savanna zone has only one rainy season, which starts in late April or early May, reaches a peak in late August or early September and ends in October. The total monthly rainfall increases slowly from March until the peak, with a midterm decline in June or July.

Rainfall is by far the most significant environmental factor affecting crop production in the semiarid area. Precipitation data are collected at two stations³ in the UWR. The annual rainfall and the number of days with rain between 1990 and 2005 are shown in Figures 1.2.1 and 1.2.2, respectively. The annual rainfall fluctuated between about 800 mm and 1,300 mm.



Source: Wa Meteorological Service Station
Figure 1.2.1 Annual Rainfall



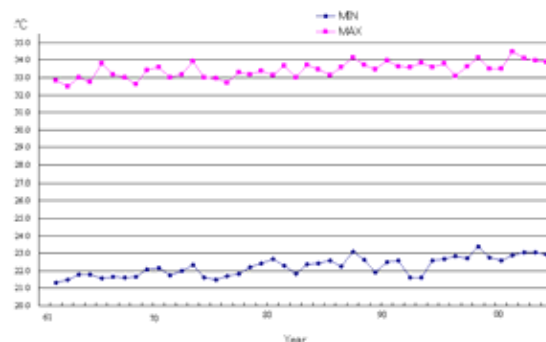
Source: Wa Meteorological Service Station
Figure 1.2.2 Number of Days with Rain

The records obtained from the stations indicate that rainfall intervals have become longer and average daily rainfall has increased in the Study Area. According to the Crops Research Institute, the

³ One station is located in Wa about 20 km south of the southern edge of the Study Area, and the other one is in Babile, which is located in the northern part of the Study Area. Babile is usually drier than Wa.

current rainfall trend is unreliable, irregular and unpredictable. The duration of rainfall has become shorter, and the amount of precipitation at one time is frequently either too much (flooding) or too little (drought). The Institute explains that changes in the rainfall pattern in the Guinea savanna zone are different from those in other ecological zones.

Figure 1.2.3 shows mean annual minimum and maximum temperatures from 1961 to 2005 at Wa meteorological station. The long-term mean annual temperature in Wa is 27.2°C, the mean maximum is 35.5°C, and the mean minimum is 18.8°C. The figures indicate an approximate rise of 1°C or more in both minimum and maximum temperatures during the period. The change enhances evapotranspiration and causes shortages of water necessary for crop growth.



Source: Wa Meteorological Service Station

Figure 1.2.3 Mean Annual Minimum and Maximum Temperatures

As can be seen in Figure 1.2.3, significant changes in climatic conditions have been observed in the Study Area. Those changes affect the food security situation⁴ in the area.

1.2.3 Soils

The soils are generally poor in the Study Area, while they are better in the floodplains and along river banks. The upland soils are generally shallow and include gravel with plinthite and ironstone. They occur as different soil units classified as Lixisols, Regosols, Leptosols and Plinthosols. The upland soils are light-textured at the surface and dry up quickly after rainfall. Additionally, most of the sub-soils have impeded drainage. At the valley bottom area are various soil units, namely, Vertisols, Gleysols and Fluvisols, which are deep and non-concretionary. The lowland is made up of the hydromorphic zone, a transitional zone between the upland and the valley bottom area that does not get flooded but is rather

⁴ According to the FAO's "Climate Change and Food Security: A Framework Document," the impacts of gradual changes in mean temperatures and rainfall are likely to be disruptive, whether positive and negative, and may include:

- Changes in the suitability of land for different types of crops and pasture,
- Changes in the health and productivity of forests,
- Changes in the incidence and vectors of different types of pests and diseases,
- Loss of biodiversity and ecosystem functioning of natural habitats,
- Changes in the distribution of good quality water for crop, livestock and inland fish production,
- Loss of arable land due to increased aridity and associated salinity,
- Changes in livelihood opportunities,
- Changes in health risks, and
- Internal and international migration.

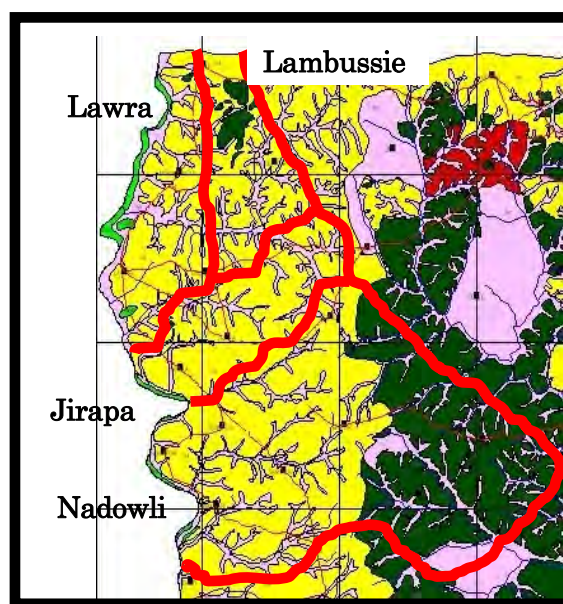
soggy, and the valley bottom area, which gets temporarily flooded by the rains. The bush farms are normally found in the uplands, hydromorphic zone and the valley bottom area. Each type of land has its own cropping pattern.

The soils in the region have pH values of 4.5 - 6.7, organic matter content of 0.6 - 2.0 %, total nitrogen ranging from 0.02 to 0.05 %, available phosphorus varying from 2.5 to 10.0 mg P/kg of soil and available calcium ranging from 45 to 90 mg/kg of soil.⁵

1.2.4 Land Suitability

The Soil-Crop Suitability Map of the Study Area and the legend are shown in Figure 1.2.4. According to the map, three classes, namely S3, S4 and N1, are the main classes of soil suitability distributed in the area. Their characteristics are as follows:

- Class S4 is by far the most widespread land, and fairly to marginally suitable for crop cultivation
- Class N1 is distributed along the river or stream and suitable for paddy but not for upland crop
- Class S3 is distributed in the eastern part of Nadowli District, and fairly suitable for crop cultivation



Class	Contents
S3	Fairly suitable areas for crop cultivation
S4	Fairly to marginally suitable areas for crop cultivation
N1	Unsuitable areas for the upland crops and tree crops but suitable for paddy

Source: Compiled by Dr. H.B. Obeng and composed and Printed By Soil Research Institute in CSIR, Accra. September, 2002

Figure 1.2.4 Land Suitability Map

The characteristics of Class N1 are different from those of Class S3 and S4, and the land is suitable for paddy but not upland crops. It can be said that the Study Area mostly consists of marginal and

⁵ The data was obtained from the Soil Research Institute, 2001

fragile land, and therefore low soil fertility is a major constraint for crop cultivation.

1.3 Agriculture

Agriculture is the backbone of the economy in the Study Area because most employment, food supply and income for both men and women are dependent on it. It is estimated that over 80 % of the economically active population is engaged in the agriculture sector. The majority of agricultural production comes from small-scale farmers, as more than 60 % of the holders farm less than two hectares.⁶

1.3.1 Related Surveys Conducted⁷

Two surveys were conducted by a local consultant firm to collect supplementary data and information. Firstly, the Baseline Survey (BS) was conducted in June and July 2008. Through the Survey, 18 communities were surveyed in the 3 target districts⁸; in each district 3 Operational Areas (OAs)⁹, and 2 communities from each OA were selected. The total number of survey samples was 180, 10 respondents from each community. The samples were selected by stratifying the community people into 3 economic classes¹⁰, choosing 2 people from the relatively rich class, 6 from the middle class, and 2 from the relatively poor class.

Secondly, the Village Socio-Economic Survey (VSS) was conducted in September 2008 in the 9 communities where the PDAs were implemented. In each community, 12 respondents were selected from the 3 economic classes; 2 from the relatively rich class, 8 from the middle class, and 2 from the relatively poor class. The interviews were made to key informants and households.

In addition to the statistics and other documentation, the results of the above two Surveys were reflected in the following sections.

1.3.2 Crop Production

Table 1.3.1 shows the cultivated area for crop production by district in the Study Area. Sorghum and millet are the principal food crops in the area, accounting for 28.5% and 15.5% of total crop cultivation area, respectively. The crops produced in the area are the main staple foods for low-income households, and they play an important part in ensuring food security.

Cash crops are groundnut, cowpea, and rice in the Study Area. Groundnut is the most dominant leguminous crop, accounting for 29% of the total cultivated area. Groundnut is a major cash crop for the people not only in the Study Area but also in other parts of northern Ghana. The Study Area produces 22%

⁶ MOFA, 1997

⁷ The whole reports are attached in Appendices P and Q.

⁸ Jirapa and Lambussie districts were considered as one district at the time of the Survey.

⁹ The OAs are explained in more detail in 1.8.

¹⁰ The stratification of the economic classes and sampling were done with the cooperation of the community people. The numbers of the samples from each class generally correspond to the proportion of the households in the community thought to belong to each class.

of total production in the country, as shown in Table 1.3.2. Groundnut is also important for sustaining livestock in the northern regions¹¹. Dry groundnut haulms are fed to livestock and are sold at the local markets. Cowpea is the third most widespread crop in the Study Area, next to Sorghum, and the area produces about 35% of the national production. Cowpea is an important protein source for the local people. It is a high-value crop with enormous domestic and international demand. Rice is also another important cash crop, but its cultivation is limited to the valley bottom area.

Table 1.3.1 Ratio of Crop Cultivation Area within the Study Area
(unit: %)

District	Sorghum	Millet	Maize	Rice	Yam	Groundnuts	Cowpea	Soybean	Total (ha)
Lawra	51.4	17.5	5.1	-	-	22.0	3.7	0.2	60,846
Jirapa-Lambussie	19.3	18.5	4.6	1.3	1.6	32.5	22.2	-	58,290
Nadowli	17.7	11.8	7.0	-	6.3	31.9	24.5	0.8	80,598
Study Area	28.5	15.5	5.7	0.4	3.0	29.1	17.5	0.4	199,734

Source: Statistics Research and Information Directorate MOFA 2008

The production shares of the main crops, namely sorghum, millet, groundnut and cowpea, grown in the area are all more than 20%, as shown in Table 1.3.2. The data indicate that the area mainly grows the crops which are not widely grown in other parts of Ghana. These crops are mainly cultivated in the arid area because they are drought resistant. Sorghum is more widely grown in Lawra District because the district is drier than others.

Table 1.3.2 Production Share of the Selected Crops
(unit: %)

District	Sorghum	Millet	Maize	Rice	Yam	Groundnuts	Cowpea	Soybean
Lawra	16.9	4.7	0.1	-	-	5.4	1.6	0.3
Jirapa-Lambussie	7.3	9.6	0.3	0.4	0.3	6.0	13.6	-
Nadowli	9.4	6.7	0.4	-	1.0	10.6	20.7	1.3
Study Area/National	33.6	20.9	0.8	0.4	1.3	22.0	35.9	1.6
UWR/National	44.2	38.7	3.3	2.8	5.8	40.3	51.9	21.4
National Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Statistics Research and Information Directorate MOFA 2008

Table 1.3.3 shows crop yields. Production is mainly rainfed and labor intensive in the Study Area. The farming practices depend on traditional methods such as mound ridge, and are further constrained by the lack of inputs. Only little amounts of chemical and organic fertilizers are used in the Study Area. Chemical fertilizers are rarely used for food crop production because their prices are beyond the farmer's reach. Organic materials such as animal dung are available but not sufficient in quantity. These materials are not extensively used, largely due to lack of awareness and lack of means of transportation to bush farms. In addition, crop densities are generally low, which results in low crop productivity. Lawra District records poorer yields in comparison to other districts, and the yields of millet, maize and sorghum are only 0.50, 0.43 and 0.84 ton/ha, respectively. One of the reasons is that Lawra is a fairly densely populated district

¹¹ The region alone accounts for one-third of the national livestock population.

with degraded soils of low fertility and poor moisture-retention properties because the fields are cultivated every season without allowing for fallow.

Table 1.3.3 Comparison of Crop Yields
(unit: ton/ha)

District	Sorghum	Millet	Maize	Rice	Yam	Groundnuts	Cowpea	Soybean
Lawra	0.84	0.50	0.43	-	-	1.23	0.85	0.95
Jirapa-Lambussie	1.00	1.00	1.20	0.96	11.87	0.95	1.25	-
Nadowli	1.02	0.79	0.85	-	8.67	1.24	1.25	1.00
Study Area	0.91	0.76	0.82	0.96	9.16	1.14	1.22	0.99
UWR	0.89	0.73	1.12	1.42	12.22	1.06	1.08	0.81
National	0.74	0.69	1.54	1.70	13.52	0.88	0.86	1.06

Source: Statistics Research and Information Directorate MOFA 2008

A comparison of crop production in the UWR between 2007 and the average of 1997-2000 is shown in Table 1.3.4. During the period, the cultivation areas of main food crops except groundnut have decreased, and the production volumes of sorghum and millet have decreased while that of groundnut increased more than double. The productivity of those three main crops has been sharply decreased. The main causes are considered to be climate change and soil degradation due to continuous cropping without fertilizer application. Soil has also been degraded as the fallow period has been shorter due to an increase in population pressure. Only the yield of maize has increased mainly because it was cultivated in the fertile areas with application of chemical fertilizer.

Table 1.3.4 Comparison of Main Crop Production between 2007 and the Average of 1997-2000

	Production (1,000 ton)			Area (1,000 ha)			Yield (t/ha)		
	2007	Av. 97-00	Change (%)	2007	Av. 97-00	Change (%)	2007	Av. 97-00	Change (%)
Sorghum	68	130	-47.3	77	97	-20.6	0.89	1.35	-34.1
Millet	44	60	-27.1	60	60	-0.4	0.73	1.01	-27.7
Maize	40	37	8.4	36	36	-0.8	1.12	1.01	10.9
Groundnut	122	54	125.4	115	40	187.3	1.06	1.35	-21.5

Source: Statistics Research and Information Directorate (SRID), MOFA, January 2008

1.3.3 Farming Practices

(1) Agricultural Land Use

Agricultural land use varies depending on the land type, as shown in Figure 1.3.1. In particular, there is a clear distinction in land use between compound and bush fields. The compound fields are found in the upland in close proximity to the living quarters of farmers. Farmers' houses can be considered as part of compound fields, and the farms are situated near residential areas. Manure and other organic amendments are often dumped in the fields because of the proximity of the houses. Sorghum, millet and cowpea are the dominant crops in the compound fields, which are cultivated annually. Vegetables such as okra, pepper, and tomatoes are sometimes grown alone or on the fringes of the maize fields. Bush farms consist of upland and lowland, and are usually found far from the residential areas. The fertility of bush

farms depends on the patterns of crop rotation, and the patterns of crop rotation in turn depend on the cropping system and the availability of lands. A fallow period is usually kept for at least two years between the croppings.

The lowland is made up of the hydromorphic zone and the valley bottom area, which correspond to “N1” in the Land Suitability Map shown in Fig.1.2.4. The hydromorphic zone is a transitional zone between the upland (“S3” and “S4” in the Land Suitability Map) and the valley bottom area, which does not get flooded but is rather soggy. The valley bottom area becomes only temporarily flooded by the rains. Bush farms can be found in the upland, the hydromorphic zone and the valley bottom area. In the hydromorphic zone, maize and sorghum are the major crops. Maize is sometimes preceded by cowpea or rice. In the valley bottom area, rice is grown every year. If rains start early, some farmers grow early-maturing varieties of maize on ridges, after which rice is planted as an intercrop in the furrows. During the dry season vegetables are also cultivated at the valley bottom area.

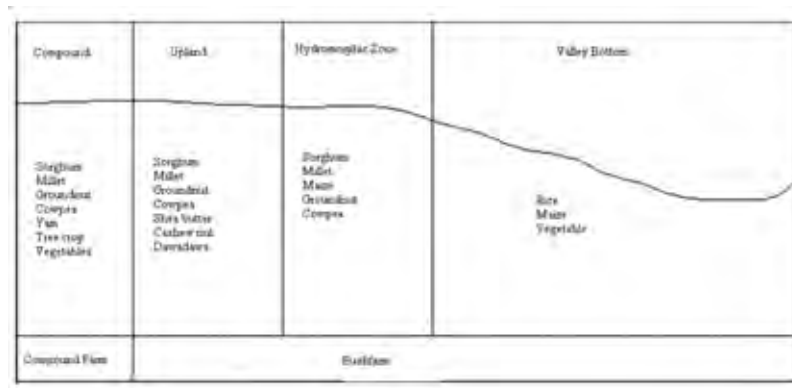
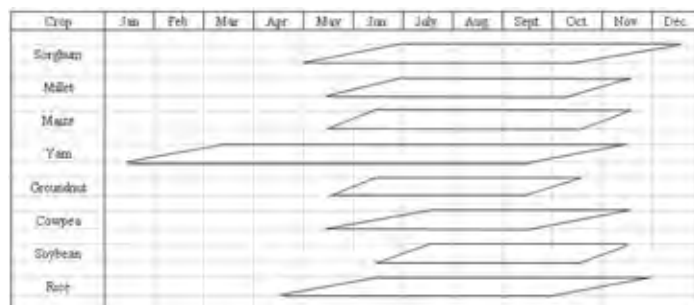


Figure 1.3.1 Agricultural Land Use

(2) Cropping Pattern

A typical cropping pattern of the Study Area is shown in Figure 1.3.2. The cropping season is usually greatly affected by rainfall because of its high variability in amount and distribution.



Source: MOFA District office

Figure 1.3.2 Typical Cropping Pattern

Mixed cropping is the most widespread cropping system in the Study Area. The system is predominantly cereal-legume based. The most widespread example is a mixed cropping of sorghum and

cowpea. The system is one of the countermeasures against rainfall fluctuation to cope with the risk of drought or flood. Otherwise, rice and groundnut are grown as pure stand.

It is said that newly opened land or fallow land is cleared for growing yam and maize. This is because these crops require many nutrients and are therefore planted in the first year after the opening up of a fallow land. Crops are grown either on a flat, mound or ridge seedbed. Cereals, legumes and yam are normally cultivated on mounds. However, pure stand of groundnut is planted on the broad ridge and rice is planted on the flat. Mounding is the most popular planting method in the area. It is both advantageous and disadvantageous for crop cultivation as follows:

- Advantage

Maize and tuber crops are not tolerant to excess soil moisture content to grow well. Therefore, mound or high ridge planting is suitable for avoiding root rotting by excess soil moisture.

- Disadvantage

Mounding is likely to prompt evaporation from the soil because the soil surface area is wider than the ridge and the flat land. It is disadvantageous for keeping moisture in soils. It is difficult for rain water to seep into soils because water can easily flow down the surface of the mound when it rains. Productivity of mounding cultivation is lower because the planting density is lower than that of flat or ridge cultivation.

1.3.4 Land Tenure System

In Ghana, lands are considered as a property of communities. The right to use the lands is only conferred to farm households by the villages' earth priests, called *Tindaanas*, free of charge. Such households, however, are not allowed to sell the lands. All household members can generally have access to the lands. The lands can be re-allocated to other farmers. The farmers are free to borrow the lands from, or lend them to, other farmers.

Young men and women are allocated the lands through their fathers and husbands, respectively. If lands are abundant in a community, the young men can request the village authorities to let them use part of such lands, but women can do so only through their husbands as they are not allocated land by the *Tindaanas*. Whether or not a woman can use land by herself depends on whether or not her husband has enough land to grow staple cereals for the household. When a household has enough land, a husband may have his wife intercrop her crops on the household's farm.

1.3.5 Post-harvest Activities

It has been widely observed in the Study Area that the harvested crops are dried on various materials such as sheets, empty sacks, iron sheets, the house roof, or even directly on the ground, and then the crops are stored before they are adequately dried or without properly sealing the storage facilities. As to storage, the problem of weevils is also often seen, particularly for cowpea. Those factors result in huge post-harvest losses of the crops. According to MOFA, "post-harvest losses of agricultural produce in Ghana

have been estimated conservatively to be between 10 and 20%.”¹² Another MOFA document¹³ points out “Available data show up to 35% of maize and 34% of cassava produced is lost along the chain. This is a major loss and potential cause of food insecurity. Factors associated with losses include limited knowledge on post-harvest handling, poor harvesting methods, poor storage systems, poor access to information on pest control methods and poor transportation methods and equipment.” Thus the issue of post-harvest loss should be taken into account if the food shortage problem is to be solved.

1.3.6 Livestock

Livestock is reared by almost every household and one of the major income sources for the people. They are kept mostly free range with little inputs, in terms of both labor and capital. Draft animals are used by a limited number of farmers for crop cultivation and transportation. The West African Short-horn is the predominant type of cattle breed in the area. It is used for meat and milk. The small ruminant population is largely made up of the West African Dwarf sheep and goat breed type.

Livestock is important also from a socio-economic aspect as a/an (i) investment for future income, (ii) insurance against disaster and other difficult times, (iii) bride price in marriage as well as payment for offenses, (iv) food at religious activities and rituals, (v) protein source, (vi) gift for visitors, and (vii) symbol of social prestige. Nevertheless, most of the people regard livestock as a safety net to be used when they are in need of cash rather than as an income source. Sufficient attention is therefore not given to livestock rearing as a means for making a profit.

Table 1.3.6 Types and Numbers of Livestock by District

(Unit : Head)

District	Cattle	Sheep	Goat	Pig	Poultry	Donkey	Rabbit	Dog
Lawra	13,980	13,433	20,603	10,973	63,004	30	1,000	-
Jirapa/Lambussie	38,100	71,000	28,200	40	46,500	60	-	80
Nadowli	11,800	45,600	45,200	12,619	39,850	-	-	-
Study Area	63,880	130,033	94,003	23,632	149,354	909	1,000	80
National Total	1,373,000	3,211,000	3,923,000	290,000	28,386,000	-	-	-

Source: Lawra District Office (2003), Jirapa/Lambussie District Office (2006), Nadowli District Office (2007), MOFA-SRID (2006)

Table 1.3.6 shows the types and numbers of livestock by district. In recent years the number of livestock has decreased. The main reasons may be the lack of feed and water in the dry season, diseases such as swine fever, theft and inadequate technical training.

1.4 Agricultural Processing

In the Study Area, the main processed items are pito, dawadawa and others as shown in Table 1.4.1. Other items include shea butter, groundnut cake (kurikuri), and cowpea pie (kose). Among the processed items, the most major one is pito.

¹² A Manual of Post-harvest Technology of Major Food Crops in Ghana, MOFA, 1997

¹³ Agriculture Sector Plan 2009-2015, Draft Final Report, MOFA, August 2009

Table 1.4.1 Processed Items

District	No. of Respondents	Processed item		
		Pito	Dawadawa	Others
Lawra	60	42	8	16
Nadowli	60	44	2	14
Jirapa	60	42	4	10

(Source: The Baseline Survey)

The volume of pito produced in the area ranges from none to over 500 gallons per year as shown in Table 1.4.2. Nearly 50% of the respondents produce over 500 gallons of pito per year.

Table 1.4.2 Volume of Pito Produced

District	Resp.	Pito (gallon)						
		N-R	<100	100-199	200-299	300-399	400-499	499<
Lawra	60	18	5	3	1	6	2	25
Nadowli	60	16	1	2	5	4	2	30
Jirapa	60	18	6	8	0	5	0	23

Note N-R: no response

(Source: The Baseline Survey)

A much smaller number of people produce dawadawa than pito as shown in Table 1.4.3. It was confirmed by the respondents that many of them do not produce dawadawa if the source of the raw materials, namely the dawadawa tree, does not grow in the locality. In that case, what is processed is purely for domestic consumption. However, dawadawa production can be seen in areas where the respondents usually travel from market to market to purchase the fruits of the dawadawa for processing. The production in this context is usually for sale.

Table 1.4.3 Volume of Dawadawa Produced

District	Resp.	Dawadawa (kg)						
		N-R	<100	100-199	200-299	300-399	400-499	499<
Lawra	60	52	3	1	2	0	0	2
Nadowli	60	58	2	0	0	0	0	0
Jirapa	60	56	3	1	0	0	0	0

Note N-R: no response

(Source: The Baseline Survey)

In the FASDEP¹⁴, agricultural processing is described as an important means to add value, reduce post-harvest losses, and promote price stability. Within this policy framework and based on the fact that agricultural processing has traditionally been undertaken mostly by women in the UWR, the promotion of agricultural processing has usually been considered in connection to women's development. Thus, the Directorate of Women in Agricultural Development (WIAD), WIAD regional agricultural officers (RAO), and WIAD district extension officers are responsible for promoting agricultural processing at the national,

¹⁴ MOFA (2002) Food and Agriculture Sector Development Policy

regional and district levels, respectively¹⁵.

The related women's activities in the Study Area, such as on-farm collection of raw materials, on-farm production, off-farm production, and processing, are shown in Table 1.4.4. Most activities are generally undertaken at the household level. Machinery is rarely used for production.

Table 1.4.4 Traditional Processing-related Activities by Women in the Study Area

District	Extent	On-farm collection of materials	On-farm production	Off-farm production / processing
Lawra	Very Common	Fire wood collection	-	Pito brewing Dawadawa ¹⁶ making Kurikuri ¹⁷ making Shea butter production
	Common	Shea nuts picking	Groundnuts cultivation Cowpea cultivation	Rice processing
	Not Common	-	Soybean cultivation	Groundnuts processing Soybean production
Jirapa - Lambussie	Very Common	Fire wood collection	Vegetable cultivation Bambara bean cultivation Soybean cultivation	Pito brewing Dawadawa making Kurikuri making Shea butter production Charcoal making
	Common	Shea nuts picking Dawadawa picking	Groundnuts cultivation Cowpea cultivation	Soybean processing Rice processing (in Lambussie)
	Not Common	-	-	-
Nadowli	Very Common	-	Groundnuts cultivation Cowpea cultivation	Pito brewing Dawadawa making
	Common	Fire wood collection	-	Charcoal making
	Not Common	Shea nuts picking	Soybean cultivation	Kurikuri making Soybean production Shea butter production

(Source: MOFA District Offices)

1.5 Marketing

1.5.1 Markets

Table 1.5.1 shows that about 90% of the farmers do not sell their products, such as sorghum, millet, maize, cowpea and yam. This means that they generally produce such crops only for subsistence, or they do not have enough to sell. The survey result also suggests that most of such crops sold at the markets in the Study Area come from other areas, except for groundnut.

Table 1.5.1 Share of Farmers not Selling Their Products (%)

Sorghum	Millet	Maize	Rice	Groundnut	Cowpea	Shea nut	Dawadawa
87	98	92	84	41	87	79	89

Source: The Baseline Survey

¹⁵ Based on the "MOFA (2005) Handbook on Roles and Responsibilities of MOFA Staff under Decentralization" and interviews by the Study Team in June 2008.

¹⁶ Dawadawa spice is made from the fruit of the dawadawa tree. It is widely used in the Study Area for soup and stew.

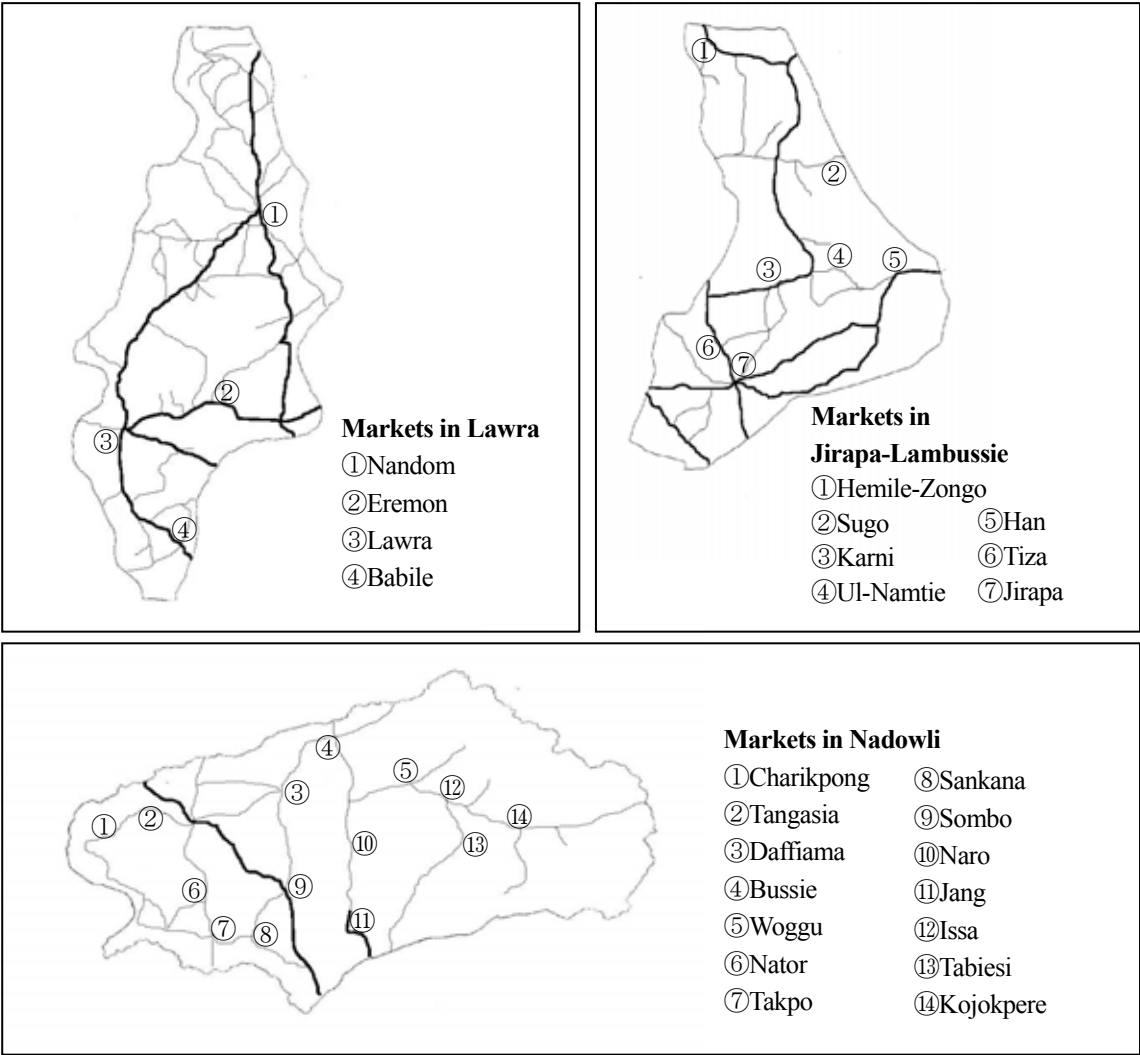
¹⁷ Kurikuri is a groundnut curd cake and is shaped like a ball with about a 2-cm diameter.

There are 45 markets in the UWR, among which 25 markets are located in the Study Area as shown in Table 1.5.2 and the maps below. Those local markets are open either every Sunday or every six days (5 Sunday markets and 40 other markets in the UWR), and most of the agricultural products are sold there. Groundnut and cowpea are the most commonly traded agricultural products. The methods of transportation to the markets are often limited. The farmers carry their products on their head, use bicycles, donkeys, etc.

Table 1.5.2 Markets in the Study Area

	Name of Villages / Towns
Lawra	<u>Nandom</u> , <u>Eremon</u> , Lawra, Babile
Jirapa-Lambussie	Jirapa, Karni, Sugo, Tiza, Ul-Nantie, Hemile-Zongo, Han
Nadowli	<u>Daffiama</u> , <u>Naro</u> , Bussie, Kojokpere, Sankana, Woggu, Takpo, Nator, Tabiesi, Sombo, Charikpong, Jang, Issa, Tangasia

Note: _____ = Sunday Market, Others: Open on a 6-day cycle
 Source: MOFAUWR Office



The local markets function also as locations where news and information are regularly exchanged among the people. The Wa market is the major urban market in the UWR and functions as a locus connecting the people in the UWR with outside regions. The Wa market attracts traders from southern Ghana and Burkina Faso as well as those in the region. The traders from Wa buy the products from producers-sellers and/or traders at the local markets, and take them back to Wa. Traders from the other urban centers occasionally visit the local markets in the region to directly buy specific products such as shea nut, yam, etc. although most of them buy the products at the Wa market. Market information such as commodity prices and market locations are broadcast by radio when MOFA receives financial assistance¹⁸.

Women play an important role in marketing farm products. For farm households, it is the woman's responsibility to carry and sell crops at the markets. Some women also buy goods within or nearby the villages. The local markets are therefore characterized by many petty traders who are mostly producers-sellers. They sometimes store the products for sale. Sorghum is sold also by women for producing and selling pito at the local markets. The selling of processed shea nut and dawadawa is similar to the situation for sorghum.

Although men are rarely involved directly in selling food crops, especially at the local level, some men are engaged in the operation and control of the large-scale wholesale markets for certain crops such as yams. Livestock such as poultry and small ruminants (sheep and goats) are sold in the Wa market and also in the local markets. The marketing channels are similar to those for the food crops. However, trading of livestock is undertaken by men. Cow marketing is different from marketing of other livestock, as a cattle producer usually contacts a cattle trader first.

1.5.2 Wholesale Prices

To analyze marketability, the crops produced in the area are classified into staple foods (millet, sorghum, maize, yam), pulses (groundnut, cowpea), and vegetables. The staple foods and pulses, except for groundnut, are produced mainly for consumption, and only the surplus is sold at the markets in close vicinity areas.

(1) Cereals

Table 1.5.3 shows the average monthly wholesale prices of main food crops in 2008 at the Lawra, Babile, Jirapa, and Wa markets. The prices fell after the harvest season (from August to November), as is generally observed in other years. Prices of the cereals in the area are subject to strong fluctuations, depending on the harvests. The price fluctuations of sorghum are smaller than for the other crops since the price of rice is about 50% higher and the others are more than double at their peak prices. The sorghum prices show peculiar fluctuation since the prices in the rural areas are higher than that at the Wa market after harvesting time, from January to May. This suggests that the demand in the rural areas becomes high

¹⁸ As of February 2010, Plan Ghana assists MOFA financially for radio broadcasting of market information.

because sorghum is used as both a staple food and an input for brewing pito. On the other hand, rice prices at the local markets are lower than that at the Wa market as rice is used as a cash crop in the area.

Table 1.5.3 Market Prices of Main Food Crops (Unit: GHS/bag)

Sorghur (109 Kg/bag)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	39	43	45	47	49	54	55	56	58	58	58	39
Babile	38	45	45	47	50	54	55	59	54	58	58	-
Jirapa	39	39	43	43	61	53	-	-	-	-	-	36
Wa	37	36	37	37	47	58	56	62	60	62	62	49
Millet (93kg/bag)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	32	38	36	36	48	50	50	52	54	54	54	29
Babile	32	35	36	36	52	50	50	59	54	54	54	-
Jirapa	43	43	43	43	52	61	-	-	-	-	-	50
Wa	36	38	39	40	57	54	55	59	61	61	66	49
Maize (100Kg/bag)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	25	30	36	36	45	44	46	50	38	36	36	49
Babile	25	31	34	36	48	44	46	57	38	36	36	-
Jirapa	32	32	37	36	48	46	-	-	-	-	-	36
Wa	28	29	35	33	47	46	53	57	47	45	39	37
Rice												
Local (100Kg/bag)	Rice											
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	60	62	66	71	85	93	100	107	112	143	114	54
Babile	60	64	66	71	88	93	100	124	113	125	114	-
Jirapa	72	71	71	71	80	107	-	-	-	-	-	125
Wa	64	70	71	75	92	96	124	124	140	143	107	107

Source: MOFAUWR Office

In general, traders buy food crops soon after the harvest, from November to December, when the prices are at their lowest level although this varies according to rainfall conditions. The traders resell them later, mainly during the lean period, when the prices reach their highest levels. This means that farmers receive a low price for their products at harvest time, and later have to pay much higher prices when they buy food. The farmers are usually in need of cash, and therefore cannot afford to wait until more favorable prices are offered.

(2) Pulses

Pulses are also important crops in the Study Area from several aspects. Cowpea is consumed as an alternative food when staple foods become scarce because it is the first crop to be harvested in the year, usually in July, and it is therefore an important food for coping with hunger during the lean season for the staple foods. The price of cowpea increases after the harvest until the harvest of other food crops. The yearly price fluctuations of pulses, groundnut and cowpea are higher than those of the food crops as the highest price is about three times greater in the lean season. Groundnut is the most common cash crop in the Study Area. As many households do not have sufficient food throughout the year, the demand for groundnut becomes high as an alternative staple food during the lean season for the main food crops. The market

prices of pulses are shown in Table 1.5.4.

Table 1.5.4 Market Prices of Pulses (Unit: GHS/bag)

Groundnut (82 Kg/bag)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	47	55	55	59	66	81	110	110	103	64	91	51
Babile	47	55	55	60	64	87	112	134	-	66	90	-
Jirapa	51	55	57	62	59	71	-	-	-	-	-	68
Wa	56	62	60	66	80	89	116	134	90	68	77	76
Cowpea (109 Kg/bag)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	47	62	58	68	75	90	119	117	103	73	65	47
Babile	47	62	62	62	82	89	117	103	92	74	67	-
Jirapa	-	63	62	64	76	91	-	-	-	-	-	55
Wa	53	62	62	66	85	95	108	103	115	113	56	55

Source: MOFAUWR Office

(3) Vegetables

The market prices of vegetable can be seen in Table 1.5.5. Vegetables, particularly tomatoes, onions, peppers, and okra, are cash crops. Most of them become scarce at the local markets, except during their harvest seasons. The seasonal price difference is therefore extremely high, at maximum almost a 10-fold difference between the harvest and the lean seasons. Tomatoes can be cultivated through the year where water is available. The price of tomatoes skyrockets in the rainy season, particularly from July and August. As for onions, the cultivation period is limited to the dry season, from November to March. Onions can be grown only in areas where irrigation water is available. Onion prices are generally high during the dry and lean season, particularly from October to December, as they become scarce at the local markets. Thus vegetable cultivation, especially in the dry season, may be proposed for the purposes of both food security and income increase.

Table 1.5.5 Market Prices of Vegetables in 2008 (Unit: GHS/bag)

Tomato (52Kg/bag)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	30	23	18	-	-	-	80	50	6	8	19	34
Babile	26	26	18	28	-	-	80	97	7	9	19	-
Jirapa	23	-	32	40	52	59	-	-	-	-	-	14
Wa	19	14	16	42	41	48	66	97	12	14	21	23
Onion (73 Kg/bag)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug.	Sep.	Oct	Nov	Dec.
Lawra	112	23	18	-	-	-	-	-	-	-	-	120
Babile	112	-	12	-	-	-	-	60	-	-	-	-
Jirapa	-	-	-	45	29	-	-	-	-	-	-	-
Wa	58	41	38	45	49	48	59	60	73	105	177	203

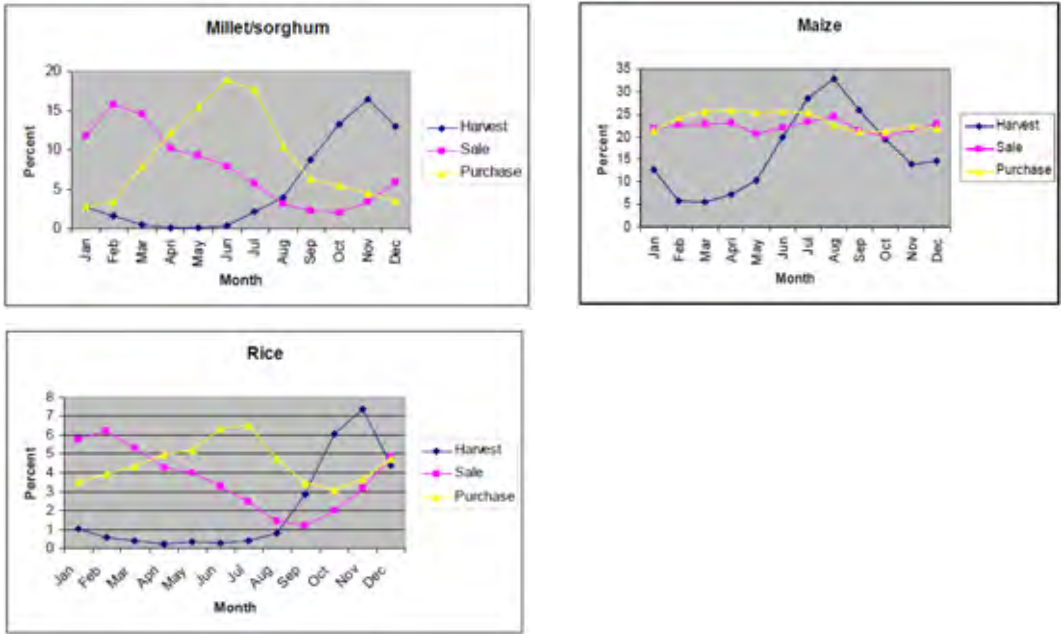
Source: MOFAUWR Office

1.5.3 Seasonal Characteristics of Harvests, Sales and Purchases

Figure 1.5.1 shows the percentage of households harvesting, selling and purchasing the main food crops over a one-year period. Most households do not harvest food crops in the first half of the year. Usually, maize-growing households harvest their crop during the third quarter of the year, from July to

September, while rice and millet/sorghum are mainly harvested during the last four months of the year, from September to December. Rice and millet/sorghum show similar harvest patterns. However, the harvesting time is largely affected by the rainfall pattern for the year.

Sales of maize by households are spread evenly throughout the year. Rice and millet/sorghum show similar sales patterns, high during the first quarter of the year, with purchases higher during the second quarter of the year. Reflecting this supply and demand situation, the crop prices become lower during the first quarter and higher during the third quarter of the year.



Source: Ghana Living Standards Survey Report of the Fifth Round

Figure 1.5.1 Seasonal Pattern of Harvesting, Selling and Buying Main Food Crops

1.6 Food Balance¹⁹

Food balance has been analyzed to examine the food demands in the country. The results are as described below.

1.6.1 National Level

(1) Cereals

The volume of imports of main foods into Ghana is shown in Table 1.6.1. Despite the growth in its agriculture sector, Ghana remains a major importer of agricultural food products. As the table shows, rice and wheat are the staple commodities that are not produced in sufficient volume to meet national requirements. While Ghana is more or less self-sufficient in sorghum production, whether or not sorghum is

¹⁹ Food balance and food security are defined by FAO as follows: Food balance presents a comprehensive picture of the pattern of a country’s food supply during a specified reference period. Food security exists "when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preference for an active and healthy life."

imported is largely affected by weather conditions.

Table 1.6.1 Imports of Main Foods

(Unit: '000 MT)

	2003	2004	2005	2006	2007
Maize	0.2	50.0	55.0	100.0	3.2
Sorghum	5.0	2.1	0.0	4.8	3.7
Rice	134.3	384.4	47.9	204.0	69.8
Wheat	213.0	250.0	369.8	344.0	357.7

Source: FAOSTAT

(2) Vegetables

Vegetables are also imported, as shown in Table 1.6.2. Their amounts vary significantly year by year due to the vulnerability of vegetables to weather conditions and seasons. Vegetables are grown for domestic consumption, and Ghana is a net importer of vegetables such as onions and tomatoes.

Table 1.6.2 Imports of Main Vegetables

(Unit: '000 MT)

	2003	2004	2005	2006	2007
Tomatoes	1	7	5	3	13,778
Onion, dry	165	152	236	41,864	6,100
Pepper	83	183	31	202	67

Source: FAOSTAT

(3) Meats

Ghana imports meats and live animals to supplement domestic production as shown in Table 1.6.3. Frozen meats and livestock products are imported largely from the European Union and live animals from neighboring countries, especially Burkina Faso, Mali and Niger. Table 1.6.4 shows the volume of meat imports from 2003 to 2007, and the figures indicate that the country remains highly dependent on meat imports. All meat imports are rising during this period even though livestock production in Ghana has been on the rise since 2000. This indicates that there is still a big gap between the supply and demand of meat at the domestic markets.

Table 1.6.3 Meat Availability from 1998 to 2002

(Unit: '000MT)

	1998	1999	2000	2001	2002
Production	62.7	66.9	66.3	68.1	73.9
Others	31.1	33.5	33.2	33.3	33.4
Import meat	13.7	32.1	30.0	33.8	31.8
Import Live	9.4	7.3	12.7	10.2	-
Total	117.2	139.8	142.2	121.5	137.8
Per Capita Supply (Kg)	6.2	7.4	7.0	6.0	7.0

Source: MOFA(SRID)

Table 1.6.4 Imports of Main Meats in 2003/07

(Unit: ton)

	2003	2004	2005	2006	2007
Beaf	2,457	1,677	3,849	3,145	13,186
Chicken	56,067	47,063	52,052	56,901	80,101
Sheep & Goat	2,902	2,432	3,710	5,227	7,257
Pork	2,327	2,082	1,811	2,344	523
Total	63,753	53,254	61,422	67,617	101,067

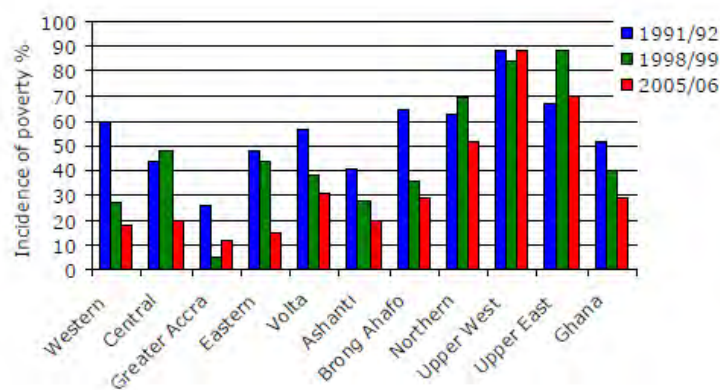
Source: FAOSTAT

MOFA has developed a livestock policy that aims to increase the supply of meat, animal and dairy products by domestic production from 30% at the current aggregate level to 80% by the year 2015. One objective is to contribute to the reduction of the incidence of poverty among agro-pastoralists from 59% to 30% by the same year.

According to MOFA, Ghana's agricultural production currently meets only half of its domestic cereal and meat requirements and 60% of domestic fish consumption. Self-sufficiency is achieved only in starchy staples such as cassava, yam and plantain, while rice and maize productions fall far below demand. Therefore, the production of food crops and meat is still largely required in terms of food security.

1.6.2 Food Security Issue in the UWR

Persisting food insecurity is concentrated in the poorest regions of the country, the areas prone to adverse weather conditions such as floods and droughts. The CFSVA (Comprehensive Food Security and Vulnerable Analysis) in 2009 found 5% of the population, or 1.2 million people, to have very limited access to sufficient and nutritious food necessary for an active and healthy life, and they are considered as food insecure people. Thirty-four percent of the population in the UWR is food insecure, which is the highest percentage among the regions. In addition, poverty incidences were increasing from 1991/92 to 2005/06 only in the UWR and Upper East region as shown in Figure 1.6.1. Poverty can therefore be considered in relation to people's inability to obtain enough food to meet their nutritional requirements.



Source: Ghana Statistical Survey

Figure 1.6.1 Poverty Incidence by Region

Table 1.6.5 shows the prevalence of four food consumption groups. The majority of the national population (86%) has an adequate diet or acceptable HIGH food consumption while a large share of the population with poor (11 %) or borderline (23%) food consumption live in Upper West Rural. In total, 34% of the population in the UWR does not have an adequate diet. This is almost 6 times higher than the average.

Table 1.6.5 Prevalence of Four Food Consumption Groups by Strata

(Unit: %)

	Food Insecure		Vulnerable to food insecurity		Food security
	Poor FC	Borderline FC	Acceptable Low FC	Acceptable High	
Upper West Rural	11.3	22.7		13.4	52.6
Average	1.6	3.8		8.8	85.9

Source: CFSVA 2008

1.6.3 Food Security Issue in the Study Area

a) Food Balance

In the Study Area, Lawra district is a typical poor area. It is densely populated with degraded soils of low fertility and poor moisture-retention. According to the District Poverty Profiling and Mapping Report of Lawra District in 2004, the food balance per year in the district is estimated between 40 and 45 % of the average food self-sufficiency. That means that only less than half of the population in the district gets enough food.

Table 1.6.6 Per Capita Crop Production and Consumption

(Unit:kg/capita/year)

	Sorghum	Millet	Maize	Rice	Wheat	Sub-total	Groundnuts	Cowpea	Sub-total	Total
Lawra*	29.3	10.6	18.0	5.9	-	63.8	26.4	3.7	30.1	93.9
Jirapa-Lambussie*	24.5	14.9	28.8	17.9	-	86.1	53.7	9.6	63.3	149.4
Nadowri*	12.0	6.8	17.8	20.9	-	57.5	78.2	16.2	94.4	151.9
Average*	22.2	11.0	22.0	15.0	-	70.2	52.6	9.8	62.4	132.6
Average consumption in Ghana**	9.3	6.2	59.8	27.0	13.3	115.6	5.4	3.6	9.0	124.6

Sources

*: Baseline Survey by the Study Team

** : Assessment of Food Import and Food Aid Against Support for Agricultural Development The Case Study of Ghana, 2004

Table 1.6.6 shows the per capita crop production in the Study Area and the average consumption in Ghana. As can be seen, the per capita cereal production in the Study Area (70.2 kg) is not sufficient compared with the national average consumption (115.6 kg), and pulses in the area play an important role to supplement cereals as the staple food since the total production of cereals and pulses (132.6 kg) is higher than the national consumption (124.6 kg). However, the per capita crop consumption in the Study Area is estimated only at about 100 kg if the amount sold (30.8 kg), as shown in Table 1.6.7, is deducted from the production.

Table 1.6.7 Per Capita Crop Sales Amount

	unit: kg/capita/yr								
	Sorghum	Millet	Maize	Rice	Sub-total	Groundnuts	Cowpea	Sub-total	Total
Lawra	2.3	0.0	0.6	1.2	4.1	7.1	0.5	7.6	11.7
Jirapa-Lambussie	0.5	0.1	0.0	5.0	5.6	24.3	2.1	26.4	32.0
Nadowri	1.3	0.1	0.0	1.6	3.0	44.8	1.8	46.6	49.6
Average	1.3	0.0	0.2	2.7	4.2	25.1	1.5	26.6	30.8

source: Baseline Survey

Ghana has set an extreme poverty line at 2,900 kilocalories using calorie requirements, and it has indicated that about 27% of the population falls into this category (Ghana Statistical Service, 2000)²⁰. The average national calorie intake is at present estimated at 2,670 kilocalories²¹.

b) Ways to Cope In Case of Food Shortages

The numbers of the households that responded to how they usually cope when they face food shortages are shown in Table 1.6.8. The numbers indicate that not many people have a strategy to cope with food shortages.

Table 1.6.8 Ways to Cope with Food Shortages

	(unit: no)		
District	Lawra	Jirapa	Nadowli
Sale of Crops	4	10	
Sale of Livestock	1	9	8
Sale of Processed Items		5	1
Sleep with Hunger		1	1
Support from Family	4	3	
Buy food	1	4	16
No Answer	26	4	10
Total	36	36	36

(Source: The Village Socio-Economic Survey)

1.7 Income Situation

1.7.1 Income at the Regional Level

As Table 1.7.1 shows, the national average annual household income²² is GHS 1,217 and the national average annual per capita income is GHS 397. On the other hand, those figures for the UWR are GHS 606 and GHS 106, respectively. In particular, the UWR's per capita income is less than a third of the national average per capita income.

²⁰ The Poverty Millennium Development Goal, Country Note 1.1, Ghana, Well

(<http://www.lut.ac.uk/well/resources/Publications/Briefing%20Notes/WELL%20CN%201.1%20-%20Ghana%20NC.pdf>)

²¹ Assessment of Food Import and Food Aid Against Support for Agricultural Development, The Case Study of Ghana, 2004

²² The words "mean" and "average" are used synonymously in the report referred to.

Table 1.7.1 Mean Annual Household and Per Capita Incomes

Region	Mean Annual Household Income (GHS)	Mean Annual per capita Income (GHS)
Western	1,222	393
Central	1,310	464
Greater Accra	1,529	544
Volta	913	272
Eastern	1,145	379
Ashanti	1,149	410
Brong Ahafo	1,202	443
Northern	1,452	296
Upper East	616	124
Upper West	606	106
Ghana	1,217	397

(Source: Ghana Living Standards Survey Report of the Fifth Round, September 2008, Ghana Statistical Service)

1.7.2 Income in the Study Area

(1) Income Sources for the Community People

a) Proportion of Income from Each Source

The income sources and their proportions to total income of a household in the PDA communities are surveyed and presented in Table 1.7.2. It is understood from the table that main income sources of the community people are crops, livestock, and processed items. The income generated from crops is the highest, followed by livestock. Besides those, the contribution to income from migrant labor is considerably higher in Lawra district, where the conditions for agricultural production are harsher than in other parts of the UWR.

Table 1.7.2 Proportions of Income From Each Source

(unit: %)

District Community	Lawra			Jirapa			Nadowli			Ave
	Puff	Tome	Zakpee	Naawu	Kogri	Nyani	Daffi	Tabi	Nanvi	
Crops	12	20	20	45	30	0	40	80	28	31
Livestock	12	10	20	30	30	70	30	10	45	29
Processed Items	14	10	10	15	20	10	13	2	15	12
Casual Labor	18	5	0	5	10	10	5	0	1	6
Migrant Labor	28	50	40	3	5	5	2	5	11	17
Others	16	5	10	2	5	5	10	3	0	6
Total	100	100	100	100	100	100	100	100	100	100

(Source: The Village Socio-Economic Survey)

b) Sales of Crops

As shown in Table 1.5.1, the proportions of the households that generally sell their crops or processed items are not high. About 60 % of them sell groundnut, but much fewer people sell the other crops or processed items. In Table 1.7.3, the proportion of each crop sold from what they produce is shown. Besides groundnut, vegetables and rice are sold although the proportions differ considerably among the communities. In Nadowli, soybean is mostly sold as there is a soybean processing factory in their vicinity.

Table 1.7.3 Proportions of Crops Sold

(unit: %)

District Community	Lawra			Jirapa			Nadowli		
	Puff	Tome	Zakpee	Naawu	Kogri	Nyani	Daffi	Tabi	Nanvi
Sorghum	20	10	0	90	10	0	90	30	50
Millet	20	0	0	5	0	0	10	1	1
Maize	10	50	0	-	40	0	10	25	20
Groundnuts	50	20	20	40	90	90	90	90	90
Cowpea	0	50	30	30	-	-	30	30	80
Soybean	0	-	0	-	-	-	97	80	99
Rice	50	50	20	-	40	0	50	60	90
Vegetables	-	50	40	-	90	-	70	30	90

(Source: The Village Socio-Economic Survey)

c) Sales of Livestock

The proportions of the respondents who generally sell their livestock are indicated in Table 1.7.4. About 50 % of them sell goats, and about a quarter of them sell chicken and pigs.

Table 1.7.4 Proportions of Households Selling Livestock

(unit: %)

Crops	Cattle	Goats	Sheep	Pigs	Chicken	Guinea Fowl
Ratio of the respondents selling their farm livestock (%)	13	49	18	23	29	13

(Source: The Baseline Survey)

d) Sales of Processed Items

Table 1.7.5 shows that more than 60% of the respondents sell pito they produce, and most of them sell 60 to 80% of it. On the other hand, less than 10% of the respondents sell dawadawa they produce.

Table 1.7.5 Percentage of Processed Items Sold

District	Resp.	Pito			Dawadawa		
		Percentage sold			Percentage sold		
		≤ 50	60 - 80	> 80	≤ 50	60 - 80	> 80
Lawra	60	0	35	5	3	5	0
Nadowli	60	1	40	4	2	0	0
Jirapa	60	1	40	4	2	0	0

(Source: The Baseline Survey)

(2) Households Producing Enough Foods and Regularly Selling Foods

In Table 1.7.6, the number of households which can usually produce enough foods for themselves, and the ones which regularly sell foods are shown. There are only 26 among 108 households producing enough foods for themselves, and only 5 households selling crops regularly.

Table 1.7.6 Numbers of Households Producing Enough Foods and Selling Crops Regularly

(unit: no)

District	Total no. interviewed	Produce enough foods	Sell crops regularly
Lawra	36	15	3
Jirapa/Lambussie	36	3	1
Nadowli	36	8	1
Total	108	26	5

(Source: The Village Socio-Economic Survey)

Thus, it can be understood that many of the community people are still at the subsistence level, trying to obtain enough foods for themselves. Almost all of them do not regularly generate incomes. They sell crops, livestock and/or processed items when they need cash mainly to purchase foods and other necessities.

1.8 Extension

1.8.1 Major Actors for Extension²³

In line with the decentralization policy, the responsibility for providing the extension services has shifted from central to district authorities. The regional offices focus on developing policies and programmes, coordinating, and providing technical backstopping and training to their regional as well as district staff. On the ground, agricultural technologies are disseminated to the community people mainly by the District Agriculture Officers (DAOs) and Agricultural Extension Agents (AEAs)²⁴ of MOFAUWR district offices. AEAs normally reside in the communities under the Operational Areas (OAs) that he/she is in charge of.

Figure 1.8.1 shows the organizational chart of the district agricultural development unit. Within the unit, the MOFAUWR district office is headed by the District Director of Agriculture (DDA)²⁵, and AEAs are assigned under DAOs (Extension). The DAOs (Crop), DAOs (Livestock), and DAO (WIAD) are specialists in their particular subject areas on the one hand, and on the other, they are involved in the supervision of AEAs. A district is divided into zones for which each DAO is assigned. A zone is comprised of several OAs, and in a typical case there are 8 communities under one OA.

Although the private sector, including NGOs, has also been contributing to the dissemination of agricultural technologies in the Study Area, their activities are limited in scale and are ad hoc. They have their own organizational goals and implementation structures. It is therefore difficult to expect them to play a major role in extension services.

²³ The data in the figures and the tables in this section (except Table 1.8.1 and 1.8.2) were collected from the AEAs through the questionnaire survey during Phase 1 of the Study. The numbers of the respondents were 11, 15 and 17 in Lawra, Jirapa-Lambussie and Nadowli, respectively.

²⁴ An AEA is usually called as "Agric Officer" by the community people.

²⁵ In line with the decentralization policy, the DDA is accountable to not only the MOFA district office but also the district authorities.

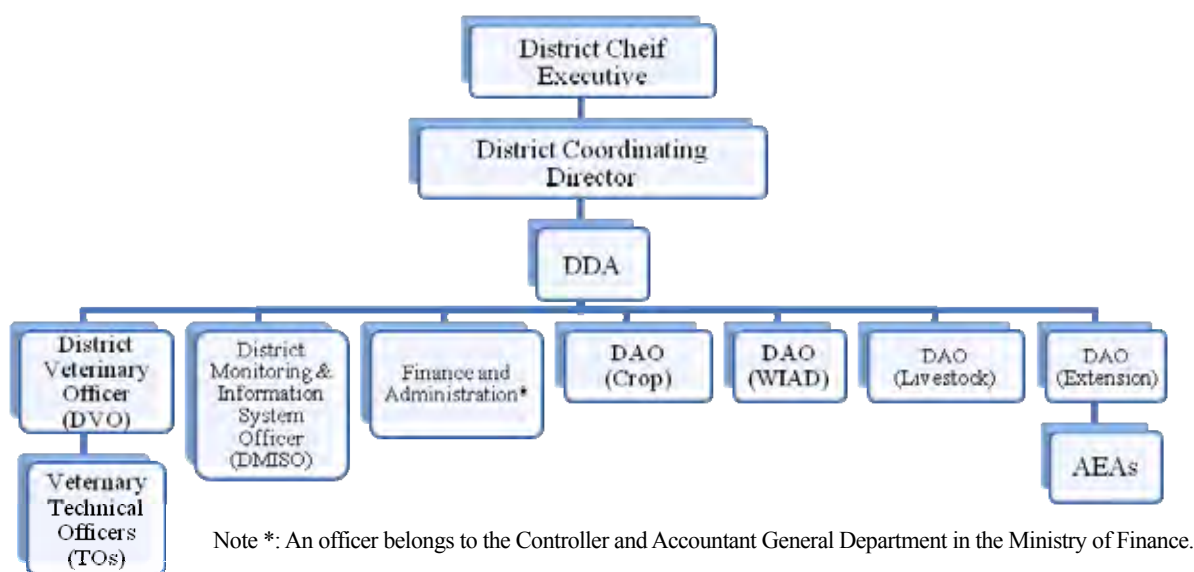


Figure 1.8.1 Organizational Chart of District Agricultural Development Unit
(Source: MOFAUWR Office)

1.8.2 Characteristics of the AEAs²⁶

(1) Number of AEAs

The number of AEAs (as of December 2009) in each district of the Study Area is indicated in Table 1.8.1. There are 32 AEAs assigned in the four districts while the required number is 62. To cope with the problem of the lack of AEAs, MOFAUWR assigns AEAs to more than one OA, although “one AEA to one OA” is the standard rule. Furthermore, in the OAs where the AEAs are unavailable, veterinary service staff or engineers, who do not hold the license for agricultural extension, are assuming the role of AEAs. Table 1.8.2 shows the operational areas and the responsible AEAs.

Table 1.8.1 Allocation of the AEAs at the District Level

	Lawra	Jirapa	Lambussie	Nadowli
The number of AEAs required*	20	12	8	22
The number of AEAs as of December 2009	11	7	4	10

Note *: The numbers do not include the veterinary field agents and those under District Monitoring and Information System Officer (DMISO)

Source : MOFAUWR Office

(2) Extension Methods by AEAs

Since the late 1980s MOFA’s methodology for extension services has been the Training and Visit (T&V), that is, regular trainings and field visits. At the end of the month, an AEA prepares a “visiting schedule” to the communities under his/her OA for the next month. The AEAs visit one community under his/her OA almost two times a month. The AEAs meet farmers individually, or sometimes in groups of farmers. If an AEA is assigned for two OAs, it is difficult for him/her to visit the communities under the sub

²⁶ The data used in the figures and the tables in this section, except the baseline survey where indicated, were collected from the AEAs. The numbers of the respondents were 11, 15 and 17 in Lawra, Jirapa-Lambussie and Nadowli, respectively.

OA. In this case he/she visits only when there is an emergency or necessity.

Table 1.8.2 Operational Areas and Responsible AEAs

District	Zone (Name)	Name of the OAs in Zone (numbers of the communities)	OA Groups for which each AEA is responsible
Lawra	A (Lawra)	Tabier (5), Lawra (8), Kalsagre (5), Tampie (4), Talibri (7), Babile (5), Birifo (8)	1. <u>Lawra</u> + Tabier 2. <u>Kalsagre</u> + Tampie (No AEA) 3. Talibri 4. <u>Babile</u> + Birifo
	B (Tome)	Tome (7), Ko (4), Brutu (6), Eremon (10), Zambo (12), Dowini (6), Lissa (4)	1. Tome 2. <u>Ko</u> + Brutu 3. <u>Ermon</u> + Zambo 4. <u>Lissa</u> + Dowini
	C (Nandom)	Nandom (8), Betaglu (6), Kokoligu (4), Tantuo (6), Munyupelle (6), Gengenpe (10)	1. <u>Nandom</u> + Betaglu 2. <u>Kokoligu</u> + Tantuo 3. <u>Gengenpe</u> 4. Munyupelle
Jirapa	A	Sigri (8), Tizza (23), Jirapa (24), Tampaala (11)	1. <u>Sigri</u> + Tizza 2. <u>Jirapa</u> , + Tumpaala
	B	Tampoe (13), Tuggo (13), Duori (15), Yagha (16)	1. <u>Tampoe</u> + Tuggo 2. <u>Duori</u> + Yagha
	C	Gbare (12), Sabuli (20), Ullo (12), Han (7)	1. Gbare 2. Sabuli 3. <u>Ullo</u> + Han
Lambussie	n/a	Hamile (15), Billaw (4), Koro (11), Lambussie (7), Piina (9), Samoa (9), Kpare (11), Karni (11)	4 AEAs (combination to be checked)
Nadowli	A (Fian)	Fian (8), Tuori (8), Bussie (8), Naro (8), Tabiesi (8), Issa (8), Kojokpere (8), Jimpensi (6)	1. <u>Kojokpere</u> + Jimpensi 2. <u>Issa</u> + Tabiesi 3. Fian + Naro (No AEA) 4. Bussie (by TO)
	B (Nadowli)	Nadowli West (8), Nadowli East (8), Charikpong (8), Tangasia (8), Daffiana (8), Dapuri (7), Serekpere (8)	1. <u>Nadowli West</u> + Nadowli East 2. <u>Charikpong</u> + Tangasia (by TO) 3. <u>Daffiana</u> + Tuori (of Zone A) 4. Dapuri 5. Serekpere
	C (Kaleo)	Kaleo (8), Jang (6), Sankana (6), Nanvilli (7), Nator (9), Takpo (6), Sombo (7)	1. Kaleo 2. Jang 3. Nanvilli 4. Sombo 5. <u>Takpo</u> + Nator (by a Schedule Officer for Cashew) 6. Sankana (by a Gardener)

Note: "+" indicates a combination of OAs for an AEA, and the underlined name is the OA where the AEAs are primarily assigned. (Source: MOFAUWR Office)

While AEAs visit the communities regularly, the dissemination of agricultural technologies and other related information to the farmers is done mainly through the demonstration farms and radio broadcasting. Radio broadcasting²⁷ is conducted by the MOFAUWR regional office with the financial assistance of an NGO. Demonstration farms are set up by AEAs, and the aims of those plots are divided into two categories: food security crops and cash crops. The numbers, areas, and target crops for the

²⁷ 1 hour program ; 4 times a week

demonstration farms are shown in Table 1.8.3. According to the AEA, the AEA firstly approaches the chief of the community and then a beneficiary when the demonstration is conducted.

Table 1.8.3 Numbers and Target Crops for Demonstration Farm

	Number of farms in an OA (the area size is about 1 acre per 1 farm)	Crops demonstrated in the year of	
		2008	2009
Food Security Crops	3	Maize	Maize
Cash Crops	2	Cowpea	Groundnuts

Source: MOFAUWR

(3) AEA’s Experience

The average number of years of experience an AEA has is about 20 years, as shown in Table 1.8.4. It can be seen from the table that the AEA are rarely transferred to areas outside of the UWR.

Table 1.8.4 Average Years of Experience as an AEA

Average Years as total	Years in the UWR	Years out of the UWR
20.4	18.3	2.1

(Source: The Baseline Survey)

Figure 1.8.2 shows that more than a quarter of the AEA have over 30 years’ experience as an AEA. There are two significant generation groups: (1) the bigger group with a mean experience of 35 to 40 years, and (2) the smaller group with a mean of 10 to 15 years. As can be seen in Figure 1.8.3, the majority of them completed agricultural college (28: 63.6%) or veterinary college²⁸ (8: 18.2%). Diploma or degree holders remain low with 3 AEA (6.8%) from the first group and 5 (11.4%) from the second group holding advanced degrees.

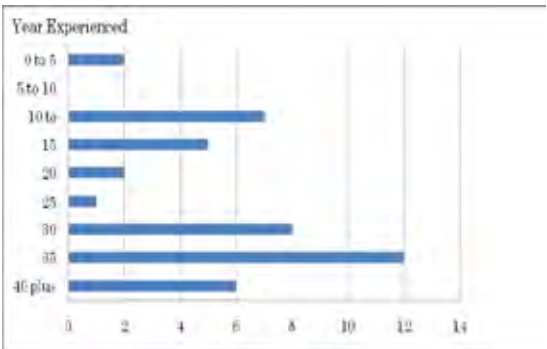


Figure 1.8.2 Years of Experience as an AEA
(% of AEA)

(Source: Questionnaire Survey to AEA)

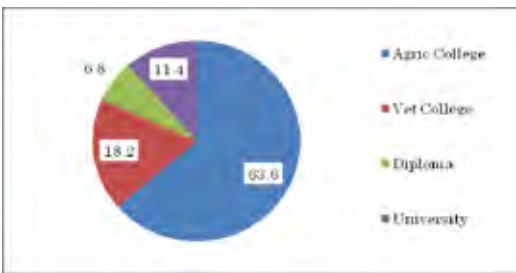


Figure 1.8.3 Educational Background of AEA
(% share by the last educational institution attended)

(Source: Questionnaire Survey to AEA)

²⁸ Although the school is often called ‘veterinary college’, the graduation certificate given does not certify the recipient as a veterinarian, but as an extension practitioner specializing in animal-related activities.

1.8.3 Major Issues in Extension

(1) Shortage of AEA's

As indicated in Table 1.8.1, the shortage of AEA's is one of the serious problems in the Study Area. This shortage hampers the dissemination of improved technologies and new information. Figure 1.8.4 shows the monthly average of the number of farmers visited by an AEA. Most of the AEA's visit up to 500 farmers per month. Nevertheless, it should be noted that there are farmers who never meet the AEA's. In the Baseline Survey, it was found that the frequency of the AEA's meeting the farmers varies from weekly to quarterly intervals, and irrespective of this, a few responded that they had never met the AEA.

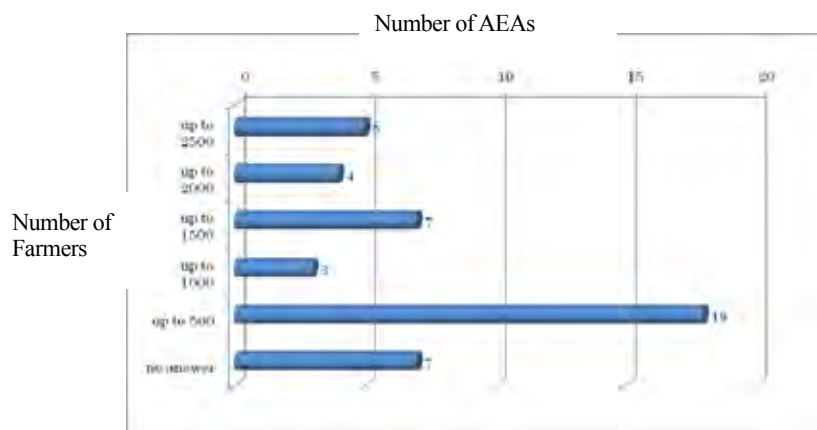


Figure 1.8.4 Monthly Average of the Number of Farmers Visited by an AEA

(Source: Questionnaire to AEA's)

(2) Lack of Resources for Extension Activities

Another problem related to extension is the lack of resources, especially for transportation, as mentioned in 1.8.1 and as can be seen in Figure 1.8.5. Insufficient funds²⁹ for fuel limit AEA's movements. More than 60% of the AEA's think that they do not have appropriate means of transportation to visit the farmers. Although they are provided with a motorbike, most of them feel their motorbikes are old. They also feel it is a problem that there is no maintenance allowance for motorbikes.

As can be seen in Figure 1.8.5, AEA's feel that the "Limited Farmers Resources" is also the problem for their extension activities. According to them, the inability of farmers to afford agricultural inputs, because the income level of most farmers is low on the one hand and the prices of agricultural inputs are high on the other hand, is a constraint for the extension activities.

²⁹ According to the interviews to the AEA's, it is about GHS 50.

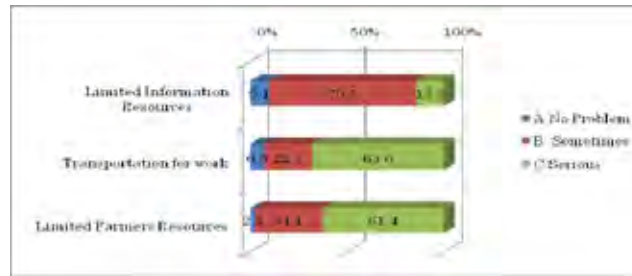


Figure 1.8.5 Problems Recognized by the AEAs

(3) Limited Access to Information

The majority of the respondents have positive feelings towards the AEAs for helping them get updated information on farming technologies (Table 1.8.5) and agricultural policy (Table 1.8.6).

Table 1.8.5 Means of Updating Information on Farming Technologies³⁰

Useful Means for Updating Information		Radio	TV	News Paper	AEAs	Community head	Friends	Development partners	Farmers day
Most Applicable	No.	61	3	0	126	18	27	15	9
	(%)	33.9	1.7	0.0	70.0	10.0	15.0	8.3	5.0
Sometimes	No.	79	6	2	30	36	95	19	3
	(%)	3.3	1.1	16.7	20.0	52.8	10.6	1.7	3.3
Total Appreciation	No.	140	9	2	156	54	122	34	12
	(%)	77.8	5.0	1.1	86.7	30.0	67.8	18.9	6.7

(Source: The Baseline Survey)

Table 1.8.6 Means of Updating Information on Agricultural Policies

Useful Means for Updating Information		Radio	TV	News Paper	AEAs	Community head	Friends	Development partners	Farmers day
Most Applicable	No.	58	2	0	104	20	28	12	4
	(%)	32.2	1.1	0.0	57.8	11.1	15.6	6.7	2.2
Sometimes	No.	63	4	3	38	30	74	18	5
	(%)	35.0	2.2	1.7	21.1	16.7	41.1	10.0	2.8
Total Appreciation	No.	121	6	3	142	50	102	30	9
	(%)	67.2	3.3	1.7	78.9	27.8	56.7	16.7	5.0

(Source: The Baseline Survey)

It is worth mentioning that radio, friends (fellow farmers), and community heads are playing a significant role for updating information on both farming technologies and agricultural policies. Nevertheless, as shown in Figure 1.8.6, it should be noted that a quarter of the AEAs feel that they could

³⁰ Total number of the respondents is 180. The respondents were asked to rank each means on a scale, with 5 being the most applicable, 3 sometimes applicable, and 1 less applicable. "Total appreciation" is calculated as the sum of the number of answers from 5 to 3. Table 1.8.4 is presented in the same way.

achieve more with information updating if they were given training/education. They feel they need to catch up on the information that keeps changing.

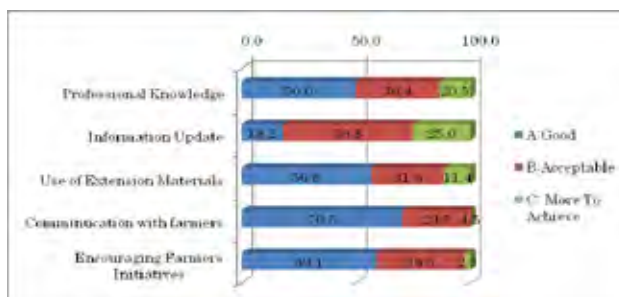


Figure 1.8.6 Access to Information Evaluated by the AEs

(4)Lack of Training for the AEs

Table 1.8.7 shows that on average more than 10 years have passed after the AEs have completed their formal education and/or training. It can be said that they have had very limited opportunities to update their technical skills or knowledge in recent years.

Table 1.8.7 Average Number of Years Since Last Training and Finishing Formal Education

Average no. of years since last training	Average no. of years since finishing last formal education
10.1	15.9

(Source: Questionnaire to AEs)

As shown in Figure 1.8.7, 59% of the AEs received training on the participatory approach, and 20% have heard the phrase but do not know the meaning. Table 1.8.8 indicates there is a certain generation gap between the two groups, with the younger generation not having as many chances to receive training on the participatory approach. This can be attributed to the fact that the participatory approach was emphasized in previous projects by the development partners, but the younger AEs were not involved in those projects. The respondents have had much less training on monitoring and evaluation than on the participatory approach (Figure 1.8.8).

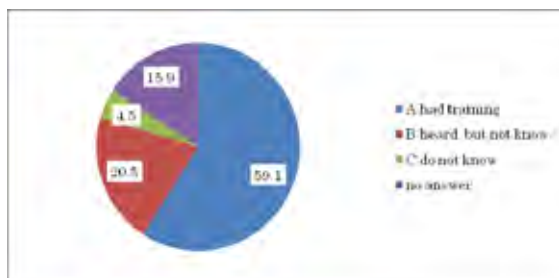


Figure 1.8.7 Training and Knowledge about Participatory Approach (% of AEs)

(source: Questionnaire to AEs)

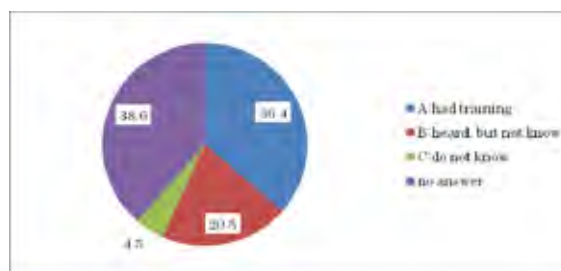


Figure 1.8.8 Training and Knowledge about Monitoring and Evaluation (% of AEs)

(source: Questionnaire to AEs)

Table 1.8.8 Training and Knowledge about Participatory Approach in Two Generation Groups³¹

	A:Had training	B: Heard but do not know meaning	C: Have never heard	No answer	Total
Older generation	19	3	0	6	28
%	67.9	10.7	0.0	21.4	100.0
Younger generation	7	6	2	0	15
%	46.7	40.0	13.3	0.0	100.0

(Source: The Baseline Survey)

1.9 Summary of the Major Problems in the Study Area

1.9.1 Major Problems Identified

The following summarizes the major problems in the Study Area described in the previous sections.

(1) Unstable Rainfall

The amount of rainfall in the Study Area is less than that in the other areas of the country, and also the current trend of rainfall is more unreliable, irregular and unpredictable. The duration of rain has become shorter, and the amount of the precipitation at one time is frequently either too much (flooding) or too little (drought).

(2) Low Soil Fertility

The soil quality is generally poor in the Study Area. In particular, upland soils are shallow and gravelly, light textured at the surface, and dry up quickly after rainfall. Due to population pressure, the fallow period has become shorter, which further deteriorates soil fertility. The Study Area mostly consists of marginal and fragile land, and therefore low soil fertility is a major constraint for crop cultivation.

(3) Soil Erosion

As a result of the expansion of crop production areas, the vegetation in the area has been degrading. In particular, the northern part of the UWR, where slopes are steeper and population pressure is higher than in other parts, soil erosion is a more serious problem.

(4) Traditional Technologies

The farming practices are traditional methods such as mound ridge, and they are further constrained by the lack of inputs. A small quantity of certified seeds is produced in the area, but they are seldom used. Little chemical fertilizer is used because the prices are beyond the farmer's reach. Organic materials such as animal dung are available but not sufficient in quantity, and also due to lack of awareness, organic fertilizer is not used. As a result, crop productivity remains low.

³¹ The number of the 'older generation' AEAs is 28, and those categorized in the bigger group have a mean experience of 35 to 40 years, while the 'younger generation' is the smaller group with a mean of 10 to 15 years.

(5) Huge Post-harvest Loss

The harvested crops are dried on various materials or even directly on the ground, and then the crops are stored before they are adequately dried or without properly sealing the storage facilities. As to storage, the problem of weevils is also often seen, particularly for cowpea. Those facts result in huge post-harvest losses of the crops. According to a MOFA document, “post-harvest losses of agricultural produce in Ghana have been estimated conservatively to be between 10 and 20%.” Thus the issue of post-harvest loss should be taken into account if the food shortage problem is to be solved.

(6) Low Production of Main Food Crops

The main food crops cultivated are drought-resistant, such as sorghum, millet, etc., which are generally less productive than the other food crops prevailing in the country. The cultivation areas, the production volumes, and productivity of sorghum and millet have been decreasing. In addition, rainfall and its patterns fluctuate every year, which significantly affects crop production volumes in an unpredictable way.

(7) Low Selling Prices of the Products

The farmers receive a low price for their products at harvest time, and later have to pay much higher prices when they buy food. The farmers are usually in need of cash, and therefore cannot afford to wait until a favorable moment to sell their products comes.

(8) Low Profits from Livestock

Livestock is important as an income source, and also for various socio-economic aspects. Most of the people however regard livestock rather as a safety net than as an income source. Sufficient attention is therefore not given for rearing livestock, which leads to low profits from the sales of livestock. The number of livestock has recently decreased, and the main reasons may be lack of feed and water in the dry season, diseases such as swine fever, theft and inadequate technical training.

(9) Limited Income Sources

It is estimated that over 80% of the economically active population is engaged in the agriculture sector in the Study Area. The majority of agricultural production comes from small-scale farmers since more than 60% of the farm-holders farm less than two hectares. Other industries or other income sources are seriously underdeveloped.

(10) Extremely Limited Extension Services

Although the core of agricultural extension is MOFA and the AEAs, their services are extremely limited. The main problems are: (i) the number of the AEAs is far below needed; (ii) there is a lack of resources for extension activities; (iii) the access to necessary information is limited for the AEAs; and (iv) the AEAs are rarely trained for acquiring updated skills and knowledge.

(11) Food Shortages

Thirty-four percent of the population in the UWR is food insecure, which refers to those who have “very limited access to sufficient and nutritious food necessary for an active and healthy life”. The ratio for the UWR is the highest among the regions in the country. In addition, the incidence of poverty has been increasing only in the UWR and Upper East region. Poverty can therefore be considered in relation to people’s inability to obtain enough food to meet their nutritional requirements.

(12) Low Incomes

As a result of the above problems, the income level of the UWR is the lowest in Ghana. The national average annual household income is GHS 1,217 and the national average annual per capita income is GHS 397. On the other hand, those figures for the UWR are GHS 606 and GHS 106, respectively. In particular, the UWR’s per capita income is less than a third of the national average per capita income.

1.9.2 Links among the Problems

The cause-effect relationships of the above-mentioned problems can be linked as shown in Figure 1.9.1. From the figure, the core problems in the Study Area are interpreted as food shortages and low incomes.

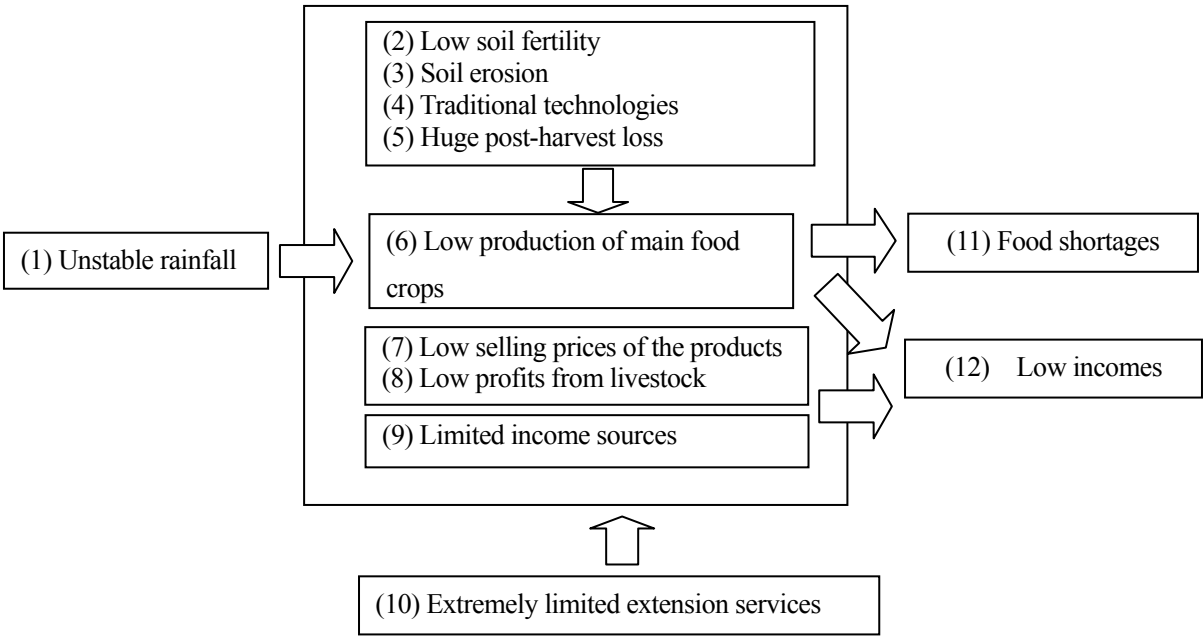


Figure 1.9.1 Links of the Problems Identified

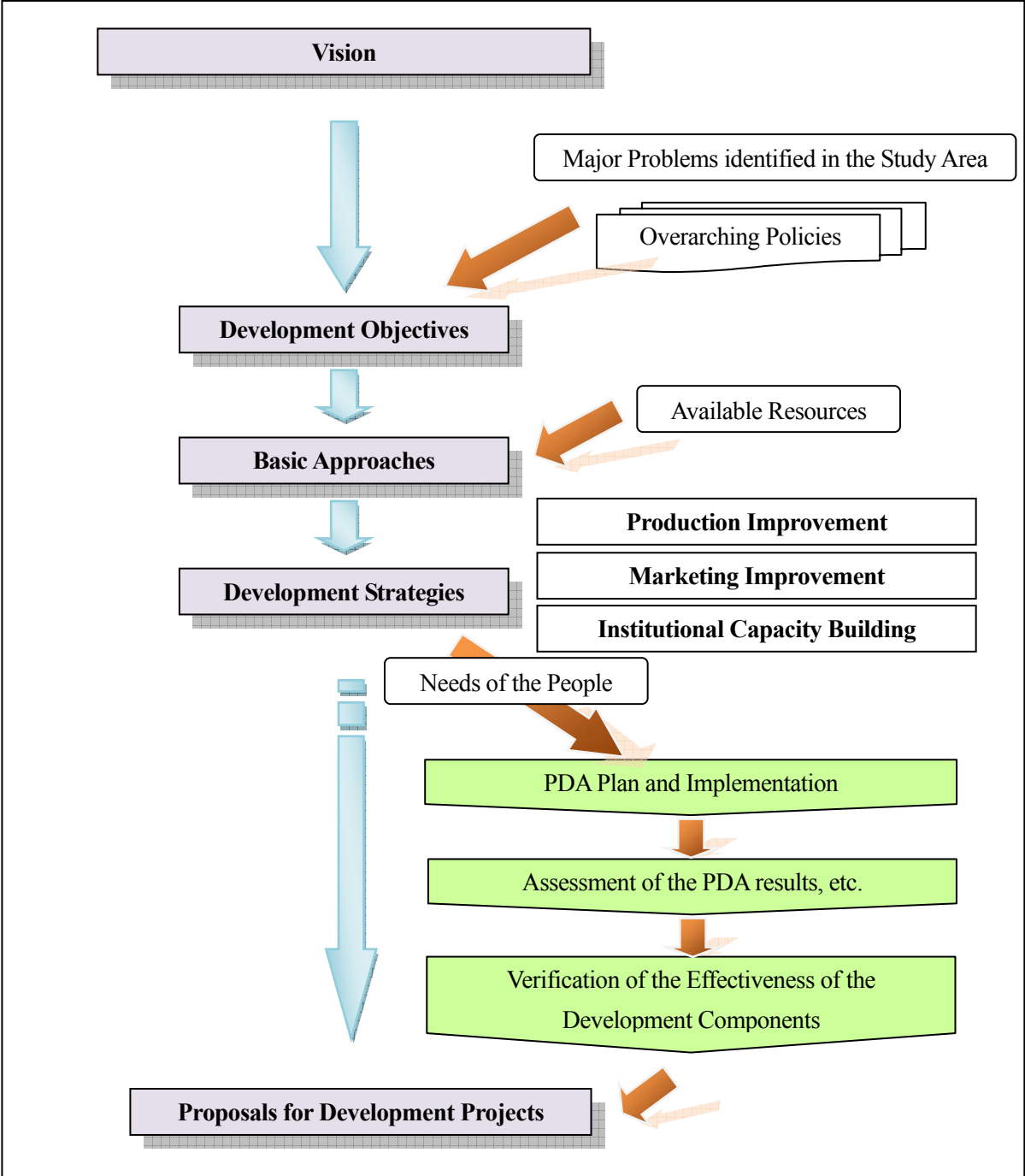
Chapter 2

Basic Framework of the Master Plan

Chapter 2 Basic Framework of the Master Plan

2.1 Preparation of the Master Plan

The Master Plan (M/P) for agricultural development of the UWR has been prepared in the following sequence:



As shown in the above figure, the M/P has been prepared, being composed of guidelines for the development and dissemination of agricultural technologies as well as proposals for agricultural development projects; that means the vision, development objectives, basic approaches, development strategies, proposed technologies and measures, and proposals for development projects. The development

strategies are composed of the strategies for production improvement, marketing improvement, and institutional capacity building. The proposals for the development projects have been made based on the assessment on the results of the PDA implementation, related documents and knowledge of the Study Team and the counterparts. The effectiveness of the development components have been verified, and the results have been reflected in the proposals for the development projects. This chapter describes from the vision to the development strategies. In Chapter 3, the PDA plans and implementation results are shown for each development component, and the assessment of the PDA results and the expected effects of the development projects on the development objectives are described in Chapter 4. The proposals for development projects, composed of development components, implementation structure, implementation schedules, and the costs, are shown in Chapter 5.

2.2 Vision for Agricultural Development

For the preparation of the Master Plan (M/P), the vision for agricultural development has been set as follows, coinciding with the vision of the Regional Agricultural Development Unit (RADU) - UWR:

Improve livelihood of farmers through transfer of appropriate technologies

2.3 Overarching Policies

The overarching policies for the M/P can be found in (i) the Growth and Poverty Reduction Strategy II (GPRSII) (2006-2009), and (ii) the Food and Agriculture Sector Development Policy II (FASDEPII) (2007). The details of these policies are described below.

2.3.1 GPRS II

The Ghana Poverty Reduction Strategy (GPRS) and the subsequent Growth and Poverty Reduction Strategy (GPRS II) provide the basic framework for Ghana’s development policy. The GPRS, issued in 2003, provides the policy framework necessary for attaining the UN Millennium Development Goals (MDGs). The GPRS II has shifted the strategic focus to the acceleration of economic growth, so that Ghana can achieve a middle-income status with an average per capita income higher than US\$1,000 by 2015. To realize the economic growth envisaged in the GPRS II requires agriculture to attain an average of 6% annual growth over the next 4 years, with crops and livestock leading the growth at an average annual growth rate of about 6%, followed by forestry and logging, and fisheries at a rate of 5.1% and 4.8% per annum, respectively. The strategies for various interventions in the GPRS II are elaborated below.

- Accelerating the provision of irrigation infrastructure
 The policy is focused on the rehabilitation, expansion and promotion of the existing irrigation facilities and infrastructure; along with interventions to promote the development of small-scale community-based valley-bottom irrigation schemes; ground water development and exploitation for irrigation purposes; and the promotion of hand-fix pumps for irrigation purposes.

- **Access to credit and inputs for agriculture**

The focus of the policy is to improve access to affordable credit for farmers, with special emphasis on increasing the proportion of women that can gain access to credit, and to promote and support the establishment of farmer-based organizations to enhance access to group credit and services.

- **Selective crop development**

The focus will be on promoting and supporting the development of selected crops with proven potential to contribute significantly to domestic food security, agro-industry and exports. The key initiatives will include: developing and multiplying new and improved seeds, promoting soil fertility management systems and ensuring the integration of pest and disease management systems.

- **Livestock development**

The emphasis will be placed on ensuring the provision of improved breeds of animals, establishing an animal feed quality control system, improving animal husbandry practices and promoting an efficient veterinary public health system.

- **Agriculture mechanization**

While mechanization in large-scale agriculture will be promoted, emphasis will also be placed on the development and use of small-scale technologies that target smallholder farmers, especially women, in the areas of tillage, storage and processing such as bullock ploughs.

- **Access to extension services**

To expand the coverage and effectiveness of extension services, special attention will be given to commodities that have the potential to lead accelerated growth in the sector. This will increase the number of farmers who are reached by the extension agents, particularly in the transition and savannah zones. In addition, Extension Information Centers (EIC) will be established.

- **Restoration of degraded environment**

To minimize the impact of environmental degradation, and in line with Goal 7 of the MDGs, interventions are planned to restore the degraded natural resources, especially water and land, while ensuring sustainable use of natural resources for economic growth, and protecting and conserving unique habitats, natural treasures and bio-diversity.

- **Regulatory reform in the area of land acquisition and property rights**

Existing variations in access to and control over land in different communities will be re-examined. The Land Administration Project will be reviewed to make manifest the importance of property rights to MSMEs, and the Land Title Registration Law of 1985 will be enforced as a means of ensuring security of tenure by small holders, especially women and the youth.

2.3.2 FASDEP II

The first FASDEP was developed in 2002 as a framework for the modernization of the agriculture sector. Its strategies were based on the Accelerated Agricultural Growth and Development Strategy (prepared in 1996). After nearly four years of its implementation, it became necessary to revise it to reflect the lessons learnt and respond to the changing needs of the sector. The strategies in the FASDEP II are compatible with the development strategies included in the GPRS II. Considering the role of agriculture in the national development framework, the FASDEP II identified the objectives and strategies for the food and agriculture sector as follows:

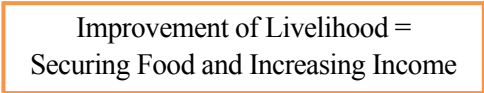
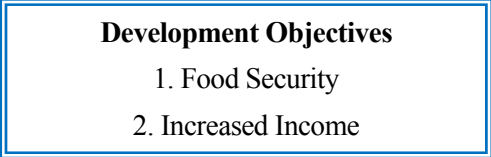
- **Food security and emergency preparedness**
To improve food security and emergency preparedness, the introduction of short duration crops variety and appropriate irrigation schemes and the improvement of post-harvest management are proposed.
- **Increased income growth**
To increase the income of farmers, the promotion of agro-processing, employment creation for the dry season, and income diversification are identified as important.
- **Increased competitiveness and integration into domestic and international markets**
To attain the above objectives, the utilization of locally processed products and strengthening the ties between the public and private sectors are considered to be critical.
- **Sustainable management of land and environment**
Raising awareness about environmental issues is identified as an important step towards environmental sustainability.
- **Application of science and technology in food and agriculture development**
The promotion of demand-driven research, intensification of agricultural policy research, and improvement of Research-Extension-Farmer linkages are considered to be necessary to improve the application of science and technology in agriculture.
- **Enhanced institutional coordination**
The specific strategies for the attainment of the objectives are to strengthen the intra-sectoral and inter-ministerial coordination etc.

As is indicated above, food security and increasing income levels are the central focus of the policies. Each MOFAUWR district office accordingly prepares the district agricultural development plan. The main problems identified, development objectives, and necessary outputs for each district described in the latest plans are shown in Appendix D.

2.4 Development Objectives and Basic Approaches

2.4.1 Development Objectives

As noted in Chapter 1, the UWR is the region with the highest level of poverty incidence in Ghana, and has an extremely large number of households that cannot produce enough foods for themselves. The agricultural development for the UWR needs therefore to focus directly on both ensuring food security and increasing people’s incomes. Thus those two issues, namely food security and increasing incomes, are considered as the development objectives. It can be interpreted that “improving the livelihood of farmers” as stated in the Vision means to help farmers secure enough food and increase their income.



2.4.2 Basic Approaches

Based on the major problems and available resources in the Study Area, the vision, and the overarching policies, the basic approaches to be taken for attaining the development objectives are as follows:

(1) Food Security

- a) Food will be made available by increasing the production of staple food crops.
- b) Production will also be increased by reducing post-harvest loss of the crops.
- c) The crops to be focused on in the M/P will be selected based on the production efficiency and preference of the people in the area.
- d) The production area for the crops will be mainly the upland area, where low-productive and other economic activities are not easily possible.
- e) The production volume, which should be increased, will aim to meet the volume required by the people in the area, taking the average consumption level in the country into consideration.
- f) The food security issue will be emphasized more for the northern side of the Study Area, where less rainfall, lower fertility, and less productive than other parts.

(2) Increased Income

- a) The income will be increased from the current income sources, namely crop production, livestock and processed items.
- b) For the income generating activities to be focused on in the M/P the following will be selected:
 - for crop production, the current soil-crop suitability and potential for improvement of productivity and marketability will be emphasized. The potential to expand cash crop production at the fertile area and/or with irrigation where possible in the dry season will be considered.
 - for livestock, diversification of animals to be reared will be considered as a precaution against the outbreak of diseases. For the selection of the animals, the potential for improvement of efficiency of fattening and breeding of the animals will be emphasized.
 - for processed items, the potential for improvement of productivity and value added to the products by improving agro-processing technologies will be emphasized.
- c) The degree of potential income increases will be discussed based on the current per capita income of the regions, i.e. GHS 106.
- d) The issue of increasing incomes will be more emphasized for the southern side of the Study Area.

2.4.3 Target Years

The final target year of the M/P has been set at 10 years after the commencement of the implementation. The period is divided into two phases, the mid-term (5 years) and the long-term (10 years), for making the development schedules and goals clear.

The Agricultural Sector Plan 2009-2015 of MOFA¹ indicates the development programs, components, outputs, and activities for agricultural development of the whole country. The following programmes are described:

- Programme 1: Food Security and Emergency Preparedness
- Programme 2: Improved Income Growth and Reduced Income Variability
- Programme 3: Increased Competitiveness and Enhanced Integration into Domestic and International Markets
- Programme 4: Sustainable Management of Land and Environment
- Programme 5: Science and Technology Applied in Food and Agriculture Development
- Programme 6: Institutional Coordination and Stakeholder Engagement

Among them, particularly Programmes 1 and 2 are most closely related to the objectives of the M/P. The goals are shown for each output under the programmes, and the following goals are most related to the M/P:

Programme 1

1. Improved technologies adopted by smallholder farmers and yields of sorghum and cowpea increased by 50% and 25% respectively by 2015
2. Production of guinea fowl increased by 20% and pigs including Ashanti Black pigs by 25% by 2015 through adoption of improved technologies
3. Post-harvest losses along the rice and sorghum value chains reduced by 35% and 20% respectively by 2015
4. Number of food insecure households reduced by 20% by 2015

Programme 2

1. Income from cash crop production by men and women increased by 20% and 30% respectively by 2015
2. Income from livestock rearing by men and women increased by 10% and 25% respectively by 2015
3. At least two new commercially viable products developed from each of staple crops, horticultural crops, livestock and fisheries by 2015
4. Efficient pilot value chains developed for two selected commodities in each ecological zone (guinea fowls and tomatoes in Guinea savanna)

To coincide with the above plans, the year 2015 should be considered as the target year for the mid-term development goal of the M/P. Therefore, the target year for the long-term goal should be 2020.

¹ The Draft Final Report, August 2009

2.5 Agricultural Development Strategies

Based on the above-mentioned basic approaches, agricultural development strategies have been developed for attaining the development objectives. These strategies are intended to make clear the technologies and measures to be introduced or extended in the Study Area for crop production, livestock development, processing, and marketing improvement. The agricultural development strategies also indicate the institutional capacity necessary for smooth implementation of the M/P. For these purposes, the technologies are

classified according to the strategies; however, it should be noted that some of the technologies, particularly those under the strategy for food security, are also important for the strategy for increasing incomes.

The technologies and measures that could be applied for the Study Area are proposed in the next section, and among them, some agricultural technologies were selected to verify the effectiveness through the PDAs. The results of the verifications are described in Chapter 4, and based on that, the development projects are proposed in Chapter 5.

2.5.1 Strategy for Food Security

The following two strategies have been developed to enhance food security for the people:

(1) Stabilization of Crop Production

Issues: Crop production in the Study Area has been largely affected by recent climate changes, particularly irregular rainfall. The upland area is especially vulnerable to drought since the soils are sandy and water retention level is low. Countermeasures against the irregular rainfall should be made for stabilizing crop production.

Strategies: The technologies that can help stabilize crop production should be applied. Those technologies include introduction of drought-tolerant varieties, environmentally-sound farming systems, water harvesting systems, etc. as shown in Table 2.7.1.

(2) Reduction of Post-harvest Loss

Issues: Most of the farmers cultivate crops for their own consumption. The harvested crops should be kept until the next harvest time. It is however observed that the farmers do not pay much attention to post-harvest loss, which is generally huge.

Strategies: The technologies for the proper drying and storage of their foods, as shown in Table 2.7.2, should be applied.

With the above strategies, it is expected that the farmers increase the total volume of crops that

Agricultural Development Strategies

1. Strategy for Food Security

- (1) Stabilization of Crop Production
- (2) Reduction of Post-harvest Loss

2. Strategy for Increasing Incomes

- (1) Increase of Productivity
- (2) Diversification of Income Sources
- (3) Improvement of Marketing

3. Strategy for Institutional Capacity Building

- (1) Capacity Enhancement of MOFAUWR office
- (2) Extension Improvement

they can produce, consume and obtain for surpluses. Part of such surpluses can be sold and thus generate income for the farmers.

2.5.2 Strategy for Increasing Incomes

The following three strategies have been developed to increase income for the people:

(1) Increase of Productivity

Issues: The area is generally characterized by low crop productivity because of traditional farming practices, low soil fertility and erratic rainfall. The hydromorphic zone and the valley bottom area should receive more focus for increasing productivity since soil fertility and access to irrigation water are better than in the upland area.

Strategies: Technologies to improve productivity such as appropriate cultivation methods and crops, introduction of marketable crops or varieties, etc. shown in Table 2.7.3 should be applied.

(2) Diversification of Income Sources

Issues: Most of the community people in the area rely on limited agriculture-related income sources. Since agriculture depends on rainfall, the income of the people fluctuates and is unstable. It is necessary to diversify income sources whatever possible for the people.

Strategies: As it is difficult to generate much income from the production of staple crops, the focus should be placed on the technologies related to vegetable production, livestock development and processing, as shown in Table 2.7.4.

(3) Improvement of Marketing

Issues: The agricultural products and livestock are usually sold at the local markets if they are not sold to middlemen coming to or residing in the communities. At those markets, the prices fluctuate significantly depending on the seasonal balance of supply and demand. Most of the community people sell their products immediately after harvesting when the prices become low, or sell their livestock in case of emergency regardless of the prices, since they cannot afford to wait until the prices become favorable to them. In addition, the people are not generally skilled in negotiating with middlemen. As a result, the people are forced to sell their products or livestock at low prices. The ways of marketing should therefore be improved.

Strategies: The improvement of marketing should be carried out by providing market information more systematically to the producers, organizing the producers into groups, etc., as shown in Table 2.7.5.

2.5.3 Strategy for Institutional Capacity Building for Implementation

(1) Capacity Enhancement of MOFAUWR office

Issues: Under the current decentralization policy, the authority for decision-making, including for the planning and implementation of the projects, has been delegated to the districts. Accordingly, the regional office is expected to take the role of coordination and supervision, and the district offices are responsible for technical issues. For example, MOFAUWR district offices should conduct the planning workshops with the community people every year and prepare the district development

plans, including the budget proposals. The projects should be implemented accordingly if the budgets are allocated by the MOFA headquarters. The regional office supervises those activities undertaken by the district offices. To ensure that the proposed projects in the M/P are implemented smoothly and the development objectives are attained, the roles of MOFAUWR office at the regional and district levels should be made clear and the capacity of the concerned officers for project management should be enhanced.

Strategies: The roles should be made clear in the Plan of Operations (PO) when a project is to be implemented, and the implementation and management capacity of the concerned officers should be enhanced through the training on the related subjects and also the on-the-job-training (OJT) in the project implementation.

(2) Extension Improvement

Issues: The current extension of agricultural technologies is mainly undertaken by MOFA through the AEAs and DAOs. MOFA's extension services, however, have serious constraints, such as: (i) shortage of the AEAs, (ii) lack of resources for extension activities, (iii) limited access to information, and (iv) lack of training for the AEAs. Nevertheless, the initiative for the extension services should be taken by MOFA. If that is difficult, the community leaders should instead be responsible for the extension activities in their own communities with the assistance of the AEAs. There are only 32 AEAs in the four districts while there are about 550 communities that need to be covered. Therefore, the capacity building of the AEAs and the community leaders, and the improvement of the current extension system are strongly needed.

Strategies: The capacities of the AEAs and the community leaders necessary for disseminating the technologies should be enhanced through the training on the related subjects and also the on-the-job-training (OJT) for the AEAs as well as on-the-farm-training (OFT) for the community leaders in the extension activities. The current extension system should be improved by developing the ways to utilize the community leaders as well as the people more effectively.

2.6 Key Concept of the Master Plan

Based on the discussion above, the key concept of the Master Plan can be visualized as shown in Figure 2.6.1.

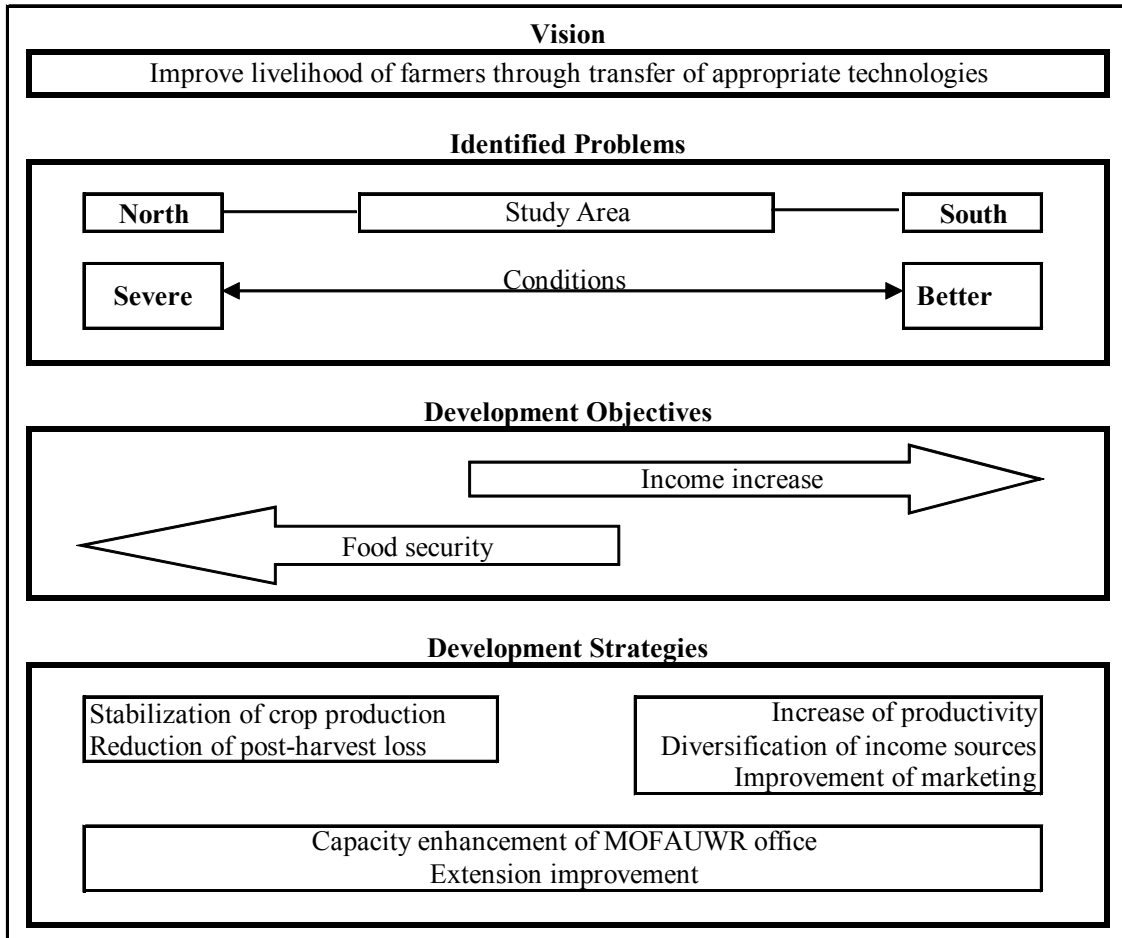


Figure 2.6.1 Key Concept of the Master Plan

2.7 Proposed Technologies and Measures

The potential agricultural technologies and marketing improvement measures that could be applied for the Study Area to attain the development objectives are proposed in Tables 2.7.1 to 2.7.5. The proposed technologies and measures are divided according to the development strategies mentioned above. The reasons why those technologies or measures are proposed are also explained in the tables.

Table 2.7.1 Technologies for Stabilizing Crop Production

Agricultural Technologies	Description of the Technologies	Justification (Reasons to propose - potentials and/or problems to be solved)
Introduction of drought-tolerant varieties and farming methods	Production and dissemination of drought-tolerant varieties of sorghum and cowpea, and introduction of early-maturing varieties such as Dorado and Kapaala for sorghum, and Songotra and Apagbaala for cowpea	Due to varying annual precipitation in recent years, crop production with traditional late-maturing varieties is unstable. It is therefore suggested to introduce drought-tolerant and improved early-maturing varieties to stabilize the production.
	Improvement of mix-cropping of late- and short-maturing varieties (mixture of improved and local varieties) to reduce the risk of being negatively affected by climate change	As the rainfall is insufficient, it is better to introduce early-maturing varieties to be cropped with late-maturing (local) ones.
	Improvement of farming method by adopting ridge till method and increasing the cultivation density at available lands	The cultivation density for the mounting method should be improved.
Introduction of alley cropping	Cultivation of food crops and legumes between mango and cashewnut trees by broadening the distance between the trees to allow alley cropping, and mix-cropping of legumes and early-maturing food crops or rotational cropping of groundnuts and soybeans.	To reduce the negative impact from the varying annual precipitation, it is suggested to reduce evapotranspiration by alley cropping. Also, diversification of crops by introducing perennial crops and pigeon peas can contribute to stabilize crop production.
	Mix-crop of pigeon peas and food crops/legumes by planting pigeon peas every few meters and other food crops between pigeon peas.	Pigeon peas are drought-tolerant and can be used as fodder for livestock.
Introduction of water harvesting method	Introduction of stone band technologies for sloping ground (adopt and improve the method introduced by DANIDA at Yagha area in Lawra-Jirapa western route)	On the sloping ground, soil erosion is spreading because vegetation area is small and soils are easily washed away by rain. It is therefore suggested to use stone band to mitigate soil erosion.
	Restore of vegetation at degraded land by adopting "STONE MULCH", by applying it for fodder trees such as <i>Cajanus cajan</i> , <i>Leucaena leucocephala</i> , <i>Pithecellobium dulce</i> , and <i>Gmerina arborea</i>	A large area of land has been degraded by soil erosion. Adoption of "STONE MULCH" is proposed to reduce evapotranspiration. It will contribute to increase vegetation.
	Introduction of water harvesting method at degraded land by making mound in a half circle- or v-shape to catch rain water	It is proposed to plant trees by utilizing rain water in degraded land to increase vegetation.
Measurement for soil erosion	Prevention of soil erosion by applying anti-erosion measures such as agroforestry	It is necessary to take action against serious soil erosion immediately as a long term measure

Table 2.7.2 Technologies for Reducing Post Harvest Loss

Agricultural Technologies	Description of the Technologies	Justification (Reasons to propose - potentials and/or problems to be solved)
Improvement of post harvest technologies for food crop	Improvement of threshing and drying technologies, by not doing it directly on the ground but on tarpaulin to maintain the quality of crops and to reduce loss.	Currently, the loss of crops during harvest and post-harvest process is significant. Such loss can be reduced by simple technologies, which will eventually improve the crop productivities.
	Improvement of crop storage technologies, including construction methods of storage facilities	In general, the price of agricultural commodities is low during the harvest season. It is therefore suggested to improve the storage facilities, so that the farmers can keep the crops until the prices become favorable for them.

Table 2.7.3 Technologies for Increasing Productivities

Agricultural Technologies	Description of the Technologies	Justification (Reasons to propose - potentials and/or problems to be solved)
Collection and use of livestock dung	Collection of animal dung efficiently by keeping animals in a run to apply it for furrow at vegetable fields, and also to cultivate vegetables at the run.	The soil fertility is low, but the use of chemical fertilisers is limited due to high prices.
Introduction of compost making and use	Compost making by utilizing existing resources, including collection and use of dead leaves and animal dung	Soil fertility in the Study Area is generally low. The farmers are therefore suggested to make compost by using available resources.
	Effective and efficient use of compost, by concentrating it at the area around the trunk of fruit trees and the furrow at vegetable fields.	Currently, compost is used evenly over the field. In this case, the direct effects of compost to crop productivity is limited. A better use (targeting specific spots) of compost should be encouraged.

Table 2.7.4 Technologies for Diversifying Income Sources (1/2)

Agricultural Technologies	Description of the Technologies	Justification (Reasons to propose - potentials and/or problems to be solved)
Expansion of small scale irrigation	Dissemination of vegetable cultivation such as tomatoes, onions, okra, and cow peas with small scale irrigation at flood-prone areas	It is possible to increase the productivity by utilizing hydromorphic and valley bottom areas in the rainy season.
	Introduction of small-scale-irrigation using manual pump along the rivers	Increase the crop productivity by utilizing river water.
Livestock development	Introduction of commercial pig farming technologies, with Babile Pig Breeding Station to be responsible for the provision of technical training and arrangement of feedstuff	Pork is marketable in and nearby the Study Area, but the supply of pork is currently little. The MOFA's Pig Breeding Station in Babile can function for the promotion of pig farming. Pig farming is now mainly considered as a safety net for the farmers. By making it commercial, it will help increase the farmers' income more stable.
	Promotion of exotic guinea fowl breed	Guinea fowl is popular in the Study Area. The improved breed has been successfully grown and has helped to increase the productivity.
	Dissemination of rabbit farming technologies	Poultry is popular in the Study Area. Chicken is an important income source as well as protein source. However, due to the spread of birdflu and Newcastle disease, the performance of poultry has been unstable. Therefore, there is a need to introduce new animals to rear, in order to mitigate risks.
	Improvement of efficient goat/sheep rearing technologies	The current practice is that farmers keep goat/sheep even after they become large enough to sell, and wait until the time when farmers need money. This practice is inefficient and wastes pasture. It is better to sell them once they are matured.
	Introduction of livestock processing technologies such as salting, drying and smoking	Currently, the livestock are sold as they are. The sales of livestock is not favorable during the dry season when their weight is lighter than the other season. It is important to process and add value to them to increase farmers' income.
	Dissemination of cultivation technologies of pasture grass around wells/boreholes where drain water can be used	By utilizing available water resources, cultivate pasture grass and trees as feedstuff. It can avoid decrease of animals' weight during the dry season.

Table 2.7.4 Technologies for Diversifying Income Sources (2/2)

Agricultural Technologies	Description of the Technologies	Justification (Reasons to propose - potentials and/or problems to be solved)
Introduction of bee keeping technologies	Introduction of bee keeping technologies, including the skills of making bee keeping box and processing honey	In the Study Area, there are many fruit trees and flowers that can be used for bee keeping, however, most of them are not utilized. Also, honey can be self-consumed or sold.
Improvement of Agro-processing technologies	Dissemination of processing technologies for soybeans, groundnuts, and fruits, by using grinder and roaster for soybeans and groundnuts and using hygienic drying equipments for fruits	There are many crops sold in the Study Area, but little effort is made for value addition. It is therefore proposed to encourage value addition of soybeans, groundnuts, and fruits to increase incomes of the farmers.
	Dissemination of cashew nut processing technologies, including simple frying method	Abandoned cashew nuts at the time of low price can be threshed and sold.
	Improvement of shea nuts processing and soap production technologies of women groups, including packaging and marketing skills	The price of shea butter is currently too low, considering work volume necessary for its production. To add value to it by more efficient way of production and marketing, it is advisable to produce and sell soap in addition to shea butter by making women groups more active and using simple machines such as grinder and roaster.
	Improvement of dawadawa processing technologies by introducing the concept of sanitation and hygenic environment for production	The fruits of dawadawa are processed mainly by women and used for cooking. The process of processing dawadawa can be more efficient, and the sanitary condition during the processing can be improved. It is proposed to make women groups more active for collective production and marketing, and use simple cooking tools that are hygienic.
	Dissemination of drying vegetable technologies	By drying vegetables, the storage period can be extended and the products can bear longer transportation time.

Table 2.7.5 Measures for Marketing Improvement

Marketing Improvement	Description of the Measures	Justification (Reasons to propose - potentials and/or problems to be solved)
Provision of current price and other marketing information	Provision of marketing information systematically by collecting current price and other necessary information on agricultural products and livestock regularly at the local markets and consolidating them at the regional office, and distributing them to the producers through AEAs	MOFAUWR office collects price information on various agricultural and livestock regularly at the six or seven main local markets in the UWR, and report it to MOFA H/Q and broadcasts it by radio with financial assistance by a NGO. This can be strengthened by systematizing the whole process and train the concerned officers on market-related issues
Provision of new market channel information	Provision of new market channel information by exploring them more intensively through the communicating with the related agencies, private-sector actors, NGOs, etc.	The exploration of new market channels covers outside of the region, which will be new challenge for MOFAUWR office. To find out the new market channels and increase the profits from the sales, the related information such as new buyers, their buying prices, required qualities, ideas of new products, etc. should be collected and provided to the producers.
Organizing marketing groups	Organizing the farmers into groups for adjusting cultivation and harvest times of the products, selecting the crops cultivated, and collectively marketing the products	The production volume of crops by each farmer is minimal, and therefore the farmers have to sell the products at the nearby markets where the seasonal fluctuation of the prices are significant. By organizing them into groups, the production volume will be increased, which will attract traders come to the communities, or make it easier the farmers collect and transport their crops to markets.
Improvement of negotiation skills	Improvement of negotiation skills of the farmers with traders (both buyers and suppliers) to increase the gain of the farmers from transactions	The income of the farmers are kept low, because most crops are sold right after the harvest when the prices tend to be low. It is therefore proposed to train the farmers on marketing skills.

Chapter 3

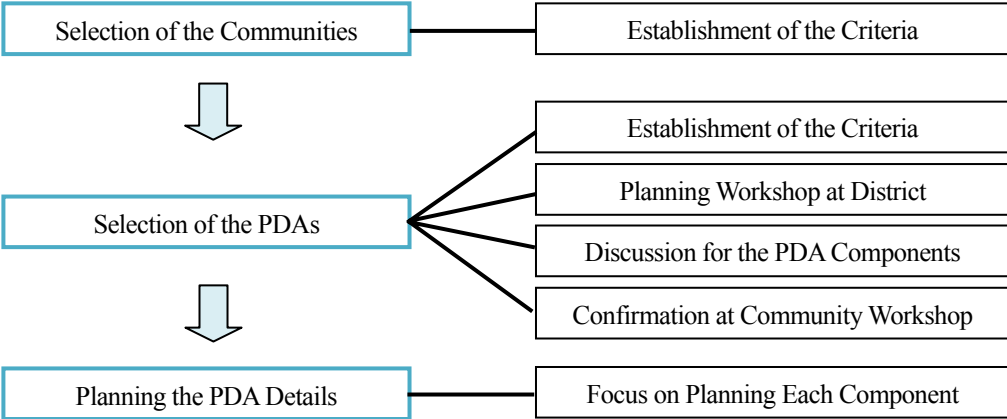
Pilot Development Activities

Chapter 3 Pilot Development Activities

In this chapter, the details of the planning and the implementation results of the PDAs are described as the basis for verifying the effectiveness of the Master Plan shown in Chapter 2.

3.1 Planning of the PDAs

The PDAs were planned according to the following flow:



3.1.1 Selection of the Communities

The PDAs were planned to be implemented at the community level, and the communities were selected according to the following criteria:

- 1) Nine communities shall be selected from the four districts: 3 communities from Lawra, 2 from Jirapa, 1 from Lambussie, and 3 from Nadowli.
- 2) Such communities will function as the satellite points, from where the technologies introduced by the PDAs will be extended to the neighboring communities. To ensure the project activities are replicable by the other communities:
 - Natural and socio-economic conditions should be typical or representative of the area where a community is located,
 - A community should be located in a strategic location for exhibiting the project outputs to the other communities, and
 - The government’s extensions services and/or NGO activities should or can be active in the selected communities for disseminating the projects’ results to the other communities.
- 3) The PDAs should be implemented with the expectation of success. Therefore:
 - The community people should be willing to implement the PDAs, participate in the project activities, and exhibit the progress and results of the PDAs to the other community people, and
 - The community should have a reliable and effective leader(s).

As a result, each MOFAUWR district office selected the communities as shown in Table 3.1.1. The locations of all the communities are indicated in the maps attached in the main report.

Table 3.1.1 PDA Communities

District	Community	Operational Area	Zone
Lawra	1. Puffien 2. Tome-Kokoduor 3. Zakpee	Nandom Tome Talibri	Nandom Tome Babile
Lambussie	1. Naawuie	Samoa	A
Jirapa	1. Kogri 2. Nyani	Ullo Jirapa	C B
Nadowli	1. Daffiama 2. Tabiesi 3. Nanville	Daffiama Tabiesi Nanville	Nadowli Fian Kaleo

3.1.2 Selection of the PDAs

The PDAs were implemented as the pilot projects for verifying the effectiveness of the proposed technologies, measures, and institutional capacities described in Chapter 2. They included several activities, and as trials, all of them were limited to a small scale and implemented within a short period. The trials that showed appropriate interventions for the area were considered as the basis for the proposals for the development projects in Chapter 5. The following criteria were set as the criteria for selecting the PDAs:

- 1) PDAs should be planned with the proposed technologies and measures described in Chapter 2.
- 2) The technologies included in the PDAs should be technically acceptable and replicable for the community people.
- 3) In principle, three PDAs should be implemented in each community.
- 4) PDAs should be able to produce certain outputs within one year or by December 2009.
- 5) PDAs should meet the needs of the community people as solutions to the problems of agricultural development.
- 6) Cost of PDAs should be limited to the minimal amount.
- 7) Based on the results of the implementation of PDAs, a full-scale-project should be able to be formulated, i.e. the PDAs should have the potential for enlarging their scales.
- 8) PDAs should be able to be implemented sustainably even after March 2010 when the Study is completed.

After setting the above criteria, one-day planning workshops were held at each of the district offices. The representatives of the communities where the PDAs were to be implemented (PDA communities), the responsible AEs, DAOs, and concerned RAOs were the core participants at the

workshops. In the workshops, major problems were identified, desired solutions were discussed, and in accordance with them, the problems trees were made. After the workshops, the Study Team and the concerned C/P discussed the components of the PDAs that should be included based on the above criteria, required costs and time, the needs and capacities of the community beneficiaries, and the capacities of the district offices including AEAs. The components of the PDAs were then finalized and confirmed in the community workshops with the people in each of the PDA communities. The main development components included in the proposed PDAs are summarized in Table 3.1.2 in relation to the development objectives and strategies mentioned in Chapter 2. The problems trees and the proposed PDAs (project purposes and outputs) are attached in Appendix E.

Table 3.1.2 Main Components in the Proposed PDAs

Development Objectives	Development Strategies	Main Development Components included in the Proposed PDAs
Food security	Stabilization of crop production	- Production of staple food crops
	Reduction of post-harvest loss	- Post-harvest loss reduction
Increase of Incomes	Increase of productivity	- Compost making
	Diversification of income sources	- Production of vegetables in dry season as cash crops (with small-scale irrigation) - Promotion of locally-characterized products (with small-scale irrigation) - Pig breeding and fattening - Small animals and birds rearing - Processing agricultural and forest products
	Improvement of marketing	- Organization of the farmers into groups
Institutional capacity building	Capacity enhancement of MOFAUWR office	- Clarification of roles and responsibilities - Monitoring and evaluation
	Extension improvement	- Involvement of community people in PDA implementation

3.1.3 Planning the PDA Details

According to the above main components, the major issues considered and the focus given for planning the PDA details are described below.

(1) Production of Staple Food Crops

Major Issues: The staple food crops in the area are sorghum and millet, followed by maize. There are not many crops suitable for cultivation in the tropical savannah zone other than those crops. The differences in the characteristics among those crops are as follows:

- Sorghum is more widely cultivated, eaten and used for processed items than millet and maize.
- Sorghum is generally grown without fertilizer, and does not require high production costs.
- Sorghum is the most important crop especially for the northern part of the Study Area, where the climatic condition is more severe than in other areas.
- Millet is generally grown as the secondary crop, and its productivity is lower and less resistant to drought than sorghum.
- Maize cannot be grown in the low-fertile areas where sorghum is generally grown
- Maize requires chemical fertilizer.

Focus of the Plan: Based on the above characteristics, sorghum was to be focused on in the PDAs among the three crops. In the PDAs, early-maturing varieties suitable to be grown in the Study Area were selected and used at demonstration plots. The effects of seed as well as compost on the production of sorghum were to be examined.

(2) Other Food Crops to be Included

Major Issues: In the Study Area, groundnut, cowpea, and rice are grown as cash crops and also as food crops when sorghum becomes scarce.

Focus of the Plan: In the PDAs, the improved production technologies including the use of improved seeds were to be introduced, and their effects on both food security and increasing incomes were to be examined.

(3) Post-harvest Loss Reduction

Major Issues: There are huge post-harvest losses of the crops. Such losses can be reduced with simple technologies such as the improvement of drying and storing methods.

Focus of the Plan: In the PDAs, the focus was given to the improvement of drying the harvested grains on tarpaulin sheets under the sun, and then storing them in an improved sack. The grains were to be given necessary treatments before storage.

(4) Compost Making

Major Issues: Soil fertility is generally extremely poor in the Study Area. The use of compost is however seldom seen since the farmers in the area are not very aware of the methods for making compost and their effectiveness. The use of chemical fertilizers is also extremely limited because most farmers cannot afford to purchase them. The exception was when the government subsidized 50% of the cost for purchasing chemical fertilizers in 2008 and 2009 to mitigate the negative impact of drought, but such subsidies cannot be always expected.

Focus of the Plan: In the PDAs, the easiness of compost making and the effectiveness of the compost on crop production were to be verified. It should be noted that compost, which is to be made from animal dung, crop residues, and other organic matter, should be applied mainly for cash crop production as the first priority, considering the limited volume of compost that can be made. When there is a surplus of compost in a community, it may be applied also for staple food production.

(5) Production of Vegetables in the Dry Season as Cash Crops

Major Issues: Vegetable cultivation in the dry season depends largely on the availability of water, and therefore the total volume of vegetables produced in the area is minimal. The market prices are accordingly much higher than in the rainy season, and if the producers can take advantage of this gap, it will be a good opportunity for them to generate income. The vegetables cultivated in the area are mainly tomatoes, peppers, okra, eggplant, and onions. In particular, tomatoes are most widely cultivated and sold since they are used as the main ingredient for local dishes. The varieties of tomatoes used by the farmers are indigenous ones that are perishable and too soft to transport.

Focus of the Plan: Among the above vegetables, the primary focus was given to tomatoes. The PDA introduced a new variety, the Rio Grande, which is much more durable for transportation, has seeds that are more easily available, and is expected to produce higher yields than the commonly-prevailing varieties. An attempt was also made to enhance the productivity of the new variety by introducing the method of pinching lateral shoots under the first flower¹. For the other vegetables such as peppers, okra, eggplant, and onions, improved seeds and cultivation technologies, including the application of compost, were introduced for increasing their productivity.

(6) Promotion of Locally-characterized Products

Major Issues: Technical renovation is not common in the Study Area, and the crops that the farmers grow are not much changed. On the other hand, there are successful cases of new crop production, such as the recent introduction of onions in the Upper East region.

Focus of the Plan: Melon production was to be attempted in the PDAs to promote the production of a locally-characterized product with the purpose of helping the community people to generate income. The potential for cultivating as well as marketing melons were to be verified.

(7) Pig Breeding and Fattening

Major Issues: In the Study Area, pigs are reared at the household level mostly by free-range or by keeping them in extremely unsanitary conditions. Feed is not adequately available, particularly in the dry season. As a result, pigs do not grow as they should because of low rearing efficiency, and the owners do not get much profit from the sales. In the Study Area, there is the Babile Pig Breeding Station,² which has been functioning as the center for the development and dissemination of the

¹ Refer to the Instruction Manuals for Agricultural Technologies and Tools for the details.

² More details on the Station are found in Appendix I.

Ashanti Black Pigs (ABPs) as an indigenous breed. The Station covers the whole country, as it is the only center of MOFA to pursue this function in Ghana. The Station is therefore expected to provide technical assistance to the communities for the dissemination of pig rearing in the Study Area.

Focus of the Plan: With the assistance of the Station, pig breeding was to be introduced to a community as a business. It was planned that community people would manage the necessary activities, including feeding pigs sustainably, so that pig breeding may become a stable income source for them. This plan was to be applied to the communities where collective activities of the people are ensured.

In addition, commercial pig rearing was also to be introduced at the household level. The scale is smaller than the above community-based pig rearing, thus allowing interested households to easily replicate and manage the activities. Pigs were to be either bred or fattened for sale depending on the needs of the beneficiaries.

(8) Small Animals and Birds Rearing

Major Issues: In the Study Area, almost all of the households rear some kinds of animals, such as small ruminants (sheep and goats), poultries (chicken and guinea fowls), pigs, and rabbits. Those animals are important income sources for them; however, adequate care is rarely given to the animals, and moreover, profits generated from the sales of the animals are not great as they are sold when the people are in need of cash for food or in other emergency cases, but not when the profit margins are at their peak.

Focus of the Plan: Among the above-mentioned animals, exotic guinea fowls were introduced by the Upper West Agricultural Development Project (UWADEP) to the UWR and proved to be successful. The beneficiaries reported that the guinea fowls were robust and about twice the size of local birds, and they were sold at prices one and a half times higher than those for local birds³. As for rabbits, it is known that rabbits can be ready for breeding or for slaughter after about 6 months from birth. A female rabbit generally delivers off-springs 3 to 4 times a year, and the documented litter size is 8 to 10 rabbits⁴. As for small ruminants, many households rear them, and therefore price competition is strong in the area. It was considered in the PDAs to introduce improved varieties of small ruminants as they could grow faster and thus be sold more efficiently. Such varieties were unfortunately not easily available. As for chickens, the UWADEP found that raising chickens was interfering with the business of commercial suppliers and it therefore shifted to guinea fowls⁵. Thus, guinea fowls and rabbits, in addition to pigs, were considered to be verified as potential income sources for the community people in the Study Area.

³ More details are found in Appendix M.

⁴ *East African Agriculture, A Textbook for Secondary Schools*, English Language Book Society and Macmillan, 1982

⁵ See Appendix M for more details.

(9) Processing Agricultural and Forest Products

Major Issues: In the Study Area, there are precious natural resources such as shea trees and dawa dawa trees, which bear fruits that can be turned into processed items. The household women have traditionally been processing them for their family's use and for sale, but the technologies are still primitive. In addition, the farmers in the area produce cash crops such as groundnut, soybean, etc., but most of them are sold immediately after the harvest when the prices are usually at their lowest. Processing of those crops, which could add value to the crops, does not receive much attention from the people.

Focus of the Plan: It is known that shea nut can be processed not only for shea butter but also shea soap, and groundnuts for oil and kurikuri. Those processed items were considered as value-added products, and therefore it needed to be verified whether or not profits could be generated from them. In particular, shea nut was expected to be a potentially good income source since the demand for shea butter has been rising abroad.

(10) Organization of the Farmers into Groups

Major Issues: It is expected that the salable volumes of crops be increased by organizing the farmers into groups. It would then become easier to attract traders to come to the communities, or for the people to collect and transport their crops to markets. In the case of vegetable production, the current average farm size per household is only about 100m², meaning that the production and salable volumes are extremely small. The products are sold in the vicinity and seldom go to large markets such as the Wa market. In order to take the products to such markets, or to make traders come and buy the products, the producing farmers need to produce a large quantity of those products, and therefore they should organize themselves into groups.

Focus of the Plan: The components related to cash crop production, community-based pig breeding, and agricultural and forest product processing were to be considered for organizing the producers into groups. In the PDAs, the effects of organizing them on increasing incomes were to be verified.

(11) Clarification of Roles and Responsibilities

Major Issues: In relation to project implementation and management, the roles and responsibilities among MOFAUWR regional and district officers, and other concerned agencies should be made clear in accordance with the current decentralization policy.

Focus of the Plan: The roles and responsibilities of the stakeholders were to be made clear and written out in the Plan of Operations.

(12) Monitoring and Evaluation

Major Issues: The monitoring and evaluation of the development activities should be taken care of by the MOFAUWR district offices together with the community leaders. The MOFAUWR regional office needs to supervise the district offices.

Focus of the Plan: The flow of PDA monitoring and reporting was discussed between the Study Team and the C/P and agreed upon as shown in Figure 3.2.1. This flow was considered based on the existing one that MOFAUWR adopted for the daily activities. The requirement for a bi-weekly report was added for the PDAs, and the functionality and effectiveness of this flow was to be verified.

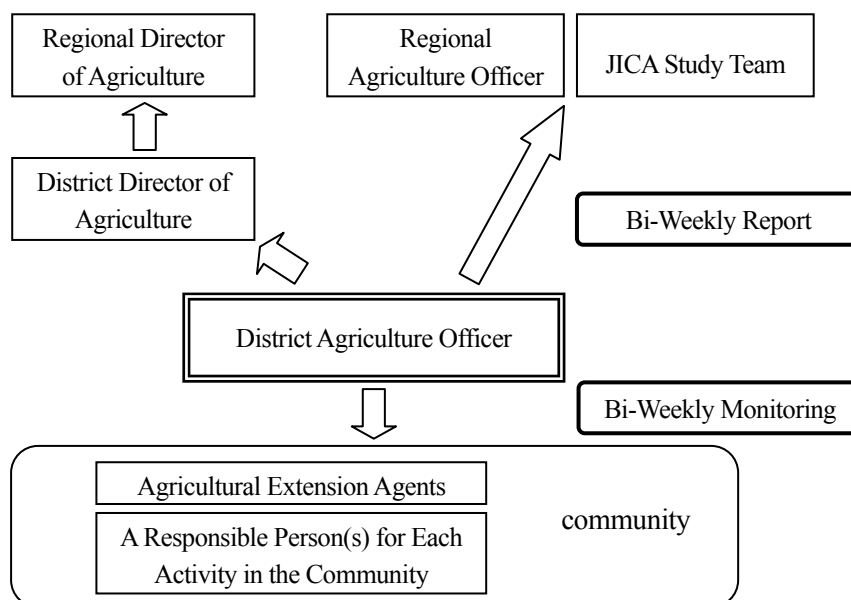


Figure 3.2.1 Flow of Monitoring and Reporting

(13) Involvement of Community People in PDA Implementation

Major Issues: The lack of AEAs is one of the major constraints for disseminating agricultural technologies.

However, the initiative of the extension services should be taken by MOFAUWR, and the ways to improve the current extension system should be considered.

Focus of the Plan: The community people, particularly the leaders in communities, were to be involved in the PDA planning and implementation to see to what extent they are capable of functioning in place of AEAs. In addition, the effectiveness of the farmer-to-farmer extension method was verified.

3.1.4 Planned PDAs

The planned PDAs are summarized in Tables 3.1.3. to 3.1.5, including main project activities, agricultural technologies to be verified through the PDAs, and the crops or livestock selected for the PDAs. The tables also describe the PDAs in connection to the areas classified in 1.3.3 where each of the PDAs should be applied, and the development objectives and strategies to which each of the PDAs is closely related. After the PDA details were planned, the Plan of Operations (PO) were prepared through the discussions with the officers and AEAs as shown in Appendix F.

Table 3.1.3 List of the Planned PDAs (Lawra District)

District	Community	PDA No.	Project Title	Main Project Activities	Agricultural Technologies Verified through the PDAs	Crops or Livestock Included in the PDAs*	Area to be applied**			Development Strategy***					
										Food Security		Income Increase			
							1	2	3	1	2	1	2	3	
Lawra	Puffien	1	Integrated Farming	Compost making, Demonstration plots for crop production, Improved breeds of small ruminants, Improved animal housing	Introduction of drought-tolerant varieties and farming methods, Introduction of compost making and use, Livestock development	sorghum and cowpea, sheep and goats	○	○		○		○	○		
		2	Mango tree planting	Supply and planting of mango seedlings	Measurement for soil erosion	mango	○			○			○		
	Tome-kokoduor	1	Integrated Farming	Compost making, Demonstration plots for crop production, Improved breeds of small ruminants, Improved animal housing	Introduction of drought-tolerant varieties and farming methods, Introduction of compost making and use, Livestock development	sorghum and cowpea, sheep and goats	○	○		○		○	○		
		2	Dry season gardening	Digging of boreholes with concrete rings, Training on production methods	Expansion of small scale irrigation	<u>tomato, cabbage, eggplant, onion</u>		○	○				○	○	
		3	Mango tree planting	Supply and planting of mango seedlings	Measurement for soil erosion	mango	○			○			○		
	Zakpee	1	Integrated Farming	Compost making, Demonstration plots for crop production, Improved breeds of pigs, Improved animal housing	Introduction of drought-tolerant varieties and farming methods, Introduction of compost making and use, Livestock development	cowpea, upland rice, groundnuts, soybean, pigs	○	○		○		○	○		
		2	Soybean processing	Training on soybean processing and nutrition	Improvement of agro-processing technologies	soybean	○	○							
		3	Pig rearing	Training on group management, improved breeds of pigs, improved piggery, community-based pig rearing, marketing	Livestock development	pigs	○						○	○	
		4	Bee keeping	Training, supply of beehives and related items, marketing	Introduction of bee keeping technologies	bees	○						○		

Note *: Vegetables underlined are monitored crops in the PDAs.

** : Area 1=compound field and upland area, 2=Hydromorphic zone, 3=Valley bottom area

***: Development Strategies for Food Security 1=Stabilization of crop production, 2=Reduction of post-harvest loss, for Income Increase 1=Increase of Productivity, 2=Diversification of Income Sources, 3=Marketing Improvement

Table 3.1.4 List of the Planned PDAs (Jirapa-Lambussie Districts)

District	Community	PDA No.	Project Title	Main Project Activities	Agricultural Technologies Verified through the PDAs	Crops or Livestock Included in the PDAs*	Area to be applied**			Development Strategy***				
							1	2	3	Food Security		Income Increase		
										1	2	1	2	3
Jirapa-Lambussie	Naawuie	1	Pig rearing and compost making	Compost making, improved piggeries, pig rearing, marketing	Introduction of drought-tolerant varieties and farming methods, Introduction of compost making and use, Livestock development	sorghum and cowpea, pigs	○	○		○		○	○	○
		2	Improvement in post-harvest technology	Training, supply of drying and storage materials	Improvement of post harvest technologies for food crop	sorghum and cowpea	○				○			
		3	Bee keeping	Training, supply of beehives and related items	Introduction of bee keeping technologies	bees	○						○	
	Kogri	1	Pig rearing and compost making	Compost making, improved piggeries, pig rearing, marketing	Introduction of drought-tolerant varieties and farming methods, Introduction of compost making and use, Livestock development	sorghum and cowpea, pigs	○	○		○		○	○	○
		2	Improvement in post-harvest technology	Training, supply of drying and storage materials	Improvement of post harvest technologies for food crop	sorghum and cowpea	○				○			
		3	Bee keeping	Training, supply of beehives and related items	Introduction of bee keeping technologies	bees	○						○	
	Nyani	1	Improvement in post-harvest technology	Training, supply of drying and storage materials	Improvement of post harvest technologies for food crop	sorghum and cowpea	○				○			
		2	Integrated Farming	compost making, training	Introduction of drought-tolerant varieties and farming methods, Introduction of compost making and use	sorghum and cowpea	○	○		○		○		
		3	Agro-forestry	Central nursery at the district office, supply of seedlings	Measurement for soil erosion	mango, cajanus, leucaena, lebbek tree	○			○				
		4	Shea butter processing	Training on group management, supply of raw materials, marketing	-	-	○						○	○
		5	Rabbit and pig rearing	Supply of rabbits and improved breeds of pigs, improved housing, marketing	Livestock development	rabbits, pigs	○						○	○

Note *: Vegetables underlined are monitored crops in the PDAs.

** : Area 1=compound field and upland area, 2=Hydromorphic zone, 3=Valley bottom area

*** : Development Strategies for Food Security 1=Stabilization of crop production, 2=Reduction of post-harvest loss,

for Income Increase 1=Increase of Productivity, 2=Diversification of Income Sources, 3=Marketing Improvement

Table 3.1.5 List of the Planned PDAs (Nadowli District)

District	Community	PDA No.	Project Title	Main Project Activities	Agricultural Technologies Verified through the PDAs	Crops or Livestock Included in the PDAs*	Area to be applied**			Development Strategy***						
							1	2	3	Food Security		Income Increase				
										1	2	1	2	3		
Nadowli	Daffiama	1	Small scale irrigation for paddy and vegetables	Demonstration plots for crop production, marketing	Expansion of small scale irrigation	lowland rice, <u>tomato</u> , okra, cabbage, pepper		○	○				○	○	○	
		2	Groundnuts processing	Training on group management, supply of raw materials, marketing	Improvement of agro-processing technologies	groundnuts	○							○	○	
	Tabiesi	1	Guinea fowl and rabbit rearing	Supply of rabbits and improved breeds of guinea fowls, improved housing, marketing	Livestock development	guinea fowls, rabbits	○							○	○	
		2	Dry season gardening with use of compost	Compost making, training on production methods	Introduction of compost making and use, Expansion of small scale irrigation	tomato, <u>okra</u> , pepper, cabbage	○	○	○					○	○	○
		3	Shea soap making	Training on group management, supply of raw materials, marketing	Improvement of agro-processing technologies	-	○								○	○
	Nanvilli	1	Guinea fowl and pig rearing	Supply of improved breeds of pigs and guinea fowls, improved housing, marketing	Livestock development	guinea fowls, pigs	○							○	○	
		2	Dry season gardening with use of compost	Compost making, training on production methods	Introduction of compost making and use, Expansion of small scale irrigation	tomato, onion, <u>pepper</u> , cabbage	○	○	○					○	○	○

Note *: Vegetables underlined are monitored crops in the PDAs.

** : Area 1=compound field and upland area, 2=Hydromorphic zone, 3=Valley bottom area

*** : Development Strategies for Food Security 1=Stabilization of crop production, 2=Reduction of post-harvest loss,

for Income Increase 1=Increase of Productivity, 2=Diversification of Income Sources, 3=Marketing Improvement

3.2 Results of the PDA Implementation

The results of the PDA implementation are summarized for each development component as shown below. More details of the results and analysis are found in Appendix K.

3.2.1 Sorghum Production

The early-maturing variety (Kapaala, 90-day cropping period) was introduced for the PDAs' trials. The results are shown in Table 3.2.1. The average yield obtained through the Baseline Survey was 325 kg/ha, and the yield indicated in the document⁶ was 910 kg/ha. If these figures are compared with the yields in the table below, this variety can be considered effective for increasing the production. In addition, if the yields between production with and without compost are compared, the effectiveness of compost was clearly indicated.

Table 3.2.1 Results of Sorghum Cultivation Trials

Community	Puffien	Naawuie*	Naawuie	Kogri*	Kogri
Yield (kg/ha)	2,857	1,500	820	6,385	2,890

Note *: Cultivated with compost, while others were without compost

3.2.2 Other Food Crop Production

The cultivation trials of groundnut, cowpea, and lowland rice were conducted at the demonstration plots. The average yields based on the Baseline Survey and the ones obtained from the document are shown in Table 3.2.2, and the results of the PDAs are shown in Tables 3.2.3 to 3.2.5.

Table 3.2.2 Average Yields indicated in the Baseline Survey and the Document

Crop	Groundnut		Cowpea		Lowland rice	
	BS*	Document**	BS*	Document**	BS*	Document**
Yield (kg/ha)	502	1,140	272	1,220	400	960

Note BS*: Baseline Survey, Document**: Statistics Research and Information Directorate, MOFA 2008

As to groundnut, the effect of the improved cultivation methods, such as the use of the improved variety (Chinese, 90-day cropping period), drilling/stripe seeding, and compost, on an increase in production was not clearly observed,⁷ while the effect of compost was confirmed as shown in Table 3.2.3.

Table 3.2.3 Results of Groundnut Cultivation Trials

Community	Zakpee*	Zakpee
Yield (kg/ha)	606	294

Note *: Cultivated with compost, others were without compost

Regarding cowpea, the results of cowpea cultivation trials, such as the use of the improved variety (Apagbaala, 60- to 65-day cropping period), ridging, and compost, indicate the positive effects of the variety as well as compost on increased production as shown in Table 3.2.4, though they were limited to certain communities.

⁶ Statistics Research and Information Directorate, MOFA 2008

⁷ The yields obtained at MOFAUWR's demonstration farm in 2009 were 754 kg/ha in Daffiama and 820 kg/ha in Sissala district.

Table 3.2.4 Results of Cowpea Cultivation Trials

Community	Puffien*	Tom-koko	Zakpee	Zakpee*	Zakpee**	Naawuie*	Naawuie	Kogri*	Kogri
Yield (kg/ha)	343	177	452	657	543	1,360	545	4,192	2,134

Note *: Cultivated with compost, **: with 15-15-15, 166 kg/ha, others were without compost and fertilizer

For lowland rice, the results of the PDA trials with the use of the improved variety (Digan, 110- to 115-day cropping period), hill seeding, and the increase of planting density, show that the effect of the variety was clearly observed as shown in Table 3.2.5.

Table 3.2.5 Results of Lowland Rice Cultivation Trials

Community	Daffiama*	Daffiama**
Yield (kg/ha)	4,138	2,635

Note *: Planting density of 25cm x 20cm, **: 50cm x 20 cm

3.2.3 Post-harvest Loss Reduction

In the PDAs, tarpaulin sheets were provided to the farmers for drying the harvested grains under the sun, and then for the storage, a double-layered sack consisting of a polythene inner sack that is sealable and a fertilizer sack as an outer cover were used. Before storage, two treatments were made to the grains. The grains for food were sterilized by solar heat on polythene sheets, and the grains for seeds were enclosed with a fumigant in a sack. Those sacks are kept in the existing individual granaries. As the grains are still being stored in the PDAs, the effectiveness of this trial has yet to be observed.

3.2.4 Vegetable Production

As to tomatoes, a comparison of yields is made among the yields obtained from the PDAs, the one at a common farm (local variety), and average yield in Ghana. The results are shown in Table 3.2.6. The yield at the controlled farm was 18.53 ton/ha, which was almost double the yield obtained from a common farm in the same community. From this, it can be said that the improved variety, Rio Grande, is effective for increasing production. In addition, the technologies introduced, pinching lateral shoots under the first flower and top dressing, were also found effective for increasing production.

Table 3.2.6 Yield Comparison of Tomatoes (ton/ha)

Tomatoes	Yields in the PDAs in Daffiama			Yield in Dry Season 2009*	Average Yield in Ghana (2007)**
	Control	Pruning and top dressing	Top dressing		
	18.53	28.80	25.38	9.52	5.29

(Source *: Estimated based on the data obtained from a tomato garden in Daffiama community, **: FAOSTAT 2007)

The improved technologies for pepper were also found effective for boosting production as shown in Table 3.2.7. Those technologies included the use of improved seeds, compost, pinching lateral shoots under the first flower, and top dressing. The other vegetables, such as eggplant, okra, and onions, were not cultivated or not harvested in the PDAs for the following reasons:

- Eggplant was planted but not grown because of poor germination.

- Okra was yet to be harvested because of late planting.
- Onion was not planted because of lack of water.

Table 3.2.7 Yield Comparison of Pepper (ton/ha)

Pepper	Yields in the PDAs in Nanvilli	Average Yield in Ghana (2007)*
	4.54	0.63

(Source *: FAOSTAT 2007)

3.2.5 Melon Production

a) First Trial

The first trial for melon production was made in Tabiesi community from June to September 2009. It was the first time for most of the farmers in the Study Area to produce melons as a new crop. The variety used in the trial was Bonus 2, which is a late-maturing type with a characteristic of netted skin. The number of melons harvested more than 1.2 kg in weight is shown in Table 3.2.8. The number of the plants per acre was about 2,200, the number of the fruits per acre was about 7,600, and the number of fruits per plant was 3.45, all of which demonstrated good results; however, the sugar content in the fruits was not satisfactory because of “Stem Gummy Blight”, which usually occurs in high temperature and humid climates. It was therefore concluded that melon cultivation should be promoted with more focus on improving its quality.

Table 3.2.8 Harvested Melons in the First Trial of the PDAs (Variety: Bonus 2)

	No. of plants		No. of fruits		No. of fruits / plant
	/540m2	/acre	/540m2	/acre	
Bonus 2	300	2,200	1,027	7,600	3.45

Unfortunately, it is difficult to control “Stem Gummy Blight” with currently available technologies, and therefore at least the occurrence of this disease should be prevented by planting melons in the dry season or applying integrated control methods with the use of fungicide. Introduction of a tolerant variety should be a topic of research in the future. Growing melons in the dry season is suitable if water is available, although there is a risk of “Melon Fly“. Necessary measures such as incineration of infested fruits are essential.

b) Second Trial

The results of the second trial for melon production in the same community as well as the first trial for melon sales are shown in Tables 3.2.9 and 3.2.10, respectively. Two varieties, Bonus 2, and Prince, which is an early-maturing type with smooth skin, were used for the trial. The following are the results:

- Harvesting the Prince Melons was started on February 15, 2010 and was still being continued when the Study Team left the site. As of February 20, 2010, 368 fruits were harvested with marketable quality and 350 fruits were still in the field for ripening.
- During the planting period, water in the nearest irrigation pond was dried up, and about 5,000 liters of

water had to be transported from another pond 2 km away to irrigate the field almost every day. Nevertheless, about 10% of the plants wilted due to water shortage. This resulted in the reduction in the mean number of the fruits produced by each plant: 2.36 fruits per plant on average for both varieties, which is much lower than the number in the first trial, 3.45 per plant. It can be said that the average number of fruits produced per plant was not satisfactory compared to the first trial but it was not that poor.

- On the other hand, the quality of melons was better in the second trial because Stem Gummy Blight did not occur.
- Damage by fruit flies was completely controlled by the spreading of a fladan solution mixed with detergent as sticker on the fruit surface. Only 6 fruits were damaged by fruit fly Larva.

Table 3.2.9 Harvested Melons in the Second Trial of the PDAs (Variety: Prince and Bonus 2)

	No. of plants		No. of fruits		No. of fruits / plant
	/864m ²	/acre	/864m ²	/acre	
Prince	300	1,458	718	3,490	2.39
Bonus 2	100	486	227	1,103	2.27
Total	400	1,944	945	4,593	(average) 2.36

As of February 25, 2010, 368 fruits were shipped to Accra and sold at an average price of GHS 1.44 each. The price was determined depending on size: the medium-size melon was sold at GHS 1.50, and the small one at GHS 1.00. The total amount generated from the sales as of February 25, 2010 reached GHS 530. The expected total sales will be GHS 1,360 if 945 fruits to be harvested are all sold at the same price.

Table 3.2.10 Sale Record of Melons

No. of fruits for sale	Sales (GHS)	Mean price / fruit (GHS)	Expected total sales (GHS)
368	530	1.44	1,360.00

The production cost for the second trial was GHS 568,⁸ as shown in Appendix K, for the cultivation area of 864 m², and the net profit is expected to be GHS 792 as shown in Table 3.2.11. It is equivalent to the profit of GHS 962 per quarter acre.

Table 3.2.11 Net Profits

Expected total sales (GHS)	Annual cost (GHS)	Net profit (GHS)
1,360.00	568.00	792.00

⁸ The cost is the sum of GHS 254 for fixed cost and GHS 314 for variable cost. The fixed cost was calculated by the depreciation, i.e. there will be the same amount of this cost every year.

Based on the above, it can be concluded that melons can be produced under the climatic conditions of the UWR, although irrigation water should always be available. In addition, melon can be considered a marketable crop that can bring profits to the producers.

3.2.6 Pig Breeding

In the PDA, 1 boar and 3 sows were provided to Zakpee community, and the results of the breeding as of the end of January 2010 are shown in the table below.

Table 3.2.12 Pig Breeding at the Community

Sow No.	Month Delivered	No. of Offsprings Delivered	No. of Surviving Offsprings
1	July 2009	5	0
1	January 2010	6	0
2	August 2009	5	0
3	August 2009	5	5

As is indicated, only 1 delivery was successful out of the four. The offsprings all died because they were crushed by the mothers when breastfed. Moreover, it is expected that a sow should deliver 8 offsprings at a time, based on the experience of the Babile Pig Breeding Station. Therefore, some improvements are considered necessary, such as review of the design of the piggery, the ways to feed the parents, the timing for crossing them, the protection of offsprings from accidents, etc.

As to pig rearing at the household level, 3 pigs were supplied to each beneficiary household as shown in Table 3.2.13. The total number of pigs supplied was 42. Although some sows were confirmed pregnant, e.g. 5 sows in Nanvilli, no delivery was recorded at the end of January 2010. It was originally agreed with the beneficiaries to introduce a pig fattening PDA but not a breeding one. It was then changed to breeding after the pigs were supplied since the beneficiaries preferred breeding or keeping pigs for a longer time to fattening or selling them immediately.

Table 3.2.13 Pigs Supplied to the Households

District	Community	No of Beneficiaries	No of Pigs Supplied per beneficiary
Lawra	Zakpee	3	3
Jirapa-Lambussie	Naawuie	2	3
	Kogri	2	3
	Nyani	4	3
Nadowli	Nanvilli	3	3

3.2.7 Guinea Fowl and Rabbit Rearing

In the PDAs, guinea fowls and rabbits were supplied to 3 communities. The results are shown in Table 3.2.14.

Table 3.2.14 Survival Numbers and Litter Size of Rabbits and Guinea Fowls

District	Community	Livestock	No of beneficiaries	Supplied by the PDAs		Offsprings	
				Total No.	No. surviving	No. delivered	No. surviving
Jirapa - Lambussie	Nyani	Rabbit	3	13	7	12	3
Nadowli	Tabiesi	Guinea fowl	5	50	28	0	-
		Rabbit	5	25	20	56	56
Nadowli	Nanvilli	Guinea fowl	3	30	9	0	-

(1) Guinea Fowls

When the guinea fowls, an exotic variety originally from Belgium, were brought into the communities in the PDAs, a lot of them died. The main reasons were considered to be fatigue from the trip or the sudden change of climates. It was then acknowledged by all the stakeholders that more necessary care should have been given. After this initial period, almost all of the live guinea fowls have survived, but it is yet to be seen how many offsprings will be delivered.

(2) Rabbits

Rabbits are considered the most fertile among the livestock in the Study Area, and this was confirmed through the PDA in Tabiesi community. In the PDAs, 38 head of rabbits were supplied to the community people, and 27 heads have survived. From the mother rabbits, 68 offsprings were delivered and 59 are alive⁹.

3.2.8 Processing Groundnut and Shea Nut¹⁰**(1) Groundnut Oil Production**

The PDA made two trials in Daffiama community, and the results are as shown in Table 3.2.15. It is still not clear yet whether processing groundnuts into oil and kurikuri is profitable or not. As indicated, the first trial showed a loss from the activity while the second trial is expected to have a slight profit. The reason was that the women's groups bought the raw material (groundnut) at GHS 120 per bag in the first trial from a middleman when the price was high. They realized they should have bought it when the price was much lower, and at the market but not from a middleman. They bought the groundnut at GHS 92 per bag at the market for the second trial. The number of the women involved in the trials was 22.

Table 3.2.15 Results of Groundnut Processing

Trial	Date	Costs (GHS)	Income(GHS)		Profits (GHS)	Remarks
			Oil	kurikuri		
1	March to April 2009	922	358.5	376.0	-187.5	Purchased 7 bags of groundnut, cost GHS 120 per bag, 82 GHS for milling cost of nuts
2	January 2010	1,037	510	540	13	Purchased 10 bags of groundnut, cost GHS 92 per bag

(Note: The milling cost of the nut and income for the second trial are estimated based on the results of the first trial.)

⁹ Five young rabbits were eaten by a snake.

¹⁰ The beneficiaries' records of the transaction for the processing and marketing activities are attached in Appendix K.

(2) Shea Nut Processing

The PDA made two trials in Tabiesi community for shea soap making, and the results are as shown in Table 3.2.16. Shea butter processing was originally planned for Nyani community, but unfortunately was not implemented since the beneficiary women were not comfortable with accepting the cost sharing concept.

Table 3.2.16 Results of Shea Nut Processing into Shea Soap

Trial	Date	Costs (GHS)		Remarks
		raw material	processing	
1	April to October 2009	1,500	2,713	Supplied 50 bags of shea nut @ GHS 30 = GHS 1,500
2	November 2009 to January 2010	1,992	4,290*	Supplied 78 bags of shea nut @ GHS24 to 30=GHS 1,992

(Note *: Estimated at GHS 55@bag)

In the first trial, 50 bags¹¹ of shea nut were processed into two types of soap: ball type (round soap) and bar type (key soap). The materials and processing cost per bag was calculated at about GHS 85 including shea nut, palm oil, palm kernel, soda, and other costs such as transportation. Based on the experience in October 2009, 712 round soaps and 41 key soaps were produced from two bags of shea nut. Thus, it is estimated that a total income of GHS 204¹² can be generated from two bags, and the profit per bag will be GHS 17.

Another 78 bags of shea nut were supplied for the second trial. As they are yet to be processed, it is estimated based on the first trial that the processing cost will be GHS 4,290 and the total profits will be about GHS 1,670.¹³ The profits per bag will be at GHS 21. As a women's group processes at least 2 bags a week¹⁴, it is expected that a group can generate about GHS 40 per week.

3.2.9 Organization of the Farmers into Groups

The main purpose of organizing the farmers into groups was to strengthen their marketing activities. Most of the PDAs were however still at the production stage and yet to reach the marketing stage. The PDA that organized the farmers into groups and progressed to the marketing of their products was the groundnut processing in Daffiama. Two women groups were established, and they bought and processed raw materials, and sold their products at the markets with the assistance of the Study Team and the C/P. In the PDA, training was also provided on (i) group management to the members of the women groups, and (ii) bookkeeping to the board members of those groups. Both trainings were conducted by the officers of

¹¹ Of the 60 bags of shea nut supplied for the first trial, 10 bags were used in the initial trial activities for producing shea butter and various types of shea soap.

¹² The prices of round soap and key soap are GHS 0.2 and GHS 1.5, respectively.

¹³ The profit is calculated from the expected total income of GHS7,956 (GHS 102 per bag x 78) minus the expected total costs of GHS 6,282.

¹⁴ The group processed 50 bags from the end of April to the end of September 2009, which means 10 bags per month.

the Cooperative Department. These trainings were originally planned to be done before the groups had started processing activities, but unfortunately the trainings were conducted only after the groups sold the products. It was observed that the women's groups had difficulty recording the transactions and concluding whether or not their activities were profitable. In addition, 2 groups disputed how the money received should be kept since both of them felt uncomfortable to let the other group handle the money. This suggests that those trainings are absolutely necessary to get the members united and make them aware of the profitability of the activities, but they should be done before the project's main activities are started¹⁵.

3.2.10 Clarification of Roles and Responsibilities

There was discussions and assignments were made regarding who should be responsible for the implementation of each PDA in the MOFAUWR regional and district offices, among the AEAs and the community people, and their names were accordingly indicated in the Plan of Operations (POs) prepared by the Study Team. Through the experience of the PDAs, it was observed that some of the responsibilities had not been clearly understood by those stakeholders; for example, it was not certain who within the MOFAUWR offices should provide lectures for the trainings to the PDA beneficiaries, who should be in charge of livestock purchase and care, who should be in charge of technically assisting women's groups for processing activities, etc. In addition, communication among the offices was not always smooth, as, for example, the expected officers and/or the AEAs did not show up when meetings were held even though invitation letters had been sent by the regional office to the district offices. Thus, it is considered that the roles and responsibilities among the major stakeholders should clearly be streamlined and implemented. The management of the MOFAUWR regional and district offices should be improved accordingly.

3.2.11 Monitoring and Reporting

The regular monitoring of the PDA activities was conducted mainly by DAOs and AEAs, and their progress and problems were reported bi-weekly to the Study Team and the regional office with the reporting forms prepared by the Study Team. The necessary transportation fees were provided to the DAOs and AEAs. Throughout the PDA period, the reports were submitted nearly always regularly, and therefore it is believed that a regular monitoring and reporting system can be institutionalized in MOFAUWR without serious bottlenecks, on condition that the means of transportation are made available for DAOs and AEAs. However, necessary actions were sometimes not taken properly; for example, in cases when crops at the demonstration plots started withering, piglets were crushed by their mothers, guinea fowls and rabbits started dying, mango nurseries were eaten by goats, etc. Thus, the officers and AEAs need to become better able to take necessary actions in a timely manner as one of the necessary steps in monitoring and reporting.

3.2.12 Involvement of Community People in PDA Implementation

Through the planning and implementation of the PDAs, it was intended to involve the community people as much as possible, particularly in the following aspects:

¹⁵ For shea soap making in Tabiesi, the women had been organized traditionally area by area within the community, and the PDA was conducted with those groups.

- Invited the community leaders¹⁶ to the planning workshops at the district level, expecting that they explain the results of the workshops to the people in their communities
- Conducted the workshops in the communities to make sure the results of the above-mentioned planning workshops were shared with the people
- Asked the community leaders to select the beneficiaries of each PDA to be conducted in their community
- Asked the community leaders to explain the concept of cost sharing to the project beneficiaries and sign the cost-sharing agreement with the beneficiaries
- Asked the PDA beneficiaries to teach what they have learnt on agricultural technologies to the other farmers to determine the effectiveness of farmer-to-farmer extension
- Invited the community leaders to the monitoring and evaluation workshops at the district level

Through the PDA implementation, it was observed that the involvement of the community leaders made the PDAs proceed more smoothly and reliably since many community people trusted their leaders. It was also found that the types of persons recognized as the community leaders vary from community to community. These leaders included elders, traditional leaders, *Tindaanas*, extension volunteers, etc. It was confirmed that those leaders had influence on the community people for mobilization, conducting activities, decision-making, and so on, although this influence varied community by community to what extent the leaders are respected by the people and can control them. In Appendix H, the social structures and various types of leaders and leaderships are described.

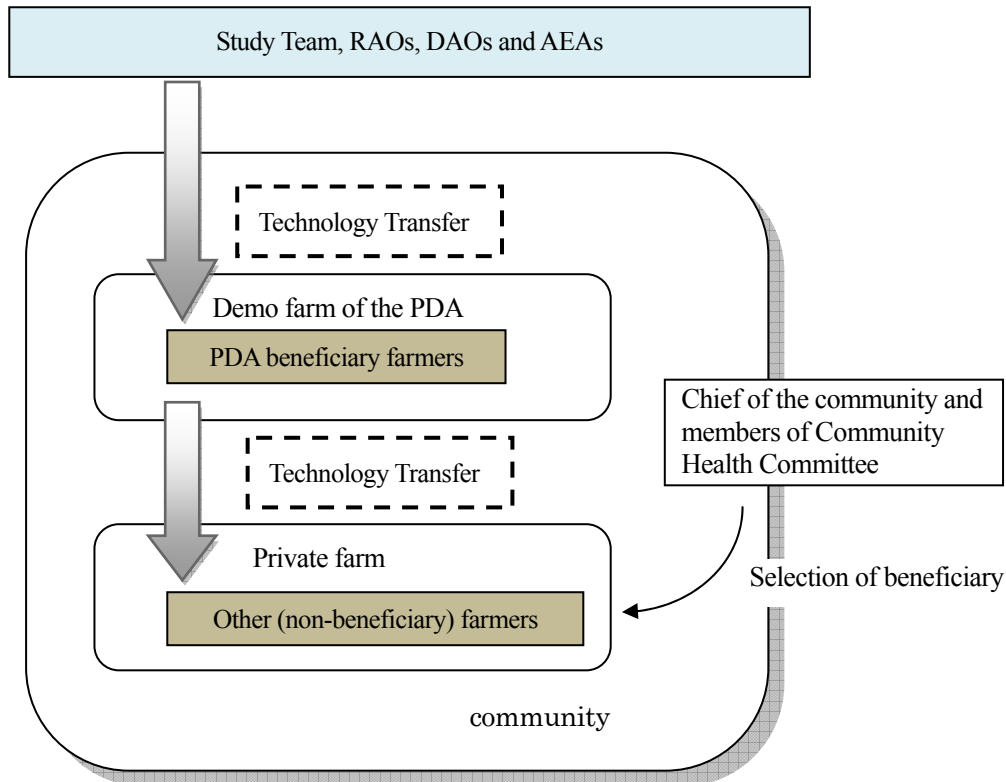


Figure 3.2.2 Trial for Farmer-to-Farmer Extension

¹⁶ The community leaders are the persons selected by the community people to represent the community, or selected by MOFAUWR district officers and/or AEAs as the community agents who work with them for development activities.

A vegetable production group was organized by the farmers themselves in Tabiesi, and the PDA provided the training for melon production to them. During the implementation of the PDA, a technology transfer among the community farmers, that is, a farmer-to-farmer extension, was attempted as shown in Figure 3.2.2. In the trial, the PDA's beneficiary farmers taught the cultivation technologies to the other (non-beneficiary) farmers after the beneficiary farmers were trained on the technologies by the Study Team and the C/P. The other farmers were recommended by the chief of the community and the members of the Community Health Committee¹⁷. It was observed that the technologies were well transferred between the farmers, and therefore it can be assumed that the farmer-to-farmer extension be one of the useful methods to strengthen the current extension services of MOFAUWR.

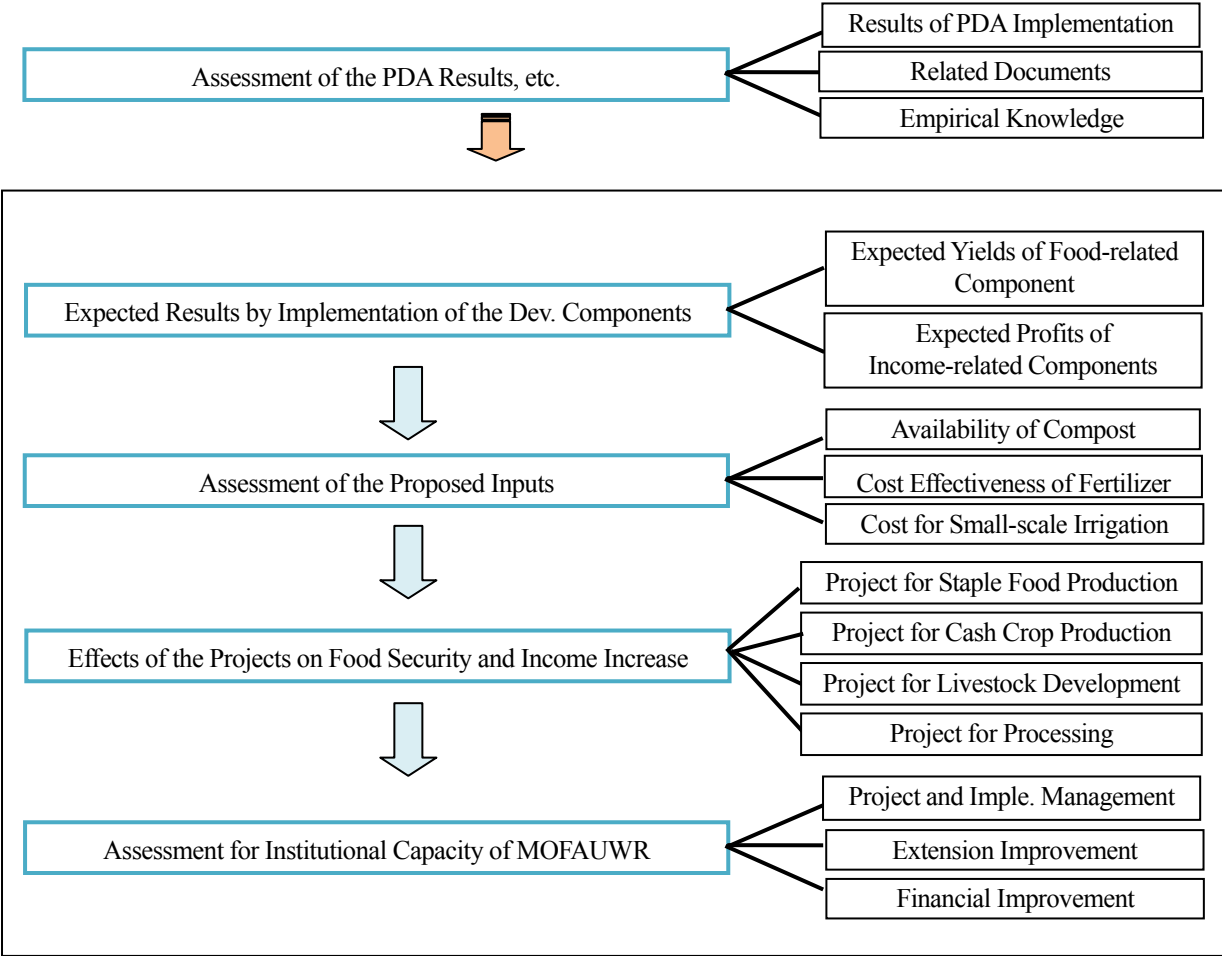
¹⁷ The Community Health Committee was involved since the Study Team intended to determine the possibility of collaboration with JICA's "Project for Strengthening Health System in UWR". The community leaders were also the members of the Committee.

Chapter 4

Verification of the Development Components

Chapter 4 Verification of the Development Components

Based on the assessment on the results of the PDA implementation, the related documents, and the empirical knowledge of the Study Team and the MOFA counterparts, this chapter verifies the development components, particularly to what extent each component will be able to contribute for attaining the development objectives in the M/P. Firstly, the expected results by the implementation of the development components are discussed. The expected yields of the crops, when the proposed agricultural technologies are applied, are determined for the components aiming to secure foods. For the components aiming to increase income, the expected profits, breakeven points, and periods necessary to recover the initial costs are calculated with the assumption that the proposed technologies are properly used and necessary marketing assistance is provided to the beneficiaries. Secondly, the proposed inputs are assessed from the aspects of availability of compost, cost effectiveness of chemical fertilizer, and costs for small-scale irrigation. Thirdly, the effects on food security and income increase by the implementation of the proposed development components are shown. Fourthly, the institutional capacity of MOFAUWR is assessed in relation to project implementation and management, extension improvement, and financial management, which are necessary to ensure that the above effects are realized. The flow of the verification of the development components is as follows:



4.1 Expected Results by the Implementation of the Development Components

4.1.1 Staple Food Crop Production

Based on the results of the PDAs, the staple food crops to be included in the M/P should be sorghum, cowpea, and lowland rice. The expected yields of those crops, which can be attained within the short-term (5years) by the implementation of the development components at the farms in the Study Area, are estimated by referring to the data shown in Tables 3.2.1 to 3.2.5. The expected yields of sorghum and cowpea should be different between Lawra and the other three districts since the climate condition in Lawra is harsher than that in the other districts. The MOFA's statistics¹ indicates that the yields of sorghum for the other three districts are 22% higher than that for Lawra, and the yields of cowpea are 39% higher than that for Lawra. Thus the expected yields for the other three districts are determined to be 20% higher than that of Lawra.

The yield data without compost application obtained in the PDAs were used as the basis for determining the expected yields of the crops. The reason why no compost application was considered was because for food crops no application of compost is more realistic than compost application since most of the farmers seldom make compost at present, and it would be difficult to collect enough compost materials to cover the wide area within 5 to 10 years. For example, the cultivation area for sorghum in Lawra in 2008 was 52,221 ha², which will require more than 1 million tons of compost. To produce such a volume of compost, 1.07 million tons of organic materials and 360,000 tons of animal dung should be collected. Thus, to be realistic, the priority for compost application should be given to cash crops. Moreover, compost making is heavily labor intensive, and it will take a long time to induce many farmers to make enough compost to obtain large quantities of it.

As the yield data was obtained from a trial only in one season, various aspects should be considered to determine the expected yields of each crop. The following was the positive factors that increased the yields in the PDAs to higher levels than in normal seasons:

- As indicated in Table 4.1.1, the rainfall in Wa and Babile in 2009 was nearly at normal levels, and there were more rainy days in October than in normal seasons, with the rain continuing until the end of October.
- In the PDAs, intensive farm management such as intertillage, weeding, etc. was possible since the farm size was only 100m² or so.
- Sorghum was planted on ridges and cowpea was planted by drilling in the PDAs, which made crop density much higher than the common practice of the farmers, which is planting crops on mounds.
- The demonstration plot for sorghum in Puffien was on the compound field, where soils are usually fertile since it is located close to the residential area and livestock often stay there.

¹ 2008 Preliminary Crop Estimate - Upper West

² 2008 Preliminary Crop Estimate - Upper West

Table 4.1.1 Rainfall

	May	Jun	Jul	Aug	Sept	Oct	Total	
Wa	1)	130.0	158.2	146.1	225.6	202.1	66.6	1,074.2
	2)	9.9	11.8	13.4	17.3	17.6	7.5	91.5
	3)	104.5	228.6	152.7	191.0	193.4	111.8	1,109.2
	4)	10	10	11	20	18	12	96
Babile	1)	105.4	149.9	204.5	251.8	171.0	55.9	1,080.2
	2)	7.1	9.8	12.1	15.2	13.4	4.3	70.2
	3)	95.7	172.7	121.6	272.6	236.6	98.2	1,065.5
	4)	8	8	9	16	17	12	80

- 1): Average rainfall in 1999-2008 (mm), no data at Babile in 2008
 2): Average number of rainy days in 1999-2008, no data at Babile in 2008
 3): Rainfall in 2009
 4): Rainy days in 2009
 (Source: MOFAUWR)

On the other hand, there were some negative factors as described below.

- The PDA beneficiaries mostly started planting the crops for the PDAs after they had completed planting their own crops. This affected the growth of some PDA crops negatively.
- The low yield of cowpea in Tome-kokoduor (177 kg/ha) resulted from incomplete vegetative growth due to the delay of sowing. Cowpea was sown on July 30 although it should have been done by early July.

Taking the above factors into account, and based on the assumption that improved seeds are sown at the early stage of the rainy season (by late June or early July at the latest), the expected yields of sorghum and cowpea are determined according to the considerations below, and summarized in Table 4.1.2.

- The yields of sorghum and cowpea obtained in Kogri should be excluded from the calculation since the demonstration plots were located on the compound field.
- For sorghum in Lawra, an expected yield should be determined based on the figures of Naawuie (820kg/ha) and the document (910 kg/ha).
- For cowpea in Lawra, the average yield in Zakpee (452kg/ha) and Naawuie (545kg/ha) should be considered the yield.
- Lowland rice fields in Daffiama were well-leveled and water was adequately retained like in a paddy field. The expected yield of lowland rice at the valley bottom area should be lower, and therefore, is determined at 60% of the results obtained from the PDA (4,138 kg/ha).

Table 4.1.2 Expected Yields of the Staple Food Crops

(unit: kg/ha)

Crops	Lawra	the Other Districts	Condition
Sorghum	1,000	1,200	Non-application of either compost or chemical fertilizer
Cowpea	500	600	
Lowland Rice	2,500	2,500	Application of chemical fertilizer (15-15-15 at 133kg/ha)

The achievable yields are indicated in the document as shown in Table 4.1.3. They are considered as the maximum level that can be obtained with the use of chemical fertilizer.

Table 4.1.3 Achievable Yields

Crops	Lawra	the Other Districts	(unit: kg/ha)
			Condition
Sorghum	1,500	1,500	Application of chemical fertilizer
Cowpea	1,250	1,250	
Lowland Rice	3,500	3,500	

(Source: Agriculture Sector Plan 2009-2015, MOFA 2009)

Since cowpea and rice are also important as income sources for the farmers in the Study Area, the enhancement of their yields will contribute to an increase in farmers' income. In 4.4, it is described to what extent such improvements in yield will contribute to increasing incomes in the entire area.

4.1.2 Post-harvest Loss Reduction

The results of the PDAs are yet to be known. Nevertheless, the sort of simple but improved technologies adopted in the PDAs are expected to have a certain impact on the reduction of post-harvest loss compared with the traditional methods employed by the farmers. As tarpaulin sheets, though convenient, are costly, existing facilities such as concrete floors, roofs, etc. are recommended for drying grains. As for storage, the method used in the PDA is recommended to be introduced. In sum, this component will consist of the following activities:

- Harvested and dried gains are to be stored in a double-layered sack consisting of a polythene inner sack that is sealable, and a fertilizer sack as an outer cover.
- Before storage, two treatments are to be made to the grains. The grains for food should be sterilized by solar heat on polythene sheets, and the grains for seeds are to be enclosed with a fumigant in a sack.
- Those sacks are to be kept in the existing individual granaries.

4.1.3 Vegetable Production

(1) Expected Yields

Based on the results of the PDAs related to vegetable production and the average and achievable yields in documents, the expected and achievable yields for the vegetables are indicated in Table 4.1.4. As for tomatoes, a yield increase from 9.52 to 18.53 ton/ha was observed. This was almost double the yield, which was possible since the demonstration plots of the PDAs were small in size, and therefore intensive crop management was possible. To make a realistic estimate for the average farms, the expected yield should be determined at a maximum of 70% higher than the current yield.

According to the experience of a Study Team member in the dry season in Sierra Leone where the climate is similar to that in the UWR in terms of temperature and rainfall, the production of eggplant was increased by 70% over the traditional method through a trial that introduced adequate pruning and timely

top dressing and additional application of fertilizer. Thus the increase of 70% in yield is considered appropriate as the expected yield for eggplant. As for other solanaceous crops such as peppers, the yield is expected to be raised by 70% as well since similar crop management can be applied.

After one of the C/Ps participated in the training in Japan, he was able to increase the yield of okra by 70% with proper doses of nitrogen. The yield of okra can therefore be raised by 70% as well if adequate doses of nitrogen are applied in a timely manner. For onion production, the average yield of 7.68 ton/ha can be raised up to 11 ton/ha by improving fertilizer application, especially phosphate fertilizer. This yield level was already attained in Karni community, the leading production areas in the UWR, by applying simple technologies with low cost and input.

Table 4.1.4 Expected and Achievable Yields (ton/ha)

	Average Yield in Ghana (2007)*	Yield in Dry Season 2009	Yields in the PDAs (control plot)	Expected Yields	Achievable Yields***
Tomato	5.29	9.52**	18.53	16.2	35.0
Pepper	0.63	-	4.54****	1.1	15.0
Eggplant	3.75	-	-	6.4	15.0
Okra	5.54	-	-	9.4	-
Onion	7.68	-	-	11.0	-

(Source *: FAOSTAT 2007, **: Estimated from a tomato garden in Daffiama community, ***: Agriculture Sector Plan 2009-2015, MOFA 2009, ****: fertilizer and pruning)

(2) Recommended Cropping Patterns

As shown in Chapter 1, the prices of tomatoes skyrocket in the rainy season, particularly in July and August. If tomatoes are produced and shipped during this period, farmers' profits could sharply be increased. To enable this value-added production, it is proposed that new cropping patterns be developed to make tomatoes durable enough, while the following technical issues are also taken into account :

- Seedlings need to be raised and transplanted when available water becomes scarce.
- Farmers are engaged in planting cereal crops at the same time when vegetables need to be planted.
- Diseases or fruit rot may be easily spread by "Late Blight", "Fusarium Wilt", or "Bacterial Soft Rot" since the stages of fruit growth and harvest occur in the middle of the rainy season.

As for onions, the "Bawku Red" variety, currently cultivated in Ghana, is the only variety adaptable to the environment in the Study Area. Although it is difficult to develop different cropping patterns for onions because of the required interaction between photoperiod and bulb formation of this variety, if the onions are shipped when prices become high, the profits can be raised. As shown in Chapter 1, the prices of onions tend to be high from October to December. To sell onions during that time, they need to be stored until September or even longer by the use of the existing storage methods.

(3) Expected Profits

The expected profit is calculated for tomatoes assuming that a farmer cultivate tomatoes in the average-sized area of 100 m² with the improved technologies. As the current yield (with the current

cultivation method) of tomatoes was 9.52 ton/ha at a tomato garden in Daffiama community, the farmer should be able to harvest 95.2 kg of tomatoes a year. The average price of tomatoes in January 2008 was GHS 26.3 per crate (52 kg), which means that the farmer can produce tomatoes equivalent to GHS 48.2 a year. When the expected yield, 16.2 ton/ha, is achieved, the income will be increased to GHS 82. The difference in income is GHS 34. The production cost for tomatoes is shown in Table 4.1.5, and as is indicated, the cost will be minimal except for the initial cost for the agricultural tools. This indicates that the break-even point will be at the fourth year; a total income increase of GHS 136 should be achieved versus total costs of GHS 130 for 4 years.

Table 4.1.5 Production Cost for Tomatoes

Items	Unit	GHS
Initial Cost		
- Agricultural tools such as hoe, shovel, cutlass, head pan, sprayer, etc.	1 set	50
Seasonal Costs		10
-Seeds	2.5g	1
- Fertilizer	4kg	5
- Pesticide	100ml	1
- Others (miscellaneous)		3

4.1.4 Melon Production

As explained in 3.2.5, a farmer can generate a net profit of GHS 792³ a year from producing melons in a cultivation area of 864 m². It is estimated that the initial cost of GHS 1,082 and the variable costs will be recovered by the third year from the sale of melons. To secure the seeds for melons, the measures described below should be considered.

(1) Purchase of the Seeds in Ghana or from Neighboring Countries

The Study Team checked several seed shops in Accra and found that no shop had melon seeds in stock as of 24 February 2010. However, it was confirmed that all those shops deal with melon seeds. The variety that can be sold by those shops is French cantaloupe, which is thought to be imported from the neighboring Francophone countries. It was said that the seeds would be available in the areas near the border with Burkina Faso. This is an open pollinated variety, with the possibility of continuous multiplications domestically once it is introduced. There is no risk of contamination by natural crossing with other varieties at the moment since no other varieties of melon are easily available in Ghana. Seed production is possible by natural crossing. This is the easiest way to secure melon seeds and considered to be effective for quick dissemination. This variety is said to be a little inferior to Japanese varieties in quality. However, melon does not yet have a presence in the general marketplace in Ghana, and as long as its taste is acceptable, it will not be a problem.

(2) Breeding of the Hybrid Variety and Maintenance and Multiplication of the Parental Lines

Compared to the above method, this method requires more careful planning and preparation, but

³ The initial cost will be GHS 1,082

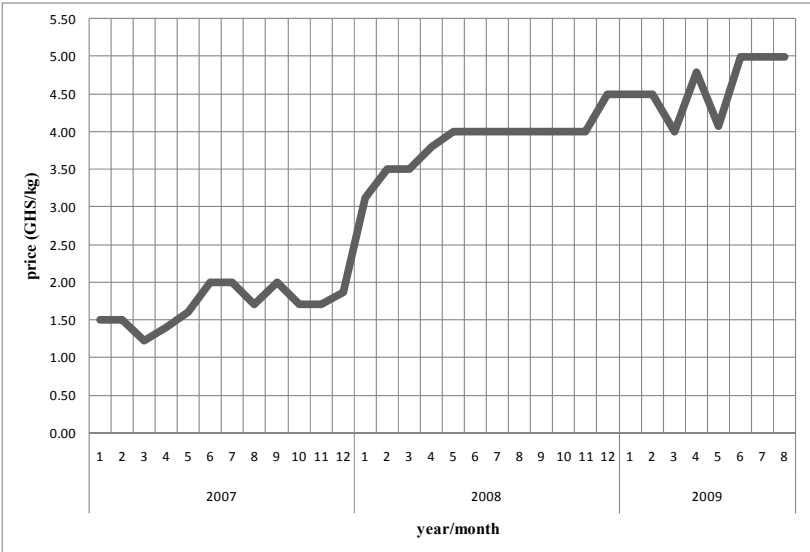
it would bring about a significant outcome if it were implemented with appropriate technical assistance. For breeding materials, this method postulates using the cantaloupe as one parent and a mid-material plant with disease-tolerant genes as another parent. Since this is a hybrid variety, the diffusion of seeds to other regions can be prevented, and the melon could be a locally-characterized product for the UWR. It is expected to take 3 years from crossing of the parental lines, selection of a superior line, and seed multiplication of parental lines to production of the hybrid variety. This process is much faster than the breeding of an open pollinated variety and more practical. However, the mating for seed production needs to be done every year, and technical transfer to farmers and maintenance of the parental lines are absolute requirements for this method.

(3) Breeding of the Open Pollinated Variety

Compared to the above method in (2), this method requires a longer time for breeding the variety. It is expected to take at least 6 years for the process from the crossing and selection to genetic homeostasis or fixation. However, once this breeding cycle is established, seed multiplication is relatively easy and it does not require a high level of technology. On the other hand, it is difficult to prevent the diffusion of seeds to other regions, and there will be less opportunity to grow it as a locally-characterized product for the UWR.

4.1.5 Pig Breeding and Fattening

The market demand for pigs looks to be sharply increasing as shown in Figure 4.1.1. However, commercial breeders or suppliers do not appear to have a significant presence in the Study Area, which indicates that a business-oriented pig rearing has potential. Moreover, there is the Babile Pig Breeding Station under MOFA, which can provide technical support to pig breeders. The PDAs for pig breeding and fattening were implemented in collaboration with the Babile Station, and the technical support from the Station was observed to be effective and essential.



(source: MOFAUWR office)

Figure 4.1.1 Retail Price of Pork at the Wa Market

(1) Community-based Pig Breeding

Assuming 1 boar and 3 sows are provided, and each sow delivers 8 offsprings every 6 months as experienced by the Babile Pig Breeding Station, this sort of pig breeding will reach the breakeven point after 5 and a half years from the commencement. A profit of GHS 460 can then be accrued every year as calculated below and as shown in Figure 4.1.2.

<p>Input Costs</p> <p>a) First Two Years</p> <p>(1) Construction of Piggery (mud bricks, mortar plastering, thatched roof, water tank, drainage): GHS800</p> <p>(2) Pigs 4 heads (boar 1=GHS 100, sow 3=GHS 80 x 3 =240): total GHS340</p> <p>(3) Compounded feeds (the beneficiaries should purchase necessary ingredients locally and compound them by themselves): GHS 0.36/kg</p> <p>1) First Year: (a) Feed for 4 parents at 1 kg a day for 6 months = 1 kg x 4 heads x 180 days x GHS 0.36 = GHS 259.20, (b) After that, feed for 22 heads of the expected piglets at 0.5 kg a day for 6 months = 0.5 kg x 22 heads x 180 days x GHS 0.36 = GHS 712.80. In total, 259.20 + 712.80 = GHS 972.</p> <p>The total costs of the feed = (a) + (b) = GHS259.20 + GHS972.00 = GHS1,231.20 a year</p> <p>2) Second Year: The same number of piglets is expected to be delivered every 6 months: GHS 1,944.00 a year</p> <p>(4) Others (Health Care = GHS 80.00, Weight = GHS 25.00): GHS 105.00</p> <p>Total for Two Years: GHS 4,420.2</p>
<p>b) 3rd and following Years- Feeds: GHS 1,944.00 a year</p> <p>- Others (Health Care): GHS 40.00</p> <p>Total (annum): GHS 1,984.00</p>
<p>c) Every 4 years: Replacement of 3 Sows: GHS 240</p> <p>d) Every 6 years: Replacement of 1 Boar: GHS 100</p>
<p>Expected Incomes</p> <p>a) First Two Years</p> <p>- At the end of the first year (6 months after the delivery) 21 piglets (1 loss) will be sold (30kg in weight, GHS 2.00 per kg) = 21 heads x 30 x 2 = GHS 1,260.00</p>
<p>b) 3rd and following Years: GHS 2,520.00 a year</p>
<p>Breakeven Point: 5.5 years, the average profits of GHS460 per annum can be expected from the 6th year.</p>

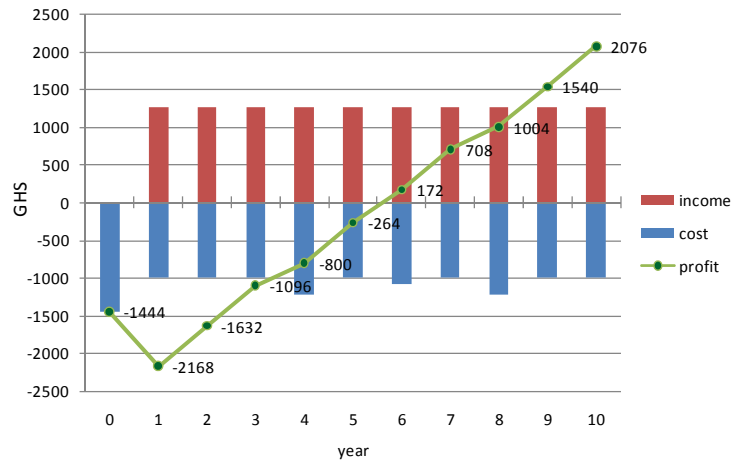


Figure 4.1.2 Estimated Costs, Incomes and Profits regarding the Community-based Pig Rearing

In case that the litter size is only 5, the estimated operation costs and incomes for one year will be almost the same. This means the initial investment costs and the replacement costs of the parents pigs will not be recovered. Therefore, as mentioned above, it is essential to pay strict attention to the management of the activities if this component is to be successful.

(2) Household-based Pig Breeding and Fattening

If 1 boar and 2 sows are provided for breeding and the litter size is expected to be 8 as indicated in 3.2.6, profits should be accrued as shown in Figure 4.1.3.⁴ It is expected that it will reach the breakeven point in 6 and a half years after the commencement, and then an average profit of GHS 240 a year can be expected.

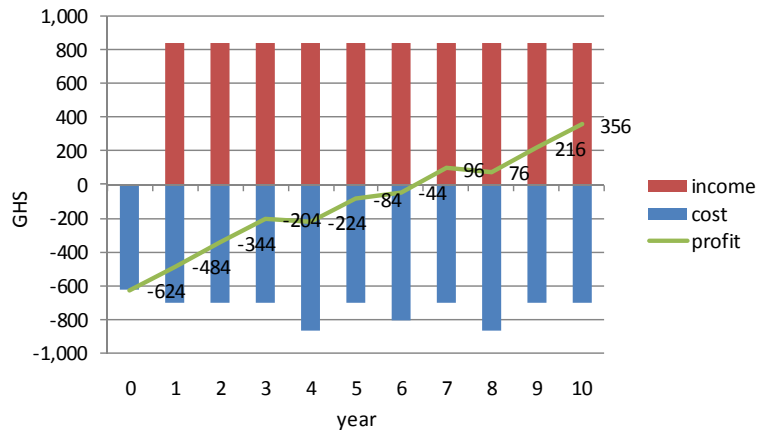


Figure 4.1.3 Estimated Costs, Incomes and Profits regarding the Household-based Pig Rearing

If the pigs are to be fattened, feed efficiency needs particular attention. Based on the PDAs, the feed efficiency was found to be 33% as shown in Table 4.1.6. This means the weight of a pig will reach

⁴ This estimate is based on the condition that the pig hut is made with mud bricks with mortar plastering and thatched roof (GHS 150 in total), one boar and two sows are supplied (GHS 260), the same compounded feeds are given (GHS0.36/kg, GHS874 in total for the 1st year), and GHS 40 a year for health care.

30kg at 180 days if 0.5kg of feed is given every day. The gross profit from selling a pig will be about GHS28.⁵

Table 4.1.6 Feed Efficiency

Community	Daily Gain in Weight (kg)	Estimated Weight at 180 days (kg)	Feed Consumption (kg)	Feed efficiency (%)
Nyani	0.19	35.0	90	39
Zakpee	0.22	40.2	90	45
Kogri	0.09	17.0	90	19
Nanvilli	0.15	26.7	90	30
Mean	0.17	29.7	90	33

(note: The pigs were supplied at the age of 6 weeks, and the weight was 7kg each.)

(3) Estimation of Producible Volume of Compounded Feeds for Pigs

The ingredients of the compounded feeds as recommended by the Babile Pig Breeding Station are as follows:

Table 4.1.7 Feed Formulation Recommended by the Babile Station

Ingredient	Weight	Equivalent
Millet Bran	3.5 kg	5 koko bowls
Miller's Waste	4.2 kg	3.5 koko bowls
Pito Mash	1.4 kg	2 koko bowls
Fish Meal	0.3 kg	1 Milo tin
Soybean Meal	0.5 kg	1 Milo tin
Oyster Shells	0.05 kg	1 Small Size Tomato tin
Salt	0.05 kg	1 Small Size Tomato tin
Total	10.0 kg	

Among the ingredients, pito mash accounts for about 25 %⁶ of the feed, and is the most critical in terms of availability. The following shows: i) the volume of feeds that can be produced from the estimated volume of available pito mash, and ii) the number of pigs that can be reared with the available feeds.

According to a pito brewer, 10 bowls of sorghum (27.25 kg) can be turned into two to three bowls of dried pito mash (3.75 kg, 13.5%). As more than half of the sorghum produced in the UWR is thought to be used for brewing pito⁷, the producible volume of pito is estimated at 60% of the sorghum production. In Table 4.1.8, the amount of producible pito and dried pito mash are estimated.

Table 4.1.8 Amount of Producible Pito and Dried Pito Mash

District	Sorghum Production 2007, A (ton)*	Producible Pito B=A x 60% (ton)	Dried Pito Mash C=B x 13.5% (ton)
Lawra	26,164	15,689	2,119
Jirapa / Lambussie	11,263	6,758	912
Nadowli	14,587	8,752	1,181

(source *: Annual Sample Survey of Agriculture Ghana, SRID of MOFA, 2007)

⁵ 30kg x GHS2-90kg x GHS0.36 = 27.6

⁶ According to the experience of the Babile Pig Breeding Station, pito mash accounts for 14% to 35% of the entire feed.

⁷ The information is based on the observations of the counterparts, AEA and community people.

The dried pito mash is mostly used for feeding pigs and poultries in the area. It is believed that only 10 to 20% of the dried pito mash produced is available at the markets. As the required average feed volume is estimated at 800 g/head/day or 300 kg/head/year, the number of pigs that can be reared with the available feed is calculated as shown in Table 4.1.9. As the table shows, it is estimated that about 5,000 to 10,000 heads of pigs can be reared in the Study Area in terms of the available feed volume.⁸

Table 4.1.9 Number of Pigs that Can be Reared

District	Pito Mash at Market, D=C* x 20% or 10% (ton)		Volume of Compounded Feed, E=D/25% (ton)	Number of Pigs, F= E/300kg (head)	Approximate Number of Pigs (head)
Lawra	20%	423.8	1,695.2	5,650	5,600
	10%	211.9	847.6	2,825	2,800
Jirapa/ Lambussie	20%	182.4	729.6	2,432	2,400
	10%	91.2	364.8	1,216	1,200
Nadowli	20%	236.2	944.8	3,149	3,100
	10%	118.1	472.4	1,576	1,550
(Note C*: refer to Table 3.2.16)				Total 20%	11,100
				10%	5,550

As is indicated, a large number of pigs can be reared in terms of feed availability. However, it is essential for the government to support the beneficiaries in obtaining the required feeds and keeping the pigs healthy at all times until the beneficiaries become ready to do so by themselves.

4.1.6 Small Animals and Birds Rearing

(1) Guinea Fowls

Table 4.1.10 is an estimate of the expected gross profits in 3 years from the guinea fowl rearing. The following is the assumptions set by the MOFAUWR office.

- A female guinea fowl hatches 75 eggs (25 eggs x 3 times) per year. A guinea fowl can lay eggs at least for 3 years.
- An adult guinea fowl eats 350g of the compounded feed per week.
- A young guinea fowl eats an average of 200g of the compounded feed per week for 6 months until it is ready for hatching eggs or for sale. 85% of the hatched fowls survive.

As shown in the table, the gross profits of about GHS 360 for 3 years or about GHS 120 per year can be expected with the above assumptions.

⁸ It is estimated that a pig requires 5 bags of sorghum a year as follows: 300kg x 25%=75kg (pito mash)/1.5kg (bowl)=50 bowls (pito mash)/2.5 bowl=20 x 10 bowls of sorghum = 200/40=5 bags of sorghum (sorghum: 1bag = 40 bowls)

Table 4.1.10 Expected Gross Profits from the Guinea Fowl Rearing (for 3 years)

	Unit Cost/Price (GHS)	Total Unit	Total Cost/Amount (GHS)	Remarks
INPUT				
a) Hut	70	1 no	70	Bricks with mortar plaster, roofs with locally available materials
b) Guinea Fowls	7	10 heads	70	Improved breeds
c) Feed	0.36	5,460kg (as shown right)	1,970	(adults) 10 nos x 52 x 3 x 0.35 = 546 (young) 63 nos x 26 x 0.2 x 5 (mother) x 3 = 4,914 Total feed = 546+4,914=5,460kg
d) Health Care	20	3 years	60	
		(sub-total)	2,170	
SALE	9	281	2,529	75 x 0.25* x 5 x 3=281 heads
PROFIT			359	

(Note *: It is assumed that a quarter of the hatched guinea fowls are grown for sale.)

(2) Rabbits

Table 4.1.11 is an estimate of the expected gross profits in 3 years from the rabbit rearing. The following is the assumptions set by the MOFAUWR office:

- A female rabbit delivers offsprings at least 3 times a year with a litter size of 8 to 10 at each time. It continues to deliver offsprings at least for 3 years.
- An adult rabbit eats 350g of the compounded feed per week.
- After the weaning period, a young rabbit eats an average 200g of the compounded feed per week for 3 months until it is ready for pregnancy or for sale. 85% of the young rabbits survive.

Table 4.1.11 Expected Gross Profits from the Rabbit Rearing (for 3 years)

	Unit Cost/Price (GHS)	Total Unit	Total Cost/Amount (GHS)	Remarks
INPUT				
a) Hut	70	1 no	70	Bricks with mortar plaster, roofs with locally available materials
b) Rabbits	5	5 heads	25	Local breeds
c) Feeds	0.36	705kg (as shown right)	255	(adults) 5 nos x 52 x 3 x 0.35 = 273 (young) 20 nos x 12 x 0.2 x 3 (mother) x 3 = 432 Total feed = 273+432=705kg
d) Health Care	20	3 years	60	
		(sub-total)	410	
SALE	6	108	648	8 x 3 x 0.5* x 3 x 3=108heads (to be slaughtered)
PROFIT			238	

(Note *: It is assumed that a half of the offsprings are grown for sale.)

As shown in the table, the gross profits of about GHS 240 for 3 years or GHS 80 per year can be expected with the above assumptions.

4.1.7 Agricultural and Forest Product Processing

As for groundnut oil production, it is still not yet clear whether processing groundnut into oil and kurikuri is profitable or not. Regarding shea soap making, it is expected that a women's group can generate about GHS 40 per week as mentioned in 3.2.8. As can be seen, the expected profit from shea soap is not significant, thus, it should be considered as a secondary income source for the women that they can obtain by making use of their spare time.

4.2 Necessary Marketing Improvement

Based on the results of the PDAs, the improvements in the farmers' marketing capabilities necessary to be included in the M/P are described below.

(1) Systematic Consolidation and Provision of Market Information

MOFAUWR's current system for collecting and providing information to the farmers should be strengthened. The regional officers at the Monitoring and Evaluation Unit, the district Monitoring and Information System Officers (DMISO), the marketing enumerators, DAOs, and AEAs should be trained in the areas of market structures, marketing analysis and strategies, market networking, etc. In addition to the above, more intensive exploration of new market channels should be facilitated by communicating with the related agencies, private-sector actors, NGOs, etc.

(2) Organization of the Farmers into Groups

Organizing the farmers into groups will increase the production volume of certain crops. It will then become easier to attract traders to come to the communities, or for the farmers to collect and transport their crops to markets. In addition, if a group is strongly united, there are still other advantages; for example, farmer-to-farmer extension will be much smoother, conflict management will be much easier, financial management will be more secure, technologies and knowledge will be shared within the group, etc. The MOFAUWR office should collaborate with local NGOs with the capacity of organizing the farmers and operating in the area for organizing the farmers.

(3) Improvement of Negotiation Skills of the Producers

The farmers need to be equipped with skills to negotiate with traders (both buyers and suppliers) so that they may increase their gains from transactions. This should be done with NGOs in the same way as the above.

4.3 Assessment of the Proposed Inputs

(1) Producible Volume of Compost

Compost should be applied for cash crop production as the first priority, taking into account that the available volume of compost is limited. When there is a surplus of compost in a community, it may also be applied for staple food crop production. Compost is made from animal dung, crop residues, and other organic matter. Among them, animal dung is the most important but limiting factor for the production of compost in the area. Table 4.3.1 shows the typical amounts of animal dung that are produced per day.

Table 4.3.1 Amounts of Animal Dung

(unit: kg/head/day)

Animals		Manure	Urine	Total	Body weight
Beef Cattle	Less than 2 years old	17.8	6.5	24.3	About 400 kg
	More than 2 years old	20.0	6.7	26.7	Over 400 kg (600 to 650 kg when shipped)
Pig	Pork Pigs	2.1	3.8	5.9	About 100 kg (120 kg when shipped)
	Breeders	3.3	7.0	10.3	

(Source: Guide for the Treatment and Use of Domestic Animals' Dung, Hokkaido Agricultural Experimental Station, 1999)

Compared with Japanese cattle, the ones in the UWR are much smaller, and therefore the average weight is estimated at 250 kg, which, extrapolating from the standard, would mean a production of 11.1kg of dung a day. If cattle are confined in a paddock at night, it would mean 5.5kg/head/day could be collected. As for pigs, they are smaller in size than pigs in Japan as well, and the average weight is estimated to be 20 kg, which would mean production of 0.42 kg/head/day of dung. If the loss of dung in a piggery is estimated at 30%, it would mean 0.3 kg/head/day of dung could be collected.

If compost is to be really effective for increasing yield, it is necessary to use 20 tons per ha. This figure is also indicated as 2.5t/1500m² (= about 20t/ha) in the Manual for Agricultural Technologies prepared by the Study Team. When animal dung is accumulated for 300 days, the compost that can be made from one cow will be enough to fertilize 2,250 m² of a farm, and from one pig enough for 125 m² as shown in Table 4.3.2.

Table 4.3.2 Volumes of Animal Dung and Compost, and Applicable Area

Animals	Accumulated Dung for 300 days, A	Materials for Compost, B (Dung accounts for 25% of all compost materials = A/0.25)	Compost (B x 70%)	Applicable Area (20t/ha)
Cattle	1,650 kg	6,600 kg (organic materials are 4,950 kg)	About 4,500 kg	2,250m ²
Pigs	90 kg	360 kg (270 kg)	250 kg	125m ²

Table 4.3.3 Producible Compost Volumes and Applicable Farm Area

Community	Number of Cattle, A (head)	Collectable Number of Cattle, B=1/2A	Collectable Cow Dung, C=Bx1.65 (ton)	Gross Producible Compost Volumes, D=C/25% (ton)	Net Producible Compost Volumes, E=Dx0.7 (ton)	Applicable Farm Area= E/20t (ha)
Puffien	125	62	102.3	409	286.0	14.3
Tome-Koko	52	26	42.9	171	120.0	6.0
Zakpee	70	35	57.7	230	161.0	8.0
Naawuie	500	250	412.5	1,650	1,155.0	57.7
Kogri	1,000	500	825.0	3,300	2,310.0	115.5
Nyani	20	10	16.5	66	46.2	2.3
Daffiama	80	40	66.0	264	185.0	9.2
Tabiesi	2,000	1000	1,650.0	6,600	4,620.0	231.0
Nanvilli	150	75	123.7	495	346.0	17.3

Note: Cattle is usually confined in a paddock at night; however, in Tabiesi, Kogri, Naawuie where the numbers of the cattle are considerably larger, confinement is not considered as standard practice.

The producible compost volumes and applicable farm areas are estimated in Table 4.3.3. These figures were calculated based on the estimated number of cattle in each community obtained from the interviews with the community people.

As shown in the table, it can be seen that the range of the farm size for which compost can be effectively applied is from 6 ha in Tome-Kokoduor to 231 ha in Tabiesi⁹.

(2) Cost Effectiveness of Chemical Fertilizer

The farmers in the UWR hardly use fertilizer because most of them cannot afford to purchase it. It is recommended that the fertilizer be used only for cash crops if it is judged cost effective for particular crops and if the farmers can afford to buy it. The use of compost is also recommended as an alternative to fertilizer since it can be produced at a much cheaper cost although the available volume of compost is limited. The tables below show the results of the experiment in the PDA to measure the effectiveness of compost and fertilizer.

In the PDA, the effects of compost and chemical fertilizer (NPK) on soybean production were measured. Soybean was selected because it is less sensitive to fertilizer than the staple food crops. The results are shown below.

Table 4.3.4 Effects of Compost and Fertilizer on Soybean Production

Conditions	Ratio of Production Increase (%)
No application of compost or chemical fertilizer	0
Application of compost	32
Application of chemical fertilizer: 25kg/ha	68
Application of chemical fertilizer: 50kg/ha	103

If chemical fertilizer is used and the same increase ratios are applied for the production of sorghum, cowpea, and rice as above, their production increases and the monetary values will be as shown in Table 4.3.5.

Table 4.3.5 Effects of Fertilizer on Staple Crops Production

Crops	UWR average without compost (ton/ha)	NPK 15-15-15 on element base: 25kg/ha = GHS 187/ha				NPK 15-15-15 on element base: 50kg/ha = GHS 373/ha			
		Production (ton/ha)	Increased Volume (ton/ha)	Average Wholesale Price (GHS/kg)	Increased Value (GHS/ha)	Production (ton/ha)	Increased Volume (ton/ha)	Average Wholesale Price (GHS/kg)	Increased Value (GHS/ha)
Sorghum	0.89	1.50	0.61	0.45	274	1.81	0.92	0.45	414
Cowpea	1.08	1.82	0.74	0.69	510	2.20	1.12	0.69	772
Rice	1.42	2.39	0.97	0.89	863	2.89	1.47	0.89	1,308

⁹ In Tabiesi and other communities where large numbers of cattle are raised, the Fulani are asked to take care of the cattle in the day time, and take them to the owners' paddocks at night. The locations of the paddocks are seasonally moved as grazing lands are shifted, and maize is generally grown where the paddocks used to be.

As it is shown in the table, it can be assumed that the production of sorghum, cowpea, and rice will be increased if chemical fertilizer is applied, and the increased values exceed the cost of the fertilizer. Thus, after a trial to apply fertilizer for those crops is made and cost effectiveness is assured in the future, it is recommended that fertilizer be used when the farmers become able to afford it or are eligible for a loan to purchase it.

Since lowland rice is cultivated at the valley bottom area, the risk of losing basal dressing is much lower than for upland crops. The standard volume of the basal dressing, 20 kg/ha of nitrogen which is equivalent to 133 kg/ha of NPK 15-15-15, was used for lowland rice in the PDA. The cost of the fertilizer per ha is estimated at GHS 123 (GHS 46/50 kg) while the generated income will be GHS 2,237¹⁰ when the expected yield of 2,500 kg/ha is achieved. The cost of the fertilizer will be only 5.5% of the income, and therefore the use of fertilizer is considered cost effective.

(3) Costs for Small-scale Irrigation

Small-scale irrigation should be applied for cash crop production taking available water volume and required costs into consideration. The irrigable areas are either in the hydromorphic zone or valley bottom area. The irrigation methods are the use of small pumps or simply watering crops with a pot. The initial costs for small pump irrigation per quarter acre are estimated in Table 4.3.6. In addition, GHS 10 a week is needed for fuel when the small pump is operated for about 1 to 2 hours a day. As indicated, the use of a small pump is recommended only for those activities that are expected to generate higher profits than the costs.

Table 4.3.6 Initial Costs for Small Pump Irrigation (per quarter acre)

(unit: GHS)

Items	Price
Pump 4.5HP	450.00
Pipe 50m	150.00
Suction pipe 6m	100.00
Horse 100m	100.00
Joint, Valve filters	100.00
Sprinkler head 4 pc	100.00
Total	1,000.00

4.4 Effects on Food Security

With appropriate agricultural technologies, the yields of sorghum, lowland rice, and cowpea can be increased as indicated in Chapter 3. Those technologies include the use of improved seeds, ridging, appropriate crop density, etc. When the technologies are spread into the whole Study Area, the effects will be seen in the increase of the production, which can be indicated as kg per capita per year. The group of the activities intending to increase the production of sorghum, lowland rice, and cowpea is called “the project for staple food production”. The component related to post-harvest loss reduction should be part of the

¹⁰ The average selling price is GHS 89.47/bag (=100kg)

project, but is not included in the assessment of the effects since its effectiveness is yet to be known as mentioned in Chapter 3. The following two tables show the effects of the project by comparing the difference in production of those crops between without and with the project:

Table 4.4.1 Effects of the Project for Staple Food Production on Food Security

With Project

(Unit:kg/capita/year)										
	Sorghum	Millet	Maize	Rice	Wheat	Sub-total	Groundnuts	Cowpea	Sub-total	Total
Lawra	71.9	10.6	18.0	41.6	-	142.1	26.4	16.1	42.5	184.6
Jirapa-Lambussie	79.2	14.9	28.8	35.7	-	158.6	53.7	24.1	77.8	236.4
Nadowri	99.2	6.8	17.8	71.1	-	194.9	78.2	40.0	118.2	313.1
Average	83.0	11.0	22.0	48.5	-	164.5	52.6	29.5	82.1	246.5

Without Project (same as Table 1.6.6)

(Unit:kg/capita/year)										
	Sorghum	Millet	Maize	Rice	Wheat	Sub-total	Groundnuts	Cowpea	Sub-total	Total
Lawra*	29.3	10.6	18.0	5.9	-	63.8	26.4	3.7	30.1	93.9
Jirapa-Lambussie*	24.5	14.9	28.8	17.9	-	86.1	53.7	9.6	63.3	149.4
Nadowri*	12.0	6.8	17.8	20.9	-	57.5	78.2	16.2	94.4	151.9
Average*	22.2	11.0	22.0	15.0	-	70.2	52.6	9.8	62.4	132.6
Average consumption in Ghana**	9.3	6.2	59.8	27.0	13.3	115.6	5.4	3.6	9.0	124.6

Sources

*: Baseline Survey by the Study Team

** : Assessment of Food Import and Food Aid Against Support for Agricultural Development The Case Study of Ghana, 2004

In the above tables, the Baseline Survey data was used for the current yields, production areas and the populations. The expected yields of the crops described in Tables 4.1.2 and 4.1.4 were used for the calculation. As indicated, the average cereal production in the Study Area is expected to increase from 70.2 to 164.5 kg/capita/year, which will be much higher than the average consumption in Ghana. The average production, including pulses, will be increased from 132.6 to 246.5 kg/capita/year, which will be double the average consumption in Ghana. Particularly in Lawra, where the food security issue is more serious than in other areas, the effect of the project on production increases will be more significant as it is indicated that the increase will be from 93.9 to 184.6 kg/capita/year. Therefore, it can be assessed that the project will eventually bring substantial effects on food security if the expected yields of such crops are attained in the Study Area.

4.5 Effects on Income Increases

4.5.1 Project for Staple Food Crop Production

(1) Effects on the Study Area

As shown in Table 4.5.1, the effects of the said project on income increases are estimated with the assumption that the increased production of the above crops is entirely sold. The prices of each crop are the average prices in 2008 at the markets in the Study Area, and the other data is based on the results of the Baseline Survey. The table indicates that the average income obtained from crop production will increase GHS 71 per capita from GHS 90.3 to 161.3 in the Study Area. The effects of the project on the production and the income are indicated by the increase ratios in Table 4.5.2. This table shows that the effects are huge since the project will increase both production and income to about double the current levels.

(2) Effects on the Communities

To assess the effects of the project at the community level, the communities are classified into the types as shown in Table 4.5.3, according to their characteristics based on the data obtained from the Baseline Survey.

Table 4.5.1 Effects of the Project on Staple Food Production and Increase of Incomes

		Without Project			With Project		
		Yield (Kg/ha)	Production (Kg/Capita)	Income (GHS / Capita)	Yield (Kg/ha)	Production (Kg/Capita)	Income (GHS/ Capita)
Lawra	Sorgham	407.5	29.3	13.2	1,000.0	71.9	32.4
	Millet	215.1	10.6	5.2	215.1	10.6	5.2
	Maize	361.0	18.0	7.0	361.0	18.0	7.0
	Rice	356.0	5.9	5.3	2,500.0	41.6	37.2
	Groundnut	566.2	26.4	23.1	566.2	26.4	23.1
	Cowpea	116.1	3.7	2.6	500.0	16.1	11.2
	Total /Capita		93.9	56.5		184.6	116.2
Jirapa-Lambussie	Sorgham	371.4	24.5	11.1	1,200.0	79.2	35.7
	Millet	278.2	14.9	7.4	278.2	14.9	7.4
	Maize	231.8	28.8	11.2	231.8	28.8	11.2
	Rice	1,250.0	17.9	16.0	2,500.0	35.7	32.0
	Groundnut	778.9	53.7	47.0	778.9	53.7	47.0
	Cowpea	239.3	9.6	6.7	600.0	24.1	16.7
	Total /Capita		149.4	99.3		236.4	150.0
Nadowri	Sorgham	145.1	12.0	5.4	1,200.0	99.2	44.8
	Millet	145.7	6.8	3.3	145.7	6.8	3.3
	Maize	427.4	17.8	6.9	427.4	17.8	6.9
	Rice	735.3	20.9	18.7	2,500.0	71.1	63.6
	Groundnut	624.2	78.2	68.5	624.2	78.2	68.5
	Cowpea	243.2	16.2	11.2	600.0	40.0	27.8
	Total /Capita		151.9	114.1		313.1	214.9
Average	Sorgham	304.0	22.2	10.0	1,137.5	83.0	37.5
	Millet	220.7	11.0	5.5	220.7	11.0	5.5
	Maize	292.0	22.0	8.6	292.0	22.0	8.6
	Rice	774.6	15.0	13.4	2,500.0	48.5	43.4
	Groundnut	664.0	52.6	46.0	664.0	52.6	46.0
	Cowpea	213.5	9.8	6.8	643.0	29.5	20.4
	Total /Capita		132.6	90.3		246.5	161.3

Note: Average price: Sorghum 49.2GH¢/bag, Millet 45.95GH¢/bag, Maize 38.87GH¢/bag, Rice 89.47GH¢/bag, Groundnuts 71.8GH¢/bag, Cowpea 75.62GH¢/bag

Source: Baseline Survey for the Figures in "Without Project"

Table 4.5.2 Effects of the Project Indicated by Increase Ratios

	Lawra	Jirapa-Lambussie	Nadowli	Average
Per capita Production	2.0	1.6	2.1	1.9
Per capita Income	2.1	1.5	1.9	1.8

Table 4.5.3 Classification of the Communities

Type	Community	Conditions
Low productivity	Tanchera, Tongho, Kogle, Wulling	The total production volumes of main staple foods are less than 100 kg per capita
Cereals	Pamyaaan, Kokodur, Sentu	The total cultivation area of sorghum and millet is more than 50 % of the cultivable area
Valley Bottom	Puffien, Tigboro, Lambussie, Serekpere	The cultivation area of lowland rice is more than 10 % of the cultivable area
Cash crop	Duong, Guli, Gylli	The total cultivation areas of groundnut and cowpea are more than 50 %

The results are shown in Table 4.5.4. With the implementation of the project, in all the communities except for Tongho, where crop productivities are at the lowest in the Study Area, the per capita production of the crops will exceed the average consumption of the country, 124.6kg/capita/year. It is found however that the per capita production for Tanchera, another community in the “low productivity” type, will only be slightly above the national average. Thus, it can be said that for the communities where crop productivities are at the lowest, the project is not able to bring per capita production up to the national consumption level although it will increase crop production by 50%. Those communities will need additional interventions, such as the provision of chemical fertilizer, to stimulate crop production.

Nevertheless, for any other communities, it can be expected that crop production will be increased by 80 to 150%. It will ensure food sufficiency of the communities, and moreover, the surpluses can be sold and turned into income for the farm households. The surpluses will also be used for the production of pito or other agro-processing products, animal feed, compost, etc.

Table 4.5.4 Effects at the Community Level

Community Type	Community	Project	Production	
			Kg/capita	GHS/capita
Low productivity	Tongho	Without	56.0	34.2
		With	85.7	52.1
		Ratio	1.5	1.5
	Tanchera	Without	70.3	44.4
		With	146.9	98.7
		Ratio	2.1	2.2
Cereals	Pamyaaan	Without	116.0	66.2
		With	205.3	129.3
		Ratio	1.8	2.0
Valley bottom	Serekpere	Without	193.5	148.2
		With	488.2	333.7
		Ratio	2.5	2.3
Cash crop	Duong	Without	154.1	116.1
		With	322.1	225.5
		Ratio	2.1	1.9

4.5.2 Project for Cash Crop Production

The effects of the “project for cash crop production”, which includes vegetable and melon production, are assessed by income increases of the farmers cultivating vegetables in the Study Area. The

planted area of the vegetables was estimated based on the cultivable areas.¹¹ The results of the calculation are shown in Table 4.5.5. In the estimation, the following assumptions are made:

- The planted ratio to the cultivable area is 20 % in Lawra and 10 % in the other districts because Lawra can expand the area along the Volta River.
- The vegetable cultivation area per household is 100 m² on average.

Table 4.5.5 Area and Number of Farmers Planting Vegetables during the Dry Season

District	Cultivable area* (ha)	No. of farm households cultivating vegetables (no.)	Ratio of vegetable farmers to the total farm households (%)	Ratio of the cultivable area in the agriculture area (%)
Lawra	14.3	286	2.0	0.051
Jirapa-Lambussie	45.0	450	3.5	0.036
Nadowli	58.0	580	4.7	0.029
Total	117.3	1,316	3.0	0.033

Source *: MOFA UWR district offices

As is shown in Table 4.1.4, the expected yield of tomatoes is 16.2 ton/ha with the project, and if this is achieved, income will be increased by GHS 34. As is indicated in Table 4.5.5, the number of the farm households cultivating vegetables is about 1,300, or 3% of the total farm households in the Study Area. They will be the beneficiaries of the project.

Table 4.5.6 indicates the effects of the project on the whole area. It is shown that the project will increase incomes about GHS 44,000 in the Study Area.

Table 4.5.6 Effects of Cash Crop Production in Dry Season

District	Without Project		With Project	
	Ton	GHS	Ton	GHS
Lawra	27.2	13,779	46.3	23,463
Jirapa-Lambussie	42.8	21,681	72.9	36,917
Nadowli	55.2	27,954	94.0	47,582
Total	125.2	63,404	213.2	107,962

Another project component is melon production as mentioned in 3.2.5. It is intended to promote melons as a locally characteristic product. If a farmer grows melons successfully on one-quarter-acre farm, a gross profit of GHS 962 per year will be generated.

4.5.3 Project for Livestock Development

The project for livestock development, involving pig breeding/fattening and guinea fowl and rabbit rearing, intends to rear and sell those animals and birds as they grow. Table 4.5.7 indicates the anticipated selling prices for them, which were obtained from the beneficiaries of the PDAs and the Babile Pig Breeding Station. Most of the prices were estimated based on the experience of the beneficiaries, except for

¹¹ The figures were obtained from the MOFAUWR district offices.

the Babile Station¹², as they had not sold the animals yet. In addition, the weights of the animals were also the estimation by size, as they were confirmed by lifting up the animals, since the people do not measure their actual weights when they sell the animals. It is interesting that the selling prices are higher for the Babile Station than the communities, which indicates that the community people are not able to access markets and/or market information appropriately, and that there is room to increase the selling prices for the community people.

The profits from pig breeding and fattening are shown in 4.1.5. As for the community-based pig breeding, 1 boar and 3 sows are considered to be reared as a package for breeding. If each sow delivers 8 offsprings every 6 months and the offsprings are sold at GHS 60 after 6 months, it is expected that the breakeven point will be reached after 5 and a half years from the commencement of the project activities, and after that a profit of GHS 460 will be generated every year.

As for the household-based pig rearing, 1 boar and 2 sows are considered to be reared at the household level either for breeding or fattening. If the same delivery and breeding rates as the community-based breeding are applied, it is expected that the breakeven point will be reached in 6 and a half years after the commencement, and then an average profit of GHS 240 a year will be generated. If a pig is reared for fattening, the profit will be about GHS 28.

As for the guinea fowl rearing, 10 improved breeds will be supplied for 3-year rearing. It is proposed that the hatched guinea fowls are grown for sale. If guinea fowls are bought at GHS 7 each and a quarter of them are sold at GHS 9 after 6 months, a profit of about GHS 360 for 3 years or about GHS 120 per year is expected. As for the rabbit rearing, 5 local breeds will be reared for 3 years. The offsprings are to be grown for sale. Provided that rabbits are bought at GHS 5 each and a half of them are sold at GHS 6, it is expected that the profit will be about GHS 240 for 3 years or GHS 80 for one year.

4.5.4 Project for Processing

The “project for processing” intends to promote shea nut processing into soaps as shown in 3.2.8. It will generate about GHS 40 weekly. It is considered as a secondary income generating activity for the women.

¹² The Babile Station often sells the pigs.

Table 4.5.7 Anticipated Selling Prices of Livestock

Livestock	Weight of animals when sold (approx. kg)*	Selling price (GHS)**	Community***
Pig	25	27	Kogri
		35	Nyani
		35 (local)	Zakpee
		45 (PDA)	
		50	BBS
	35	35	Kogri
		47 (local)	Nyani
		55 (PDA)	
		40 (local)	Zakpee
		50 (PDA)	
	50	60 (local)	Kogri
		70 (PDA)	
		50 (local)	Naawuie
		55 (PDA)	
		65 (local)	Nyani
		not known, will invite AEA to assist	
		65 (local)	
		90 (PDA)	Zakpee
100	BBS		
75	150	BBS	
85	150 (local)	Kogri	
	160 (PDA)		
100	200	BBS	
Rabbits	1	5 (wild)	Nyani
		6 (PDA, live)	
		6.50 (PDA, slaughtered)	
		5 (wild)	Tabiesi
		5 (PDA, live)	
6 (PDA, slaughtered)			
Guinea fowls	1	6 (local, live)	Tabiesi
		6.50 (local, slaughtered)	
		5 to 6 (local, live)	

Note *: The weights are estimated by size since people do not measure it when they sell animals.

** : The prices are either actual or expectation of the rearers based on their experience

*** : BBS = Babile Pig Breeding Station

4.6 Assessment for Institutional Capacity of MOFAUWR

For smoothly implementing the development components and ensuring that the above effects are realized, the institutional capacities of the MOFAUWR regional and district offices need to be strengthened in several aspects. In this section, the institutional capacity of MOFAUWR is assessed based on the experience of the PDA implementation, and the ways to build necessary institutional capacities are discussed. Firstly, the project implementation and management capacity of the MOFAUWR office is considered. Secondly, the improvement of the agricultural extension services, that is, the system of disseminating appropriate technologies to the community people, is proposed. Lastly, the ways to improve the financial status of MOFAUWR are recommended. The details are explained below.

4.6.1 Project Implementation and Management Capacity

To effectively implement and manage the projects proposed in the M/P, there are several issues that need to be focused in the MOFAUWR office. The following is the issues and the countermeasures for them:

(1) Streamlining of Roles and Responsibilities

The roles and responsibilities of the MOFAUWR office should be streamlined. The regional office should focus more on supervision as well as coordination of the district offices and the other related agencies, and the district offices should concentrate more on directly assisting the communities. The concept of decentralization should be explained by MOFA Headquarters' responsible officers, and then the officers and AEAs of MOFAUWR should discuss practical ways to streamline their roles and responsibilities.

For example, when a project is to be started, the Plans of Operations (PO) should be prepared and agreed upon by the officers concerned and the community beneficiaries. A series of discussions should be held until the PO is completed. Accordingly, the roles and responsibilities of the officers at the regional and district levels, AEAs and the community representatives for implementing a particular project will become clearer.

(2) PDCA Cycle

A project always requires monitoring, reporting and taking necessary actions. The MOFAUWR office should have such system, and therefore strengthen its capacity for properly executing the plan-do-check-action (PDCA) cycle and taking immediate action in the project implementation. All the related MOFAUWR offices should allow the officers and AEAs to take necessary actions immediately when they become necessary. Awareness of the concerned officers and AEAs should also be established for enabling that. Through the training and discussions, an appropriate PDCA-cycle system should be established, and in addition, the budget for transportation necessary for project implementation should be prepared.

(3) Communication

The MOFAUWR office and concerned officers and AEAs should be well informed and coordinated for the implementation of the projects. It should be remembered that lots of livestock brought into the communities died particularly at the initial stage. This would have been avoided if communication between the responsible officers and AEAs within MOFAUWR had been smoothly made. To make sure that, communication between the offices, and between the offices and the AEAs should be facilitated by assigning the responsible officers for communication at the regional office and each of the district offices.

(4) Participatory Development

The concerned officers and AEAs should develop their capacity as the promoters of participatory

development, that is, the facilitators for mobilizing the community people for planning, implementing, monitoring, and other necessary actions for the proposed projects.

4.6.2 Extension Improvement

As mentioned in 1.8, the lack of AEAs as well as funds for the related activities are the major constraints on the current extension services. In addition, inadequate access to information on agricultural technologies and lack of training opportunities are the other constraints for AEAs. Through the Baseline Surveys, the questionnaire survey to AEAs, and the PDA implementation, the ways to improve the current extension services have been identified as described below.

(1) Main Actors of Extension

Although there are some serious constraints as mentioned above, AEAs are well acknowledged¹³ and accepted by the community people. AEAs normally reside in the community they are in charge of and are very familiar with the activities of farmers in the community. AEAs should therefore be the main actors for the dissemination of agricultural technologies. In addition to AEAs, the community leaders should also be main actors for extension as explained in the previous chapters and below in (3). Through the PDA implementation, it was confirmed that the involvement of the community leaders was effective and essential for transfer of the technologies.

(2) Extension Approach

In the current extension services, MOFAUWR officers and AEAs usually contact some selected farmers for disseminating agricultural technologies to the people in the communities. The farms of those farmers are basically used as the demonstration plots and trainings are given to them. They are called as the cooperating farmers. To disseminate the technologies wider and faster to the community people, the people themselves should be involved more actively in the extension activities. To realize this, a more effective extension approach should be considered, which can be applied to any community regardless of whether AEAs are stationed there or not. Such an approach should also contain the farmer-to-farmer extension, which was verified as being effective in the PDA, to overcome the problems of the shortage of AEAs and funds. In this respect, the proposed approach can be called a “community approach” since it will focus more on the whole community rather than on the selected beneficiary farmers.

As the results of the PDA implementation indicate¹⁴, the role of the community leaders is crucial for mobilizing the community people. To secure the active involvement of the leaders, it is recommended to organize them into a committee for managing the related activities of the community people. It can be named as an “Agricultural Committee” to be responsible for the agricultural development of the community.

¹³ see Table 6.3.1 and Table 6.3.2 in Appendix P

¹⁴ See the section 3.2.12

(3) Extension Methods

As far as the MOFAUWR is concerned, the demonstration farms and radio broadcasting are the main methods for disseminating agricultural technologies and information to the farmers as mentioned in 1.8. Those methods are also well acknowledged by the community people as the means of receiving information on farming technologies and agricultural policies¹⁵. The demonstration farms have been used commonly for on-farm training (OFT) of the farmers. It is therefore recommended to maintain those methods for the extension though there should be some improvements to enhance their effectiveness.

For example, under the current methods, AEAs and demonstration farms are not very visible to most of the community people because of the ways to contact the farmers and set up the demonstration farms¹⁶. In addition, although AEAs are making efforts to meet as many of the community people as possible, some people have never met the AEA.¹⁷ This suggests that the ways to meet the community people and set up the demonstration farms need to be reconsidered and realized with the funds available.

(4) Effective Use of AEAs

MOFAUWR sometimes assigns an AEA to two OAs to be responsible for coping with the problem of the lack of AEAs as mentioned in 1.8. In such a case, it is difficult for the AEA to take care of two OAs equally, and therefore it is suggested that an AEA take care of the assigned OAs alternatively as the main OA (OA fully in-charge of development process) and the sub OA (OA partly in-charge of development process) from time to time so that all the communities can benefit from the AEAs equally. Even if an AEA is assigned to only one OA, the same manner should be applied to the communities in such OA. Furthermore, as is pointed out in 3.2.10, the management of the MOFAUWR district offices should be improved so that DDAs may manage DAOs and DAOs may manage AEAs more effectively.

(5) Capacity Development of AEAs, Community Leaders, and Farmers

To ensure the effective functioning of the above approach, the participatory development method should be adopted. AEAs need to be familiar with the participatory method, but as mentioned in 1.8, more than 40% of the AEAs, especially younger ones, had not received any training on the participatory method and about 20% had only heard of the term. It is therefore necessary to give them training on this topic. Furthermore, essential subjects such as agricultural technologies, monitoring and evaluation, marketing, etc. should also be included in the trainings.

For involving the community people, trainings for the community leaders on the same subjects as above are also important. In addition, training regarding the basics of agriculture should be provided to the volunteer farmers who will be the core persons for the farmer-to-farmer extension in the community. Besides the above training, the capacity building of AEAs and community leaders should be considered along with any project activities so that they can learn their roles and responsibilities in a more practical

¹⁵ see Tables from 6.1.2 to 6.1.5 and Table 6.2.2 in Appendix P

¹⁶ see the section 1.8.1 (3)

¹⁷ see P-36 in Appendix P

sense.

(6) Incentive Generation for the Farmers

For smooth dissemination of agricultural technologies, it is desirable for farmers to have a natural interest in such technologies and accept them. If the number of interested farmers increases, the technologies will be spread without the need for heavy assistance from the government. It is difficult to keep farmers motivated without incentives, that is, an expectation for generating income. The successful case of introducing onions in the Upper East region suggests that utilizing an attractive local product or technology is a good way for the farmers to be motivated.

It is noted that an idea for an attractive local product is unlikely to come out merely from discussions among the community people. It is recommended that the promotion of such product be initiated by MOFAUWR. A candidate product may be cultivated/tried within the premises of MOFAUWR district office or at an advanced farmer's farm so it may become visible and motivate the farmers to produce them. This undertaking should be considered as a field demonstration rather than an experiment or research at station. This is a kind of "extension-oriented research" but not "paper-oriented", and for the extension-oriented research, it does not require the publishing of papers, but only "trial and error" on the ground. It is recommended that MOFAUWR staff, especially those who are connected to extension activities, i.e. RAOs/DAOs/AEAs, take responsibility for this approach. For finding out such products, the "One Village One Product" (OVOP) Movement in Japan can be a good example.

4.6.3 Financial Improvement

In order to make the proposed projects sustainable, it is necessary for the AEAs and other MOFAUWR staff to assist the beneficiaries in implementing the projects and monitoring the progress. For the AEAs to assist the beneficiaries, they have to be able to move around the communities constantly, and this work requires sufficient budget allocation for fuel as well as maintenance of vehicles and motor bikes. However, according to the MOFAUWR regional officers in charge of budgeting, MOFAUWR is chronically under-budgeted both at the regional and district levels. As a result, the AEAs and the DAOs in particular are constantly facing the difficulty of being assured of having the means of transportation to carry out their duties. If this situation continues, it is naturally unlikely that the projects will be monitored regularly by the AEAs and the DAOs.

Considering that assuring the mobility of the MOFA staff is critical for making the projects sustainable, the next section examines the financial management of MOFAUWR. Firstly, the financial framework and the budgeting process are reviewed. Secondly, the challenges for improvement are presented.

(1) The Financial Framework of MOFAUWR

a) Budgeting

In the UWR, MOFA regional office, district offices, and the Babile Pig Breeding Station are the

cost centers¹⁸, and each of them prepares a budget every financial year. The officers in charge of budgeting are normally the MISOs (Management and Information System Officer) at the district level and the Monitoring and Evaluation officer at the regional level.

The financial year of the Ghanaian Government starts in January and ends in December. The cost centers are given a ceiling for the budget, and the budget should be kept under the ceiling. In addition, cost centers are required to prioritize the expenditures, so that MOFA Headquarters (H/Q) may identify expenditure items that could be cut, if necessary. The budget is then disbursed quarterly. The budgeting process is shown in Table 4.5.1.

Table 4.6.1 The Budgeting Process

August or September	<ul style="list-style-type: none"> ● MOFA regional offices receive the invitation from the MOFA Headquarters (H/Q) to attend the Budgeting Workshop in Accra. Regional budget officers attend the workshop, at which the budget guide lines (schedule) and ceilings are explained.
September or October	<ul style="list-style-type: none"> ● After the Budgeting Workshop in Accra, the Regional budget officers hold a similar budgeting workshop in the regional capital for the budget officers (MISOs) from all the cost centers, and inform them of the latest budget guide lines and ceilings. ● The MISOs who attend the workshop start drafting the budget at the workshop, but they make additions and changes after returning to their cost centers. ● At the district level, the AEA's prepare a list of activities to be carried out for the next financial year through discussions with the community people and observation of their activities. The AEA's send this list to the DAO's. Upon receipt of the lists from the AEA's, the DAO's make cost estimates and prioritize the activities identified by the AEA's and prepare budgets and submit them to the MISOs.
Early November	<ul style="list-style-type: none"> ● The budget officers (MISOs) in each cost center finalize the budget and submit it to the RADU.
Mid November	<ul style="list-style-type: none"> ● The budget officer at the RADU compiles the budget from all the cost centers within the region, and makes the regional budget. After obtaining the approval from the Regional Director, the budget is sent to MOFA H/Q for review.
Late November / Early December	<ul style="list-style-type: none"> ● If the budget proposals made by the regions need clarification, MOFA H/Q makes inquiries to the region. ● The budget proposals need to be approved in the following order. MOFA H/Q Budget Unit --> Ministry of Finance and Economic Planning --> Parliamentary Committee on Agriculture --> the Cabinet
Mid December	<ul style="list-style-type: none"> ● The Budget Speech at the Parliament ● The budget framework and important budgetary issues are presented at the Parliament. ● Immediately after the Budget Speech, the Parliament debates the budget to finalize it.
January	<ul style="list-style-type: none"> ● The budget for the 1st quarter is disbursed.

¹⁸ A cost center is a non-revenue-producing element of an organization, where costs are separately figured and allocated, and for which a designated officer has formal responsibility.

b) Spending

In MOFAUWR, the officers who need expenses write a memo, which includes the expenditure items and amounts, to the regional or district directors for approval. Subsequently, the memo goes to the accounting officer and he/she provides the amount to the officer who wrote the memo. However, in the case of fuel provision in Wa, the amount approved for allocation for the officer is informed to the fuel station, so cash is not handed directly to him/her. All the officers are required to submit receipts for the expenses to the accounting officer as evidence. When formal receipts are not available, they can be replaced by honor receipts (informal receipts).

c) Reporting

As for financial reporting, each cost center prepares monthly, quarterly, mid-term, and annual reports. The regional office collects these reports from the cost centers and submits them to MOFA H/Q. To prepare the financial reports, the accountants at the regional and district offices collect the expense memos and evidence (receipts) from the officers. The evidence is not submitted to H/Q, but kept at the regional and district offices.

d) Auditing

The MOFA's internal audit is conducted randomly, and each cost center is targeted usually every other year. The external audit is conducted by the Auditor General Department (AGD)'s UWR office. Each district has an AGD branch. This external audit is conducted every year.

(2) Improvement of MOFAUWR: Challenges and Initiatives

a) Challenges

From the perspective of MOFAUWR, there are 3 major challenges in its financial management, namely, (i) the low budget ceiling set by the H/Q, (ii) the small amount of funds disbursed, and (iii) the late disbursement of funds¹⁹.

Since the needs for agricultural services and inputs are large in the region, if MOFAUWR prepares the budget based on needs rather than the previous year's expenditures, as they currently do, the budget request will easily exceed the budget ceiling. Nevertheless, MOFAUWR has been setting the budget request at a higher level than the budget ceiling. The amount disbursed to MOFAUWR from MOFA H/Q has however been far less than the budget ceiling. Consequently, the number, size and depth of MOFAUWR activities are not satisfactory in the eyes of the MOFAUWR officers. Moreover, the delay in the release of funds has adversely affected their activities.

Although MOFAUWR hopes that the allocation for them will increase, it will not happen easily unless the government revenue increases, or the allocation to MOFA increases relative to the other ministries. Even if MOFA receives more budget allocation, whether the UWR will receive a proportionate

¹⁹ It is likely that MOFAH/Q and MOFEP have different views on these issues.

increase in budget is not yet known.

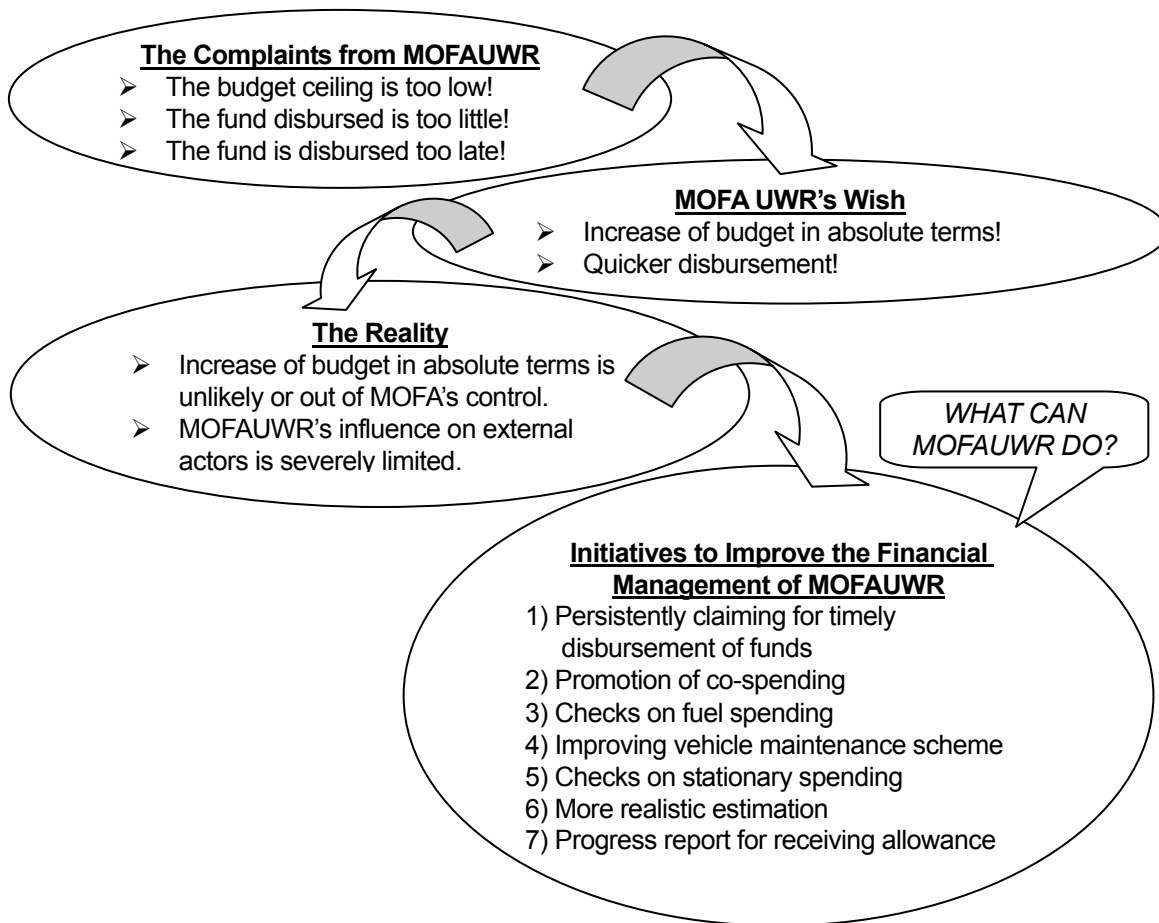


Figure 4.6.1 MOFAUWR's Expected Initiatives for Financial Management

b) Initiatives of MOFAUWR for Improving the Financial Management

Considering the above situation, MOFAUWR needs to take actions that do not require outside help in order to improve its financial status. The Study Team can identify the following seven initiatives, including on-going ones. Although the list of the initiatives below is not exhaustive, if adopted, they would make the financial status of MOFAUWR better. By taking these initiatives, MOFAUWR can gradually cut down unnecessary costs and allocate resources efficiently to the prioritized items. Figure 4.6.1 shows the sequence of how those initiatives are identified.

- 1) *Persistently claiming for timely disbursement of funds*: Since the timely disbursement of funds is critical to the operation of MOFAUWR, claims for quicker disbursement of funds should be made persistently to push MOFA H/Q and MOFEP.
- 2) *Promotion of co-spending*: For more efficient use of the limited resources, the officers should make efforts to share the spending as much as possible. An example is to share a ride, when more than one officer is going to the same destination. MOFAUWR should seek a way to implement co-spending

systematically.

- 3) *Checks on fuel spending*: Until recently, the fuel provision to the officers had not been appropriately controlled or monitored. It was therefore difficult to know how much was allocated and how much was actually consumed and for what purpose by the officers. Consequently, a disproportionate amount of budget had gone to the fuel. To rectify the problem, MOFAUWR started to require officers to request fuel allowances in writing, and to record their actual consumption at the fuel station. This initiative should be continued to prevent the use of fuel for private purposes and enable the officers to plan the use of fuel better.
- 4) *Improving vehicle maintenance scheme*: The lack of an appropriate vehicle and motorbike maintenance scheme has caused continuous breakdowns of vehicles and motorbikes, and made vehicle maintenance a drain on the budget. Restructuring of the vehicle maintenance scheme should be done with the aim of decreasing the costs.
- 5) *Checks on spending on stationary*: Like fuel spending, stationary spending has not been effectively controlled or monitored. Similar measures should be taken as in the case of fuel.
- 6) *More realistic estimations*: From experience, all the officers know that the requested amount of budget will not be disbursed; at the same time, they can estimate the approximate size of budget that will be disbursed. Thus, rather than preparing unrealistic budget requests, they should make their requests more realistic, based on the past records. This will help to close the gap between plan and practice from the outset of the fiscal year.
- 7) *Progress reports for receiving allowance*: During the implementation of the PDAs, the Study Team has been providing supplementary fuel allowances to the AEsAs and the DAOs to monitor and report on the PDAs' progress. When receiving such allowances, they are requested to submit their progress reports on the PDAs. If they do not submit the reports, the allowance is not provided. In this way, MOFAUWR can allocate the resources only to those areas where the duties are actually being performed.

Chapter 5

Proposals for Development Projects

Chapter 5 Proposals for Development Projects

The major contents of the Master Plan (M/P) are as shown in Figure 5.1. The vision, development objectives, basic approaches, development strategies, and proposed technologies and measures are shown in Chapter 2. In this chapter, the proposals for the development projects, which aim to attain the development objectives in the M/P, are presented with the following sequences and considerations:

- 1) The proposals cover the projects for (i) staple food production, (ii) cash crop production, (iii) livestock development, and (iv) processing. The project for processing, which is for the production of shea soaps, is included even though its effectiveness for increasing incomes is not significant but it still can be regarded as a secondary income generating source for the women.
- 2) In the preparation of the proposals, firstly, the components necessary to be included in those proposed projects were clarified, and each component was planned based on the results of the assessment mentioned in Chapter 4.
- 3) Secondly, the proposals are made for the improvement of the project implementation structure in two aspects: one for MOFAUWR office's capacity enhancement related to project implementation and management and the other for improvement of agricultural extension.
- 4) Thirdly, the implementation schedules are presented within the framework of the above proposed implementation structure.
- 5) Lastly, the project costs are indicated together with the proposals for the Benefit Revolving System and the information on the available financial sources in the Study Area.

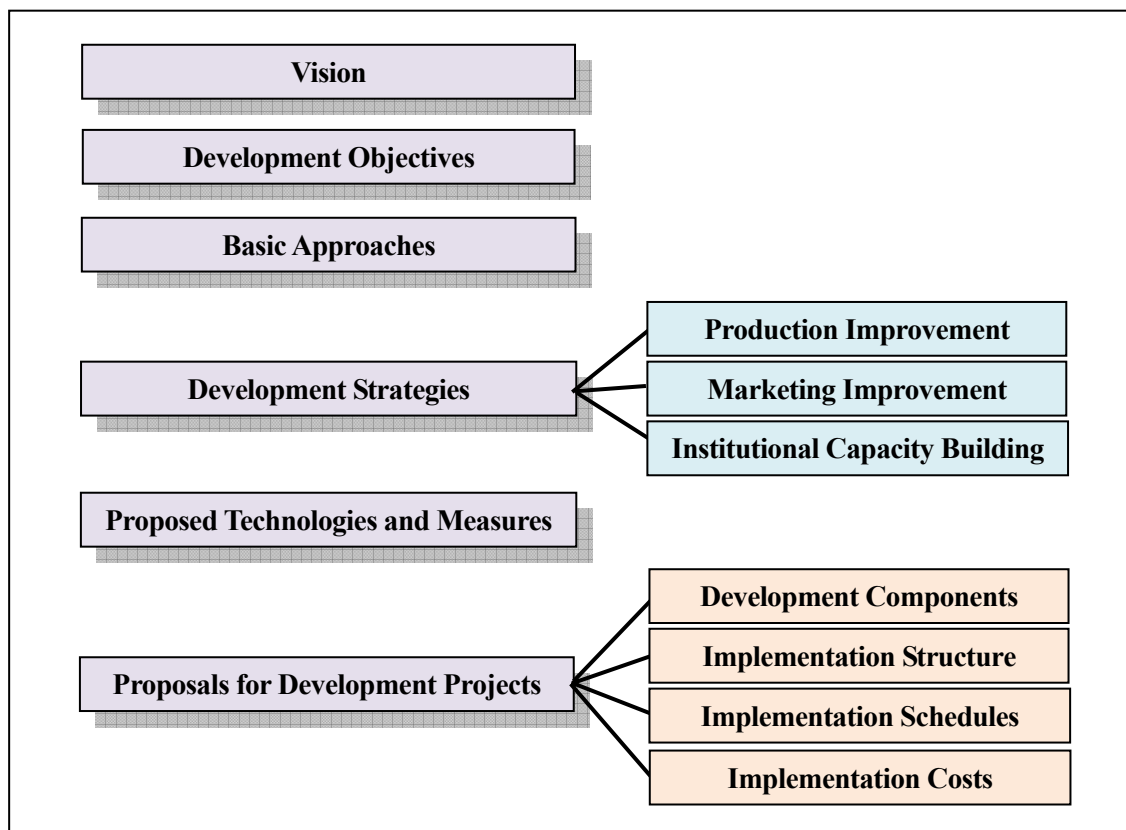


Figure 5.1 Major Contents of the Master Plan

5.1 Summary of the Project Components

In this section, the development components to be included in the proposed projects are summarized in Tables 5.1.1 and 5.1.2. The development components are divided into three main categories according to their nature; technical, marketing, and institutional. As indicated above, some of the technical components are regarded as supplementary since their objective is to support other technical components to enhance their effectiveness. The technical and marketing components aim at either increasing food security or increasing income levels. Each of them should be applied based on the needs of the community people and their agricultural development potential by using a development menu as explained in 5.4.3.

Table 5.1.1 List of Technical and Marketing Components

Category	Development Component	Description
Technical Component	T-1. Staple Food Production	To increase the production of sorghum, cowpea, and lowland rice which are staple foods of the area. Such crops are more adapted to the area's climate and are more fertilizer-sensitive than the other staple foods.
	T-2. Post-harvest Loss Reduction	To reduce post-harvest loss and eventually increase production volumes by improving crop drying and storing methods
	T-3. Vegetable Production	To increase the production of marketable vegetables such as tomatoes, peppers, okra, onion, etc.
	T-4. Melon Production	To promote the production of melons as a specially characteristic UWR product
	T-5. Community-based Pig Breeding	To promote pig breeding at the community level as a community business
	T-6. Household-based Pig Rearing	To promote pig breeding or fattening at the household level
	T-7. Guinea Fowls and Rabbit Rearing	To promote the rearing of guinea fowls and rabbits
	T-8. Shea Nut Processing	To promote processing activities turning shea nut into shea soaps
Supplementary Technical Component	S-1. Compost Making	To promote the production and use of compost as an alternative to chemical fertilizer
	S-2. Small-Scale Irrigation	To enable small-scale supplemental irrigation using manual operation or simple machines in the areas where possible
Marketing Component	M-1. Marketing Improvement	To enhance marketing capacities by making market information more accessible to the producers, organizing producers into groups, improving their negotiation skills, etc.

Among the above, the components aiming to increase incomes are supposed to be implemented with the Benefit Revolving System (BRS)¹. This assumes that MOFA or a development partner principally bear the initial costs necessary to start the project activities while the beneficiaries borrow and purchase the necessary inputs for the activities and then repay the community. By continuing this way, the benefits are expected to revolve within the community.

For the implementation and supervision of the technical components, as well as the dissemination of the appropriate technologies to the other people and areas in the UWR, the following are proposed as the institutional components to be simultaneously planned and implemented with the technical and/or marketing components.

Table 5.1.2 List of Institutional Components

Category	Development Component	Description
Institutional Component	I-1. MOFAUWR Office Capacity Enhancement	To enhance the capacity of MOFAUWR office for effective implementation and management of the projects
	I-2. Extension Improvement	To facilitate the dissemination of agricultural technologies effectively and efficiently to the communities by enhancing the capacity of AEAs and the community leaders and promoting the community approach

As mentioned in 1.2.4, the Study Area is divided into the following three types based on the soil-crop suitability:

- S3: fairly suitable areas for crop production
- S4: fairly to marginally suitable areas for crop production
- N1: Unsuitable for upland crops but suitable for paddy

Most of the S3 areas are located in the protected areas where agricultural activity is prohibited. The S4 areas can be further divided into two more areas: upland area and hydromorphic zone. The hydromorphic zone is more fertile and soggy compared to the upland area, which is sandier. As a result, the Study Area can be classified into the following four areas:

- Upland area with low or medium productivity
- Hydromorphic zone with high potential for crop cultivation
- Valley bottom area with high potential for expanding crop production by irrigation
- Protected area where agricultural land use is prohibited

¹ The details of the BRS are explained in 5.6.2. The expected annual sales and the projection of a target year for full reimbursement, estimated by the beneficiaries, are described in Appendix L

The agricultural development plan should be made and implemented taking the above-classified areas into consideration, except for the protected areas. Each of the areas has different agricultural development potential. Table 5.1.3 shows the relationship between soil suitability and crops that can be cultivated:

Table 5.1.3 Soil Suitability and Crops that can be Cultivated

		Sorghum	Millet	Maize	Rice	G nuts	Cowpea	R Veg.	D Veg
Upland	(a)	○	○			○	○		
	(b)	○	○	○		○	○	○	
Hydromorphic				○		○	○	○	○
Valley bottom					○				○

R Veg. : Rainy season vegetables, D Veg.: Dry season vegetables

(a) Less fertile area, (b) Comparatively fertile area

5.2 Detail Plans of the Project Components

In this section, the plans of the above development components are explained. The groups of some development components will comprise the development projects as indicated.

5.2.1 Project for Staple Food Production

The project for staple food production includes the components of staple food production and post-harvest loss reduction. As mentioned in 5.4, the components of MOFAUWR office capacity enhancement and extension improvement are also included. The objective of the project is food security of the people in the Study Area.

- Development Project 1: Staple Food Production by packaging the following development components:

- Staple Food Production - Post-Harvest Loss Reduction

- MOFAUWR Office Capacity Enhancement - Extension Improvement
--

The components in the projects are planned as below.

(1) Staple Food Production

Contents	T-1. Staple Food Production
Goal	The production of the staple food crops in the UWR meet the food requirements of the whole population in the area.
Long-term Objective	Half of the communities in the UWR apply the appropriate technologies indicated in this component.
Purpose of the Component	With appropriate technologies, the production of food crops such as sorghum, cowpea, and lowland rice is increased.

Contents	T-1. Staple Food Production
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the farmers on crop production is improved. 2. Farmlands are properly prepared. 3. Improved seeds are obtained. 4. Adequate agricultural tools are prepared. 5. Crops are properly raised.
Implementing Agency	MOFA District Offices
Implementation Cost	Material Cost per Community: GHS 200 (seeds, pesticides, tools) for sorghum and cowpea, and GHS 300 for lowland rice (seeds, fertilizer, pesticides, tools) for the initial year, GHS 50 (seeds, pesticides, part of tools) for sorghum and cowpea, and GHS 150 for lowland rice (seeds, fertilizer, pesticides, part of tools) from the second year
	Training Cost per Community: GHS 60
Monitoring Cost	GHS 300 per month
Remarks	<ul style="list-style-type: none"> - The average number of the beneficiary farmers is 10. - This component covers sorghum, cowpea, and lowland rice. - The size of the demonstration farms for sorghum and cowpea is 1 acre each. - The size of the demonstration farm for lowland rice is 1 acre. - The benefit revolving system is not applied as this component aims at food security.
Risks	- The harvest volumes largely fluctuate depending on rainfall.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 10 times/month = GHS300/month

The main activities for producing the expected results should be the training, mainly conducted at the demonstration plots as listed below. The details of the training modules are found in Appendix N.

Table 5.2.1 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Field preparation including fertilizer application and sowing	Cereal crop growers, DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Crop management including weeding, inter-tillage and pest control	Cereal crop growers, DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Harvest and post-harvest	Cereal crop growers, DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Seed production including plant selection and trimming	Cereal crop growers, DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in staple food production should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 10. The group members should be selected by the community people at the planning workshop². At the same time, the members who will take the harvested crops should be decided.
2. The group members should decide an adequate place to be used as a demonstration farm that belongs to one of the members, and manage the farm according to the cropping plan to be made at the training.
3. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.
4. The harvested products should be given to the farm owner or distributed to the members as agreed.

(2) Post-harvest Loss Reduction

Contents	T-2. Post-harvest Loss Reduction
Goal	The post-harvest loss of the staple food crops in the UWR meets the national standards or targets.
Long-term Objective	Half of the communities in the UWR apply the appropriate technologies indicated in this component.
Purpose of the Component	With appropriate technologies of drying and storage, post-harvest losses are reduced.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the farmers on post-harvesting is improved. 2. The bookkeeping capacity of the farmers to keep records of post-harvest activities is improved. 3. Adequate materials for drying crops are obtained. 4. Adequate materials for storing crops are obtained. 5. Crops are properly dried and stored.
Implementing Agency	MOFA District Offices
Implementation Cost	Material Cost per Community: GHS 300 (polythene sheet and sack, fertilizer sack, fumigant)
	Training Cost per Community: GHS30
Monitoring Cost	GHS120 per month
Remarks	<ul style="list-style-type: none"> - The average number of the beneficiary farmers is 10. - This component deals with the staple food crops for enhancing food security of the households. The benefit revolving system is not applied.
Risks	Crops for seeds might be mixed unintentionally with crops for foods.

Training Cost: Transportation $GHS15/\text{person}/\text{time} \times 2 \times 1 = GHS30$

Monitoring Cost: Transportation $GHS30/\text{time} \times 4 \text{ times}/\text{month} = GHS120/\text{month}$

² The planning workshop is explained in the part on the extension improvement in this chapter.

The main activities for producing the expected results should be the training, held mainly at the beneficiaries' compounds as listed below. The details of the training modules are found in Appendix N.

Table 5.2.2 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Drying, threshing and winnowing	Crop production farmers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1/2 day	In field
Sterilizing and packing grains	Crop production farmers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1/2 day	In field

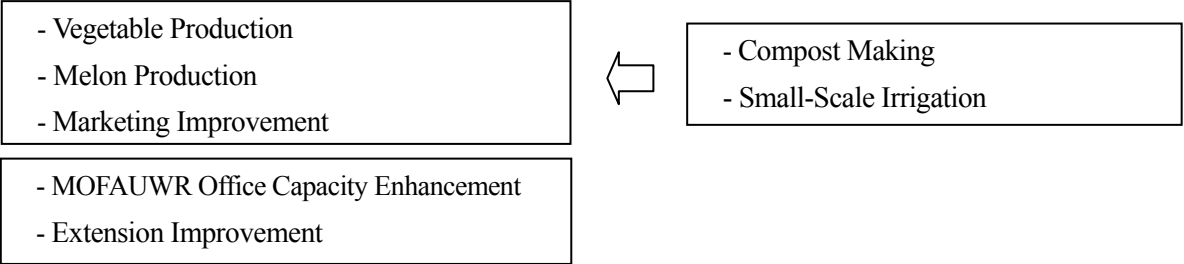
Besides the above training, the community people should undertake the following:

1. The farmers who are interested in post-harvest loss reduction should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 10. The group members should be selected by the community people at the planning workshop.
2. Each of the group members should use their products to be dried and stored with the proposed methods.
3. The members should agree that the stored grain is to be occasionally monitored (the sacks are opened for the monitoring).
4. After the members participate into the above trainings, they should explain their experience to the other farmers when the "field day" is organized.

5.2.2 Project for Cash Crop Production and Marketing

The project for cash crop production and marketing is comprised of the components for vegetable production and melon production. The components of MOFAUWR office capacity enhancement and extension improvement are also included in the same way as the project for staple food production. In addition, the component for marketing improvement is also included as explained in 5.3, and the components for compost making and small-scale irrigation as mentioned in 5.2.5 are considered, depending on the necessity of the communities, as the supplementary components. The objective of the project is to increase the income levels of the people in the Study Area.

- Development Project 2-1: Cash Crop Production and Marketing Project by packaging the following development components:



The plans of the technical components are as follows:

(1) Vegetable Production

Contents	T-3. Vegetable Production
Goal	The farmers themselves purchase necessary tools and prepare and manage vegetable production properly with the profits generated from the sales of vegetables.
Long-term Objective	Half of the communities in the UWR apply the appropriate technologies indicated in this component.
Purpose of the Component	With appropriate technologies, the production of vegetables such as tomatoes, peppers, eggplant, okra, and onions is increased.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the farmers on vegetable production is improved. 2. The bookkeeping capacity of the farmers to keep records of production costs, profits, and crop management is improved. 3. Farmlands are properly prepared, including the application of compost. 4. Improved seeds are obtained. 5. Adequate agricultural tools are prepared. 6. Vegetables are properly raised.
Implementing Agency	MOFA District Offices
Implementation Cost	Material Cost per Community: GHS 400 (seeds, fertilizer, pesticides, tools) for the initial year, GHS 100 (seeds, fertilizer, pesticides, part of tools) from the second year
	Training Cost per Community: GHS 60
Monitoring Cost	GHS 300 per month
Remarks	<ul style="list-style-type: none"> - The average number of the beneficiary farmers is 8. - This component covers tomatoes, peppers, eggplant, okra, and onions. - The size of the demonstration farm is 0.1 acre. - The vegetables are grown in both the dry and rainy seasons where possible. - Organizing the producers into a group is recommended and included in the Marketing Improvement Component. - The benefit revolving system should be applied.
Risks	<ul style="list-style-type: none"> - The harvest volumes largely fluctuate depending on rainfall. - Vegetables require water at appropriate times even in the rainy season.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 10 times/month = GHS300/month

The main activities for producing the expected results should be the training, conducted mainly at the demonstration plots as listed below. The details of the training modules are found in Appendix N.

Table 5.2.3 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Vegetable field preparation and fertilizer application	Vegetable growers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Nursery management	Vegetable growers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Crop management	Vegetable growers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1.day	In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in cash crop production should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 8. The group members should be selected by the community people at the planning workshop. At the same time, the members who will take the harvested crops should be decided.
2. The group members should decide an adequate place to be used as a demonstration farm that belongs to one of the members, and manage the farm according to the cropping plan to be made at the training.
3. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.
4. The harvested products should be given to the farm owner or distributed to the members as agreed.

(2) Melon Production

Contents	T-4. Melon Production
Goal	The farmers themselves purchase necessary tools and prepare and manage melon production properly with the profits generated from the sales of new crops.
Long-term Objective	Half of the communities in the UWR apply the appropriate technologies indicated in this component.
Purpose of the Component	With appropriate technologies, the production of melons is increased.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the farmers on crop production is improved. 2. The bookkeeping capacity of the farmers to keep records of production costs, profits, and crop management is improved. 3. Farmlands are properly prepared including the application of compost. 4. Improved seeds are obtained. 5. Adequate agricultural tools are prepared. 6. Crops are properly raised.
Implementing Agency	MOFA District Offices An international expert should be assigned for technical support.
Implementation Cost	Material Cost per Community: GHS 500 (seeds, fertilizer, pesticides, tools) for the initial year, and GHS 200 (seeds, fertilizer, pesticides, part of tools) Training Cost per Community: GHS 60

Contents	T-4. Melon Production
Monitoring Cost	GHS450 per month
Remarks	- The average number of the beneficiary farmers is 5. - The size of the demonstration farm is a quarter acre (1,000m ²). - Since this is new crop production, monitoring should be done frequently. - The benefit revolving system should be applied.
Risks	- The harvest volumes largely fluctuate depending on rainfall.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 15 times/month = GHS450/month

The main activities for producing the expected results should be the training, conducted mainly at the demonstration plots as listed below. The details of the training modules are found in Appendix N.

Table 5.2.4 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Melon field preparation and fertilizer application	Vegetable growers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Nursery management	Vegetable growers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Crop management	Vegetable growers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1.day	In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in melon production should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 5. The group members should be selected by the community people at the planning workshop. At the same time, the members who will take the harvested crops should be decided.
2. The group members should decide an adequate place to be used as a demonstration farm that belongs to one of the members, and manage the farm according to the cropping plan to be made at the training.
3. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.
4. The harvested products should be given to the farm owner or distributed to the members as agreed.

5.2.3 Project for Livestock Development and Marketing

The project for livestock development and marketing includes the components for pig breeding and fattening, and guinea fowl and rabbit rearing. The pig-related components are divided into two: one for community-based pig breeding and the other for household-based pig rearing. The community-based pig breeding is regarded as a community business while the household-based pig rearing is intended for the profits of the individual households. The components of marketing improvement, MOFAUWR office capacity enhancement, and extension improvement are also included as well. The objective of the project is to increase the income levels of the people in the Study Area.

- Development Project 2-2: Livestock Development and Marketing Project by packaging the following development components:

<ul style="list-style-type: none"> - Community-based Pig Breeding - Household-based Pig Rearing - Guinea Fowl and Rabbit Rearing - Marketing Improvement
--

<ul style="list-style-type: none"> - MOFAUWR Office Capacity Enhancement - Extension Improvement
--

The plans of the technical components are as follows:

(1) Community-based Pig Breeding

Contents	T-5. Community-based Pig Breeding
Goal	The community people themselves manage pig breeding, including feed preparation and health care, properly with the profits generated from the sales of pigs.
Long-term Objective	Pig breeding is spread to the household level in the UWR.
Purpose of the Component	With appropriate technologies, pigs are bred efficiently at the community level.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the community people on piggery construction, pig breeding, and feed preparation is improved. 2. The bookkeeping capacity of the community people to keep records of breeding costs, profits, and management is improved. 3. A properly-designed piggery is constructed. 4. An adequate number of pigs is supplied. 5. Feeds are prepared or obtained adequately. 6. Pigs are properly managed with necessary health care, feeds, and sanitation. 7. Pigs are bred and sold.
Implementing Agency	Babile Pig Breeding Station (technical support), MOFA District Offices (health care, overall monitoring)
Implementation Cost	Material and Animal Costs per Community : GHS2,436.2 for the first year, GHS1,984 from the 2nd year, plus GHS240 for every 4 years and GHS100 for every 6 years as shown in 4.1.5 (1)
	Training Cost per Community : GHS300
Monitoring Cost	GHS300 per month
Remarks	- As it is a new component, government support is essential until the community people are properly skilled and become able to handle it as a business.

Contents	T-5. Community-based Pig Breeding
	<ul style="list-style-type: none"> - Pig manure produced through this component may be used for compost making. - Organizing the community people into a group is necessary and included in the Marketing Improvement Component. - Required volumes of feed ingredients need to be obtained at all times. - The benefit revolving system should be applied.
Risks	<ul style="list-style-type: none"> - The available volumes of feed ingredients are affected by climate. - Swine fever may occur.

Training Cost: Transportation GHS15/person/time x 2 x 10 = GHS300

Monitoring Cost: Transportation GHS30/time x 10 times/month = GHS300/month

The main activities for producing the expected results should be the training, conducted mainly at the piggery sites as listed below. The details of the training modules are found in Appendix N.

Table 5.2.5 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Introduction to Pig Rearing	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field
Piggery construction and management	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field
Feed formulation	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field
Health care	Pig rearing farmers DAOs and AEAs	RAO-Vet, District Veterinary Officer	Once a year	1 day	In field
Reproduction and Delivery	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in the community-based pig rearing should be organized as a beneficiary group. The group members should be selected by the community people at the planning workshop. At the same time, how the profits will be distributed among the members and what portion of the profits the community will save should be decided.
2. The members should select a leader or leaders to make sure that the group members work in collaboration.
3. The community should find an adequate site for rearing pigs, and the members should build a piggery.
4. The members should prepare the compound feed according to the instructions given by the Babile Pig Breeding Station.
5. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.
6. The generated profits should be distributed to the members or given to the community for saving.

(2) Household-based Pig Rearing

Contents	T-6. Household-based Pig Rearing
Goal	The community people themselves manage pig breeding or fattening, including feed preparation and health care, properly with the profits generated from the sales of pigs.
Long-term Objective	With appropriate technologies, pigs are reared efficiently at the household level.
Purpose of the Component	(same as the long-term objective)
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the community people on piggery construction, pig rearing, and feed preparation is improved. 2. The bookkeeping capacity of the community people to keep records of rearing costs, profits, and management is improved. 3. A properly-designed piggery is constructed. 4. An adequate number of pigs is supplied. 5. Feeds are prepared or obtained adequately. 6. Pigs are properly managed with necessary health care, feeds, and sanitation. 7. Pigs are reared and sold.
Implementing Agency	Babile Pig Breeding Station (technical support), MOFA District Offices (health care, overall monitoring)
Implementation Cost	<p>Material and Animal Costs per Community: GHS1,324 for the first year, GHS1,400 from the 2nd year, and GHS160 for every 4 years and GHS100 for every 6 years as shown in 4.1.5 (2)</p> <p>Training Cost per Community: GHS 60</p>
Monitoring Cost	GHS 300 per month
Remarks	<ul style="list-style-type: none"> - The average number of the beneficiary farmers is 5. - The rearing includes both breeding and fattening, either of which may be chosen by the beneficiaries. - The benefit revolving system should be applied.
Risks	<ul style="list-style-type: none"> - The available volumes of feed ingredients are affected by climate. - Swine fever may occur.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 10 times/month = GHS300/month

The main activities for producing the expected results should be the training, conducted mainly at the beneficiaries' houses as listed below. The details of the training modules are found in Appendix N.

Table 5.2.6 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Introduction to Pig Rearing	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field
Piggery construction and management	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field
Feed formulation	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field
Health care	Pig rearing farmers DAOs and AEAs	RAO-Vet, District Veterinary Officer	Once a year	1 day	In field
Reproduction and Delivery	Pig rearing farmers DAOs and AEAs	Staff of Babile Pig Station	Once a year	1 day	In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in pig rearing should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 5. The group members should be selected by the community people at the planning workshop.
2. Each of the group members should find an adequate site for rearing pigs and build a piggery.
3. The members should prepare the compound feed according to the instructions given by the Babile Pig Breeding Station.
4. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.

(3) Guinea Fowl and Rabbit Rearing

Contents	T-7. Guinea Fowl and Rabbit Rearing
Goal	The community people themselves manage rearing guinea fowls and rabbits, including feed preparation and health care, properly with the profits generated from the sales of animals.
Long-term Objective	Half of the communities in the UWR apply the appropriate technologies indicated in this component.
Purpose of the Component	With appropriate technologies, guinea fowls and rabbits are reared efficiently at the household level.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the community people on animal hut construction, animal rearing, and feed preparation is improved. 2. The bookkeeping capacity of the community people to keep records of rearing costs, profits, and management is improved. 3. A properly-designed hut is constructed. 4. An adequate number of animals are supplied. 5. Feeds are prepared or obtained adequately. 6. Animals are properly managed with necessary health care, feeds, and sanitation.

Contents	T-7. Guinea Fowl and Rabbit Rearing
	7. Animals are reared and sold.
Implementing Agency	MOFA District Offices
Implementation Cost	Material and Animal Costs per Community: GHS 70 for a hut (bricks with mortar plaster, roofs with locally available materials), GHS 70 (10 guinea fowls), and GHS 25 (5 rabbits)
	Training Cost per Community: GHS 60
Monitoring Cost	GHS 120 per month
Remarks	- The average number of the beneficiary farmers is 5. - This component covers guinea fowls and rabbits. - The benefit revolving system should be applied.
Risks	- It may take time for exotic varieties of guinea fowls to get accustomed to the environment in which they are reared.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 4 times/month = GHS120/month

The main activities for producing the expected results should be the training, conducted mainly at the beneficiaries' houses as listed below. The details of the training modules are found in Appendix N.

Table 5.2.7 Main Activities

Subject	Trainees	Trainers	Training frequency	Duration	In-class or field
Introduction to rabbit rearing	Rabbit farmers DAOs and AEAs	RAO-APD/Vet District Vet. Officer	Once a year	1 day	In field
Housing, feed and health care	Rabbit farmers DAOs and AEAs	Ditto	Once a year		In field
Reproduction management	Rabbit farmers DAOs and AEAs	Ditto	Once a year		In field
Introduction to guinea fowl rearing	Guinea fowl farmers, DAOs and AEAs	RAO-APD/Vet District Vet. Office	Once a year	1 day	In field
Housing, feed and health care	Guinea fowl farmers, DAOs and AEAs	Ditto	Once a year		In field
Harvest eggs and incubation management	Guinea fowl farmers, DAOs and AEAs	Ditto	Once a year		In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in guinea fowl or rabbit rearing should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 5. The group members should be selected by the community people at the planning workshop.
2. Each of the group members should find an adequate site for rearing guinea fowls and rabbit rearing and build an animal hut.
3. The members should prepare the compound feed according to the instructions given by the RAO/DAO

Veterinary.

4. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.

5.2.4 Project for Shea Nut Processing and Marketing

The project for processing and marketing consists of the component for shea nut processing into soaps since it was only the processing activity identified as profitable. The components for marketing improvement, MOFAUWR office capacity enhancement, and extension improvement are also included as well. The objective of the project is to increase income levels of the people in the Study Area.

- Development Project 2-3: Project for Shea Nut Processing and Marketing by packaging the following development components:

- Shea nut Processing - Marketing Improvement
- MOFAUWR Office Capacity Enhancement - Extension Improvement

The plan for the shea nut processing component is as follows:

Contents	T-8. Shea Nut Processing
Goal	The community people themselves purchase and manage necessary raw materials and machinery properly with the profits generated from the sales of processed items.
Long-term Objective	Half of the communities in the UWR apply the appropriate technologies indicated in this component.
Purpose of the Component	With appropriate technologies, shea nut is processed and sold.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the community women on procuring, storing and processing raw materials is improved. 2. The bookkeeping capacity of the community women to keep records of processing costs, profits, and management is improved. 3. Knowledge of community women on group management and collective activities is improved. 4. Required amounts of raw materials are obtained and stored. 5. Adequate machinery is obtained. 6. Raw materials are properly processed.
Implementing Agency	MOFA District Offices
Implementation Cost	Material and Other Costs for Processing per Community: GHS 24 to 30 for a

Contents	T-8. Shea Nut Processing
	bag of shea nut and GHS 55 per bag for others as indicated in 3.2.8 (2)
	Training Cost per Community: GHS 60
Monitoring Cost	GHS 120 per month
Remarks	<ul style="list-style-type: none"> - This component covers the processing of shea nuts. - The beneficiaries are community women’s groups. Organizing the women producers into groups is included in the Marketing Improvement Component. - It is important for the group to become able to purchase and manage raw materials, and record these procedures properly. Procurement of machinery should be considered only for those groups. - The benefit revolving system should be applied.
Risks	- The amounts of available raw materials fluctuate largely depending on climate.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 4 times/month = GHS120/month

The main activities for producing the expected results should be the training, conducted mainly at the places where beneficiary women’s groups process shea nut as listed below. The details of the training modules are found in Appendix N.

Table 5.2.8 Main Activities

Subject	Trainees	Trainers	Training frequency	Duration	In-class or field
Necessary tools and materials for shea soap making	Shea soap making group	RAO-WIAD/D AOs-WIAD	Once a year	3 days	In field
Round soap making	Shea soap making group	RAO-WIAD/D AOs-WIAD	Once a year		In field
Key soap making	Shea soap making group	RAO-WIAD/D AOs-WIAD	Once a year		In field
OMO soap making	Shea soap making group	RAO-WIAD/D AOs-WIAD	Once a year		In field

Besides the above training, the community people should undertake the following:

1. The women who are interested in processing shea nut should be organized as a beneficiary group. The group members should be selected by the community people at the planning workshop. At the same time, how the profits will be distributed among the members and what portion of the profits the community will save should be decided.
2. The members should select a leader or leaders to make sure that the group members work in collaboration.
3. The community should find an adequate site for conducting processing activities.
4. The members should obtain and store the necessary materials.
5. After the members participate in the above trainings, they should explain their experience to the other women when the “field day” is organized.

6. The generated profits should be distributed to the members or given to the community for saving.

5.2.5 Supplementary Technical Components

The following component is regarded as supplementary, applied when necessary for the implementation of the technical components outlined above.

(1) Compost Making

This component is applied particularly for cash crop production as the first priority taking into consideration the fact that the available volume of compost is limited. When there is a surplus of compost in a community, it may be applied also for staple food production.

Contents	S-1. Compost Making
Purpose of the Component	The necessary volume of compost for implementing the related crop production components is prepared.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the farmers on compost making is improved. 2. The bookkeeping capacity of the farmers to keep records for managing compost-making is improved. 3. Necessary raw materials are obtained. 4. Compost is prepared.
Implementing Agency	MOFA District Offices
Implementation Cost	Material Cost per Community: For making 9 m ³ of compost, GHS 2 for 1.8 kg of urea as necessary nitrogen. The other materials can be obtained by the farmers themselves.
	Training Cost per Community: GHS 30
Monitoring Cost	GHS 60 per month
Remarks	- The average number of the beneficiary farmers is 10.
Risks	<ul style="list-style-type: none"> - The quality and quantity of compost that can be made largely depend on climate. - Making compost is highly labor intensive, which might not attract the people into making it.

Training Cost: Transportation 15/person/time x 1 x 2 = GHS30

Monitoring Cost: Transportation GHS30/time x 2 times/month = GHS60/month

The main activities for producing the expected results should be the training, conducted mainly at the places where the beneficiaries produce compost as listed below. The details of the training modules are found in Appendix N.

Table 5.2.9 Main Activities

Subject	Trainees	Trainers	Training frequency	Duration	In-class or field
Materials for compost	Crop production farmers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year	1 day	In field
Piling the materials	Crop production farmers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year		In field
Application of the compost	Crop production farmers DAOs and AEAs	RAOs, DAOs and AEAs	Once a year		In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in compost making should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 10. The group members should be selected by the community people at the planning workshop. At the same time, who will take the compost should be decided.
2. The group members should dig compost pits (three on average), and gather the materials to make compost.
3. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.
4. The compost should be distributed to the members as agreed.

(2) Small Scale Irrigation

This component is applied particularly for cash crop productions taking available water volume and required costs into consideration.

Contents	S-2. Small-Scale Irrigation
Purpose of the Component	The necessary water for implementing the related crop production components is supplementarily supplied.
Expected Outputs	<ol style="list-style-type: none"> 1. Knowledge of the farmers on irrigation methods and management of irrigation facilities is improved. 2. The bookkeeping capacity of the farmers to keep records on irrigation costs and management is improved. 3. Necessary equipment and facilities are obtained. 4. Farms are irrigated.
Implementing Agency	MOFA District Offices
Implementation Cost	Material Cost per Community: GHS 1,000 plus GHS10 for fuel as indicated in 4.2. (3)
	Training Cost per Community: GHS 60
Monitoring Cost	GHS240 per month
Remarks	- The average number of the beneficiary farmers is 10.

Contents	S-2. Small-Scale Irrigation
	<ul style="list-style-type: none"> - Irrigation is considered supplementary in the rainy season and early in the dry season. - The equipment and facilities in this component should be limited to those with purchasing and running costs lower than the profits obtained.
Risks	- Regular maintenance of the equipment, particularly small gasoline pumps, is essential. Availability of spare parts for the equipment should be ensured.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 8 times/month = GHS240/month

The main activities for producing the expected results should be the training, conducted mainly at the farms where the beneficiaries use irrigation as listed below. The details of the training modules are found in Appendix N.

Table 5.2.10 Main Activities

Subject	Trainees	Trainers	Training frequency	Duration	In-class or field
Simple water use management and crop irrigation	Dry season gardeners, AEAs	RAO-Engi, DAOs and AEAs	Once a year	1 day	In field
Portable engine pump irrigation	Dry season gardeners, AEAs	RAO-Engi, DAOs and AEAs	Once a year		In field

Besides the above training, the community people should undertake the following:

1. The farmers who are interested in small-scale irrigation should be organized as a beneficiary group. To make the transfer of the technology effective, the number of the first group should be limited to about 10. The group members should be selected by the community people at the planning workshop. At the same time, whose farm will be irrigated should be decided.
2. The group members should dig a well and/or a canal from a water source to the farm for irrigation.
3. After the members participate in the above trainings, they should explain their experience to the other farmers when the “field day” is organized.
4. The farm(s) should be irrigated as agreed.

5.3 Marketing Improvement

This component is included in all the projects that aim to increase income.

Contents	M-1. Marketing Improvement
Goal	The community people are able to make production and marketing plans by themselves, and generate adequate incomes.
Long-term Objective	Half of the communities in the UWR apply the appropriate technologies indicated in this component.
Purpose of the	With appropriate marketing methods, the agricultural products and processed

Contents	M-1. Marketing Improvement
Component	items produced by the community people are strategically sold.
Expected Outputs	<ol style="list-style-type: none"> 1. The market information collected by the enumerators of MOFAUWR is systematically consolidated and updated. 2. The information on market prices and places is provided to the producers at the proper times. 3. The information on existing and new buyers is provided to the producers to develop or ensure sales channels. 4. The producers are organized into groups and their potential is strengthened for collective production or marketing. 5. The marketing strategies and plans are made by MOFAUWR district offices and the producers (groups). 6. The bookkeeping capacity of the producers to keep records for managing sales is improved. 7. The negotiation skills of the producers vis-à-vis buyers are improved. 8. The products are shipped or sold at proper times and proper methods.
Implementing Agency	MOFAUWR Regional Office, District Offices (technical support, information), Cooperative Department (community-based organization)
Implementation Cost	Material Cost per Community: - Training Cost per Community: GHS 60
Monitoring Cost	GHS 300 per month
Remarks	<ul style="list-style-type: none"> - The average number of the beneficiary farmers is 10. - This component includes organizing the producers into groups for collectively increasing the profits from sales. - The focus should be placed selectively among the above outputs according to the products to be sold.
Risks	<ul style="list-style-type: none"> - The producers do not have adequate access to market information, and therefore the government support is strongly needed.

Training Cost: Transportation GHS15/person/time x 2 x 2 = GHS60

Monitoring Cost: Transportation GHS30/time x 10 times/month = GHS300 /month

Some of the marketing aspects are already taken into account in the above-mentioned technical components. As shown in Table 5.3.1, the improvement of the quality and productivity of agricultural products is included in the listed components aiming to enhance the product qualities for adding value or improve the production efficiency. The introduction of high-value crops or varieties means the introduction of melon as a new crop or a new variety of tomato as a draught-tolerant and transportable one. The shift of cultivation and harvest times of the products is intended to enable producers sell their products when the prices are at the highest level possible.

Table 5.3.1 Marketing Aspects included in the Technical Components

Marketing Aspects	Related Technical Components
Improvement of the quality and productivity of agricultural products	Vegetable Production, Community-based Pig Breeding, Household-based Pig Rearing, Guinea Fowls and Rabbit Rearing, Shea Nut Processing
Introduction of high-value crops or varieties	Vegetable Production (new variety of tomatoes), Melon Production
Shift of cultivation and harvest times of the products	Vegetable Production (dry season cultivation)

The main activities for producing the expected outputs for this component should be the training as listed below. The details of the training modules are found in Appendix N.

Table 5.3.2 Main Activities

Subject	Trainees	Trainers	Training frequency	Duration	In-class or field
Data collection methods, tools and organization	DAOs, MISOs, AEAs	Selected RAOs	Once a year	3 days	In class
Market information system	MISOs, AEAs, and Market Enumerators	RAO (M&E)	Once a year	2 days	In class
Sensitization on commodity price trends and demand function of food crops	MISOs, DAOs, Market Enumerators and AEAs	RAO (Programmes & Budget Officer)	Once a year	1 day	In class
Organization management	Members of Beneficiary Groups, AEAs	Officers of the Cooperative Department	Once a year	2 days	In class
Book Keeping & Proper Accountability	Executive members of Beneficiary Groups AEAs	Officers of the Cooperative Department	Once a year	5 days	In class

Through the implementation of the proposed projects, the MOFAUWR officers and AEAs should provide the services necessary for marketing the beneficiaries' products based on what they learn in the above training. In addition, the community people should undertake the following:

1. The farmers who are interested in marketing should be organized as a beneficiary group. The members should basically be the beneficiaries of the above-mentioned proposed projects.
2. After the members participate in the above trainings, they should explain their experience to the other farmers.
3. The group members should collectively perform the required tasks taught in the trainings. The executive members should keep the account books for their activities.

5.4 Implementation Structure

5.4.1 Overall Structure

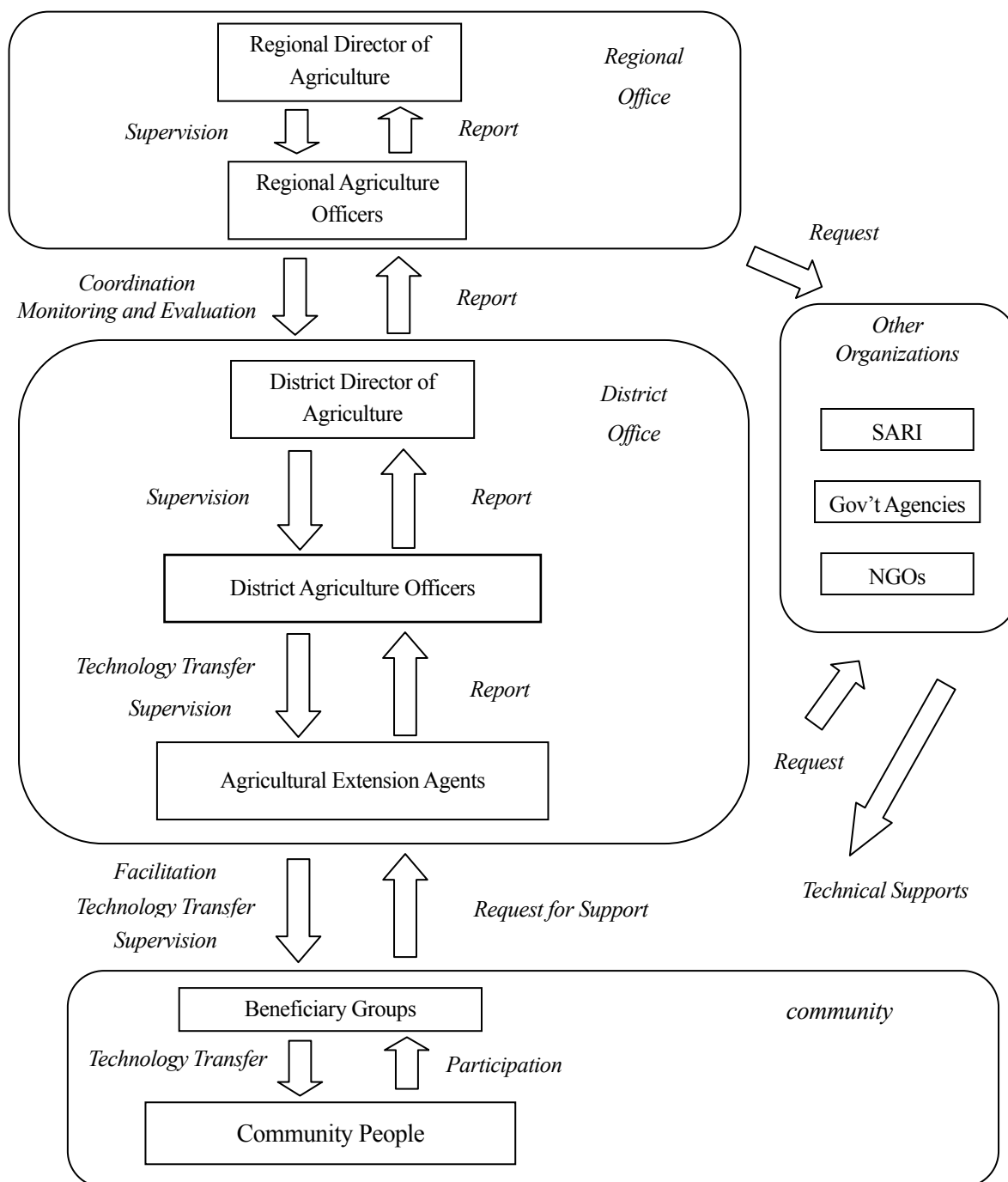


Figure 5.4.1 Implementation Structure for the Proposed Projects

The implementation structure for the proposed development projects is indicated in Figure 5.4.1. Most of the stakeholders and their functions are the same as the ones for the regular operations of MOFAUWR. The improvement of the current project implementation structure is institutionally needed from two aspects: one for MOFAUWR office's capacity enhancement related to project implementation and management and the other for extension improvement. The details are explained in this section.

5.4.2 MOFAUWR Office Capacity Enhancement

As mentioned in Chapter 4, it is pointed out that MOFAUWR office needs some improvement to effectively implement and manage the projects proposed in the M/P. The following is the main issues for the component:

- 1) Streamlining of Roles and Responsibilities
- 2) Establishment of the PDCA Cycle
- 3) Facilitation of Communication within MOFAUWR office
- 4) Promoting of Participatory Development

The plan of the component is as follows:

Contents	I-1. MOFAUWR Office Capacity Enhancement
Goal	MOFAUWR's regional and district offices maintain the project activities over the long term and assist the communities in properly managing the profits from the project activities.
Long-term Objective	MOFAUWR's regional and district offices become able to smoothly manage the implementation of development projects and components
Purpose of the Component	MOFAUWR's regional and district offices start properly managing the implementation of the development projects and components
Expected Outputs	<ol style="list-style-type: none"> 1. The roles of the regional and district offices are made clear and understood by all the stakeholders . 2. The projects are planned and evaluated by the MOFAUWR staff and the community people. 3. Project monitoring is regularly conducted by the MOFAUWR staff and results are reported to the responsible offices for necessary action. 4. Information is smoothly exchanged among the MOFAUWR offices, including the AEAs. 5. The contents of the manuals for agricultural technologies and extension, including the concept of the community approach, are understood and implemented by the MOFAUWR staff. 6. The basics of marketing are understood and implemented by the MOFAUWR staff. 7. Market information is smoothly collected, tabulated and passed on to the producers. 8. The profits from the development projects and components are properly monitored by the MOFAUWR staff.
Implementing Agency	MOFA Regional Office and District Offices
Implementation Cost	Material Cost: -

Contents	I-1. MOFAUWR Office Capacity Enhancement
	Training Cost: GHS 100 per training (In addition to the trainings recommended in Table 5.4.1, MOFAUWR office's capacity should be enhanced through regular operations.)
Monitoring Cost	- (The status of capacity enhancement should be monitored in regular operations.)
Remarks	- The manuals for agricultural technologies and extension should be used for the training.
Risks	- Trained officers may leave their positions, which would necessitate the same training to newly assigned or recruited officers. - The direction of the current decentralization policy may be changed.

The main activities for producing the expected outputs should be the training as shown below. The details of training modules are found in Appendix N. It is noted that the capacity of key staff, such as RAOs, DDAs and DAOs, should be enhanced through not only the trainings, but also along with their efforts to operate and supervise the development activities.

Table 5.4.1 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Decentralization Policy and Roles of Region and Districts	RAOs, DDAs and DAOs	MOFA H/Q	Once a year	2 days	In-class
Participatory Method in Agricultural Development	RAOs and DDAs	NGOs	Once	2 days	In-class
Development Planning and Budgeting	RAOs and DDAs	RDA, selected DDAs or RAOs	Once a year	1 day	In-class
Marketing Strategies	RAOs, DDAs and DAOs	Selected RAOs	Once a year	2 days	In-class
Project Monitoring and Evaluation	RAOs, DDAs and DAOs	Selected RAOs	Once a year	1 day	In-class
Benefit Revolving System	RAOs and DDAs	Selected RAOs	Once a year	1 day	In-class

5.4.3 Extension Improvement

The ways to improve the current extension services are discussed in 4.5.3. The details of the proposal for extension improvement are explained below.

(1) Community Approach

As mentioned in Chapter 4, it is proposed that the community approach be adopted in the extension activities. However, the community approach may not be universally applicable to the communities, and even if it is applicable, the adoption will take place gradually. Therefore, the current extension approach and the community approach may be used concurrently. The community approach is

used for the communities that decide to take the process mentioned in Figure 5.4.2. Otherwise, the current extension approach, the extension through the cooperating farmers, will be applied.

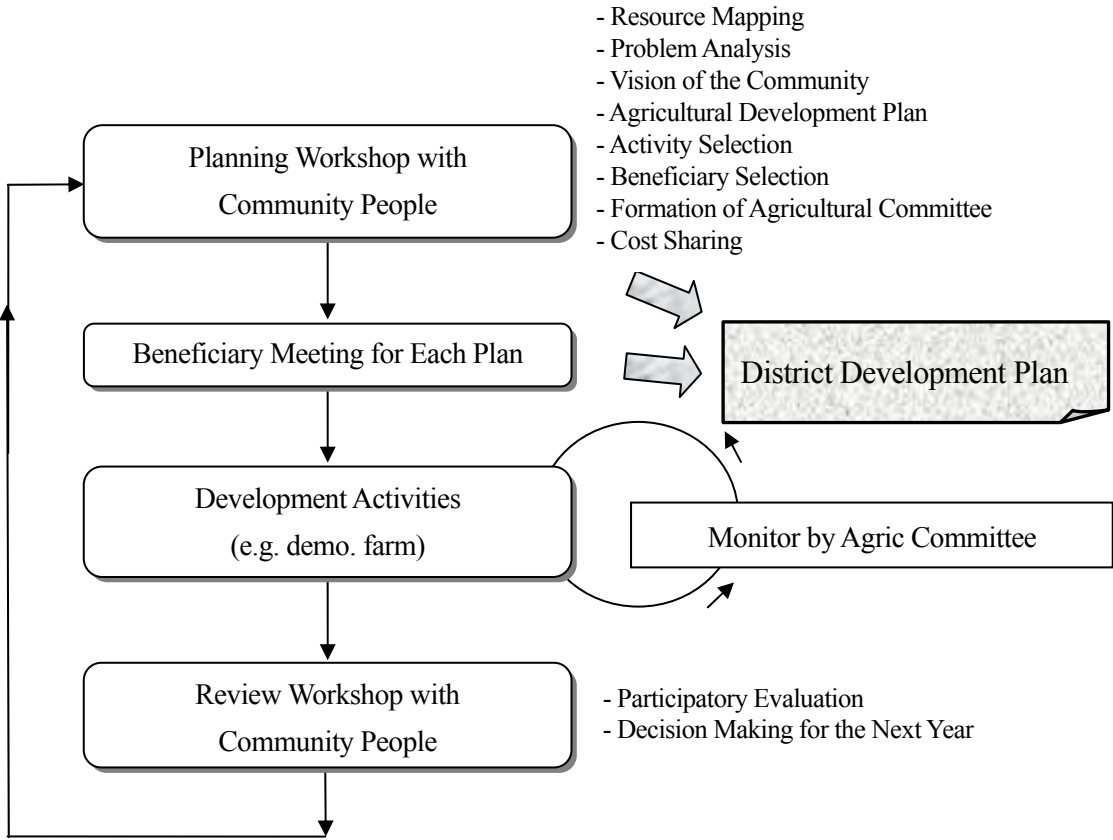


Figure 5.4.2 Development Process with Community Approach

The development process of the community approach is shown in Figure 5.4.2. The process should be almost uniform in the communities regardless of whether AEAs are stationed there or not. What is different is how to run or manage the development activities, such as demonstrations. Where an AEA is stationed, the demonstration activities require the AEA to frequently visit the sites. If an AEA is not stationed in the community, the activities should be run by the community leaders. For any case, the involvement of DAOs and AEAs in the other activities, such as the planning workshop, the beneficiary meeting, and the review workshop, is essential, and the Agricultural Committee should always be involved in the whole process. The process and the characteristics of the community approach are explained below.

1. In the planning workshop, with an AEA as a facilitator, community people will be asked to discuss the current status of the community. During the workshop, the sessions for preparing the resource map and the problem analysis may be held for establishing the vision of the community. It is important to have as many participants as possible at the discussion, preferably at least one participant from each household³. In the discussion, the participants

³ Persons who represent the sub-sectors of the community should at least attend if “one participant from each household” is difficult.

need to come to an agreement on the future direction of the community and the type of agricultural development and technologies necessary to realize it.

2. Upon deciding the vision for the community, the participants will make an agricultural development plan⁴ and identify required activities. Priorities of the activities and beneficiaries for each activity will be determined. The introduction of cost sharing and the benefit revolving system (BRS) described in 5.6.2 will also be discussed and agreed upon among the participants.
3. The community will establish the Agricultural Committee for supporting and supervising the development activities. The members of the Committee may include chief(s), traditional leader(s), other community leader(s)⁵, extension volunteer(s), school teacher(s), ex-teacher(s), ex-agric. officers, volunteer farmers, etc. The community people should select the members. The AEA will also be a member as a facilitator and a general secretary of the committee.
4. After the participants decide the beneficiaries for each activity, each of the beneficiary groups will have a beneficiary meeting to discuss and agree on the details of the activities and the roles among themselves.
5. Development activities will be implemented according to the results of the discussions. Through the activities, required agricultural technologies will be transferred to the beneficiaries. The Agricultural Committee shall be responsible for the implementation. The way to transfer the technologies will be discussed later in this section.
6. The Agricultural Committee and the beneficiaries will have a review workshop to evaluate the activities by themselves. The results will be reflected in the plans for the following year.

For the community approach, there are the following merits:

- i) It does not put an extra financial burden on MOFAUWR.
- ii) The open process for selecting project beneficiaries will enhance fairness and transparency.
- iii) The beneficiaries themselves decide their responsibilities in project activities, which develops a sense of ownership of the projects among them.
- iv) All the projects are directed for the development of the community since the Agricultural Committee will be responsible for the implementation.
- v) It is possible to incorporate this approach in the current bottom-up process of district development planning.

In line with the decentralization policy, the responsibility for providing the extension services has been shifted from central to district authorities. The regional offices focus on developing policies and programmes, coordination, providing technical backstopping and training to their region and districts. At the district level, development plans are made every year through participatory planning. As MOFA district offices consult the representative farmers to formulate the district agricultural development plans in the

⁴ In principle, a five-year plan may be prepared although the periods of the Plan might be different according to the needs of the communities.

⁵ Regarding the community leaders and their characteristics, see the Appendix H.

current planning process, the community approach can be incorporated in the process.

(2) Agricultural Committee

As mentioned in the previous sections, an Agricultural Committee will be established. The members of the Committee will be leaders and others of the community as mentioned above and selected or elected by the community people. As shown in Figure 5.4.3, the roles of the committee are to host the workshops, manage the demonstrations, and take care of the BRS.

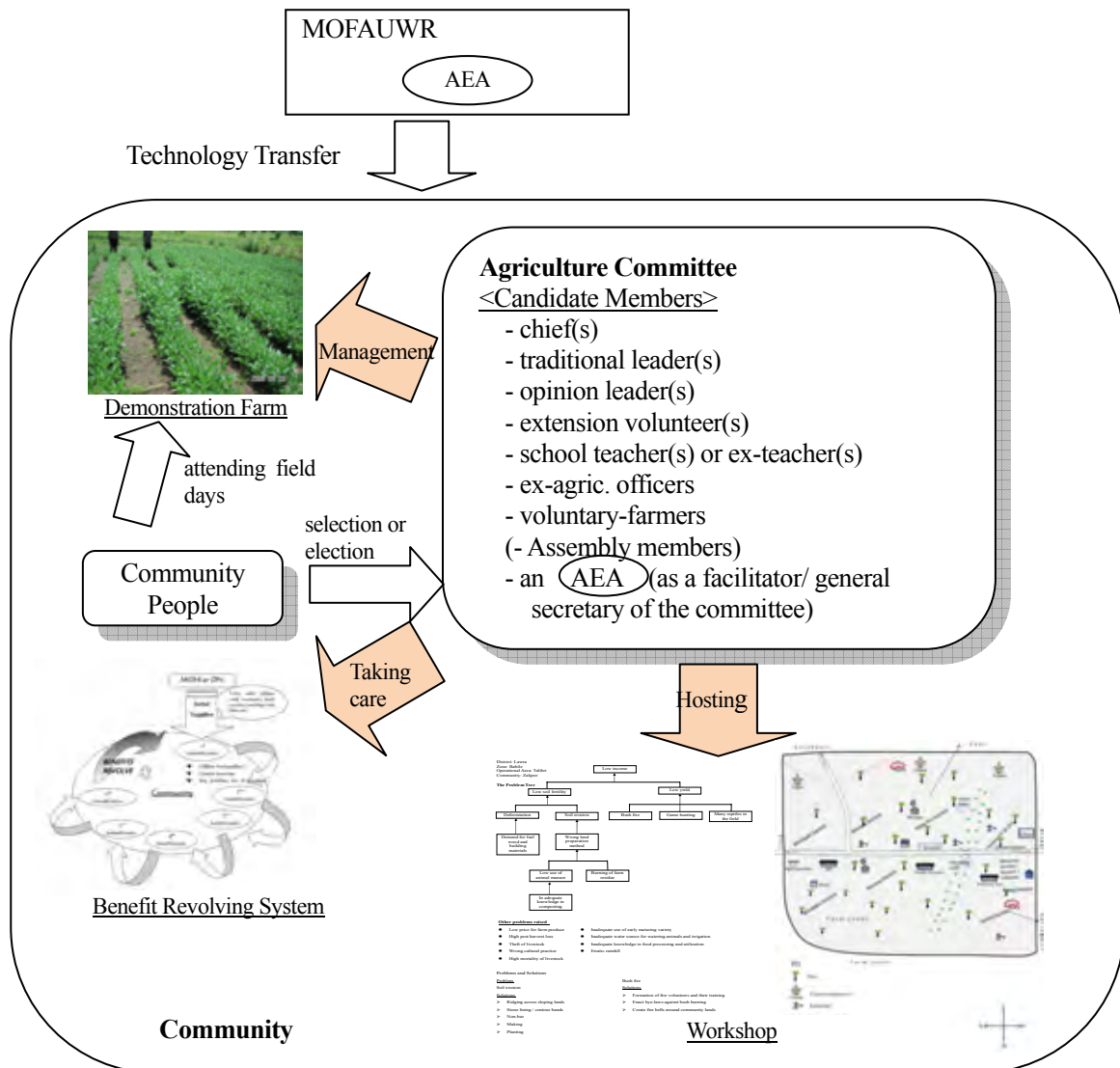


Figure 5.4.3 Roles of the Agriculture Committee

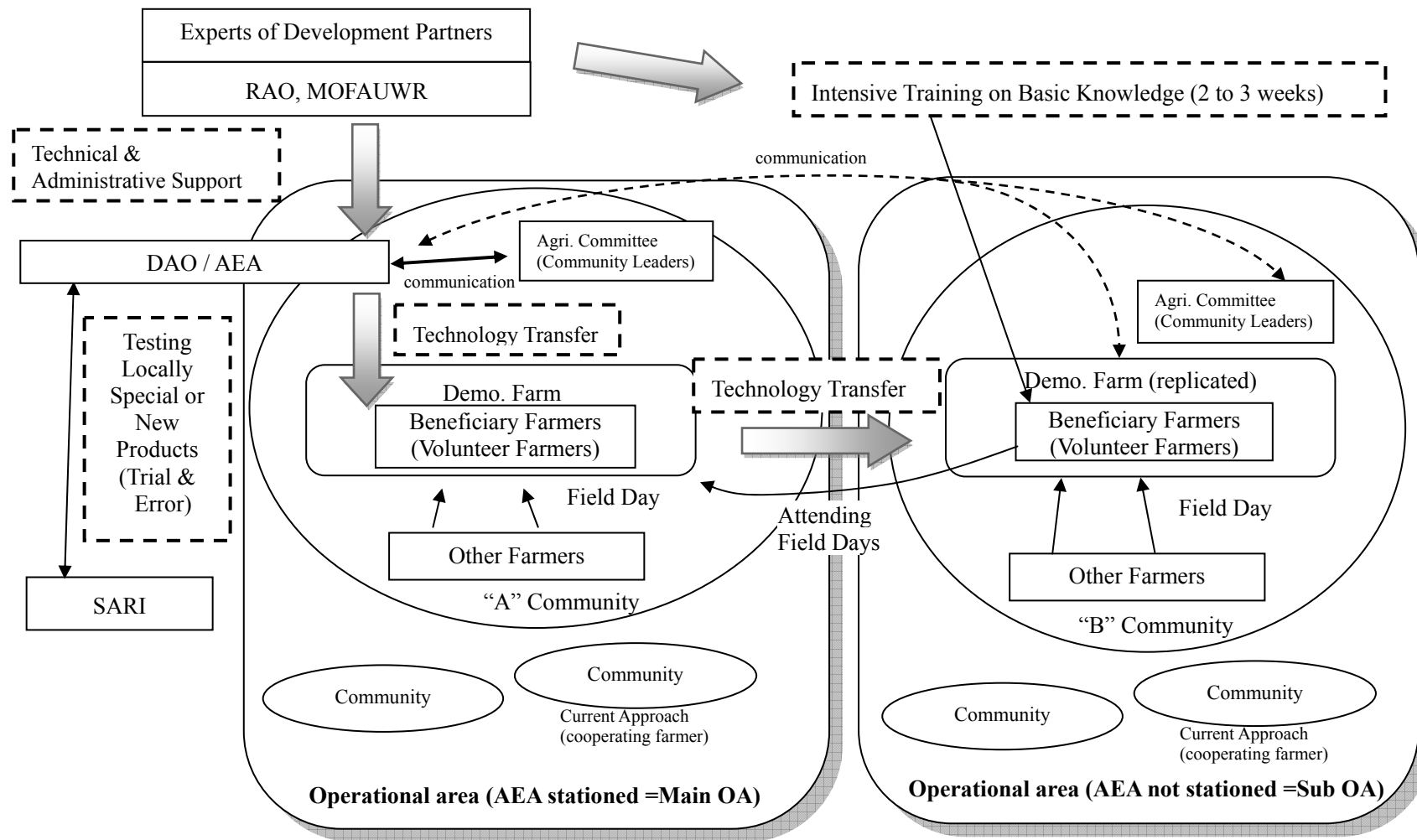


Figure 5.4.4 Extension Framework

(3) Ways of Extension by OAs

In relation to the extension improvement explained in 4.5.3, the extension framework is proposed as shown in Figure 5.4.4. In this figure, it is assumed that an AEA be assigned to work for two OAs and that he or she is stationed in a community in one of the OAs, which are the OA in-charge (left side in the figure; called as “main OA”) and another OA (right side in the figure; called as “sub OA”). In the figure, for the “A” community in the main OA, the demonstration farms and the field days will be taken care of by the AEA, while in “B” community in the sub OA, where the regular visit of the AEA cannot be expected, the demonstration farms and the field days will be managed by the farmers and the Agricultural Committee. In the latter case, it is still important for the AEAs to maintain communication with the community people, for example, by mobile phone, etc. The beneficiary farmers will be invited to the nearest AEA-led field days⁶ for training. The volunteer farmers, who should be the core persons for the farmer-to-farmer extension, should be provided with intensive training regarding the basics of agriculture in order to become able to manage the demonstration farms appropriately.

(4) Use of the Development Menu

While discussing the vision for the community or the technologies required, the community people may find it difficult to ensure that the options appropriately meet their needs since their access to technical information is limited. It is therefore recommended that MOFAUWR, particularly the district offices, present a “development menu” to the communities, as done in the PDAs, so that the community people may select the options from the menu. Tables 2.7.1 to 2.7.5 can be used for this purpose.

(5) Extension Methods

The methods for the technology transfer from AEAs to farmers will be mainly the OFT (on-farm-training) conducted at the demonstration farms and on the “field days”. Examples of the timing and contents of the field days are shown in Tables 5.4.2 and 5.4.3.

Table 5.4.2 Timing for the Field Day for Cereal Crop

No.	Timing	Contents
1	Before starting	Field preparation including fertilizer application and sowing
2	When starting nursing	Crop management including weeding, inter-tillage and pest control
3	Before harvesting	Harvest and postharvest
4	Before harvesting	Seed production including plant selection and trimming

Table 5.4.3 Timing for the Field Day for Vegetable Cultivation

No.	Timing	Contents
1	Before starting	Vegetable field preparation and fertilizer application
2	When starting nursing	Nursery management
3	Before transplanting	Crop management (In this case various topics such as Pruning, Top dressing, Inter-tillage and weeding, and Pest control are included. It can be divided into different field days.)

⁶ If the agricultural activities (products and/or technologies) are not attractive, the farmers will not attend the field days held at the distant communities. That is one of the reasons why it is proposed to develop special local products.

The trainings on the “field days” will be delivered mainly by AEAs⁷, though RAOs and DAOs should also take part, especially until the AEAs become familiar with the community approach. RAOs who have participated in the trainings in Japan should provide the trainings to AEAs.

(6) Plans for Extension Improvement

As a result of the above proposals, the plans for the extension improvement component can be designed as follows:

Items	Contents
Goal	The AEAs become able to smoothly disseminate the agricultural technologies mentioned in the manuals of agricultural technologies and extension to the community people with the help of the agricultural committee.
Long-term Objective	Half of the communities in the targeted districts in UWR start adopting the new extension approaches.
Purpose of the Component	The AEAs and the agricultural committee (community leaders) start functioning as the engine of the new extension approaches.
Expected Outputs	<ol style="list-style-type: none"> 1. The agricultural committee is established in the community. 2. The community leaders play roles in agricultural extension through the agricultural committee. 3. The contents of the manuals of agricultural technologies and extension, including the concept of the community approach, are understood and implemented by the AEAs and the community leaders. 4. The AEAs and the community leaders function as the facilitators /catalysts for the agricultural development activities, such as the planning workshops, beneficiary meetings, activities at the demonstration plots, and review workshops. 5. Volunteer farmers are trained through intensive training on the basics of agriculture. 6. The profits from the development projects and components are properly managed by the community people. 7. The basics of farm management, including simple cost/benefit calculations, are understood and implemented by the AEAs and the community leaders. 8. The basics of marketing are understood and implemented by the AEAs and the community leaders.
Implementing Agency	MOFA Regional and District Office for technical issues, partner NGOs for participatory approach
Implementation Cost	Material Cost: - Training Cost: GHS 200 per training (In addition to the trainings)

⁷ This is the case for the community under the main OA where the community approach will be taken. On the other hand, for the community in the sub OA, farmers will lead the field day after getting the necessary knowledge from the AEA.

Items	Contents
	recommended in Table 5.4.4, extension services should be improved through regular operations.)
Monitoring Cost	- (The status of extension improvement should be monitored in regular operations.)
Remarks	- Manuals for agricultural technologies and extension should be used for the training.
Risks	<ul style="list-style-type: none"> - Trained AEAs may leave their positions, which would necessitate the same training to newly recruited AEAs. - The unity, leadership, and commitment for development vary from community to community. The extension method should be carefully considered according to the characteristics of each community.

Capacity building of the AEAs and the community leaders should be considered with the following objectives:

- To train them as agricultural generalists who are able to handle various problems arising from the community people rather than as specialists
- To train them as facilitators who can promote the participatory approach to the community people, and take the initiative in institutionalizing the community approach in the communities
- To equip them with the basics of farm management including simple cost/benefit calculations (to make them sensitive to the goal of profit-making)
- To equip them with the basics of marketing skills
- To familiarize them with ways to promote areas' characteristic products, such as the one-community-one-product idea

The main activities for producing the expected outputs should be the training as listed below. The details of the training modules are found in Appendix N. It should be noted that the capacity of key stakeholders, such as DAOs, AEAs, and community leaders, should be enhanced by not only the trainings, but also along with their efforts to apply the proposed extension methods in the field.

Table 5.4.4 Main Activities

Subject	Trainees	Trainers	Training Frequency	Duration	In-class or field
Extension Methods	DAOs, AEAs, community leaders	RAOs, selected DAOs	Once a year	2 days	In-class
Facilitating Participatory Development	DAOs, AEAs, community leaders	RAOs, selected DAOs, NGOs	Once	3 days	In-class and community
Basics of Farm Management and Marketing	DAOs, AEAs, community leaders	RAOs, selected DAOs	Once a year	3 days	In-class and field
Management of Agricultural Committee	DAOs, AEAs, Agri. Committee Members	RAOs, selected DAOs, Coop. Dept.	Once a year	3 days	In-class and community
Operation of Benefit Revolving System	DAOs, AEAs, community leaders	RAOs, selected DAOs	Once a year	2 days	In-class

5.5 Implementation Schedule

5.5.1 Principles of Implementation

The implementation of the proposed development projects intends to (i) disseminate appropriate agricultural technologies to the community people through the proposed extension methods, and eventually (ii) achieve the development objectives, either food security or increased incomes with such technologies. It is recommended that the development projects be implemented at the community level, and that the project duration be basically for five years. The reasons are as follows:

- 1) The proposed agricultural technologies should be disseminated to the people through extension efforts by combining the current extension approach and the “community approach” as explained. Both approaches intend to work directly with the communities.

- 2) It is considered that it takes at least three to five years for the community people to understand, accept and become able to use any of the proposed agricultural technologies transferred through the development projects. Since the proposed projects contain several technologies, it will take a longer time for them to be effectively disseminated than the case for a single technology. On the other hand, there are about 550 communities in the Study Area to be covered by 32 AEAs. One AEA should be responsible for 17 communities on average. Taking into account the balance between the necessity to cover as many communities as possible and the current capacity for extension of MOFAUWR, the project period in one community should be limited to five years.

Through the proposed planning workshops as explained in 5.4.3, the community people themselves should identify the problems, make an agricultural development plan of their community, and from the menu, select agricultural technologies or development activities to be introduced to their community. The development plan of the community should be incorporated into the respective district

agricultural development plans.

5.5.2 Implementation Schedule

The project implementation schedule is greatly affected by the implementation capacity of MOFAUWR, particularly AEA, since they are the ones who are responsible for the project implementation as well as the dissemination of the agricultural technologies on the ground. In this regard, the schedule of the project implementation and extension should be considered as a package.

(1) Schedule of Extension Activities

year		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
Main OA		X				Y				X			
X Operational Area	community 1	A	C	C	C	D	B	D	D	C	C	A	C
	community 2	A	C	C	C	D	B	D	D	C	C	A	C
	community 3	E				B	D	D	D	C	A	C	C
	community 4	E				F				A	C	C	C
	community 5	E				F				A	C	C	
	community 6	E				F				E			
	community 7	E				F				E			
	community 8	E				F				E			
<i>Community Approach</i>													
Y Operational Area	community 1	B	D	D	D	C	A	C	C	D	D	B	D
	community 2	F				A	C	C	C	D	B	D	D
	community 3	F				A	C	C	C	D	B	D	D
	community 4	F				E				B	D	D	D
	community 5	F				E				F			
	community 6	F				E				F			
	community 7	F				E				F			
	community 8	F				E				F			
<i>Community Approach</i>													
<i>Current Approach</i>													

Figure 5.5.1 Schedule of Extension Activities

Legend:

Community Approach

- A** Planning and review workshops and demo farm (OFT) by AEA (farmers from other areas are invited)
- B** Planning and review workshops by AEA, demo farm run by community people (farmers attend “OFT” in A or C)
- C** Review workshop and demo farm (OFT) by AEA (farmers from other areas are invited)
- D** Review workshop by AEA, demo farm run by community people (farmers attend “OFT” in A or C)

Current Approach

- E** Only scheduled visit
- F** Visit only when needed

As mentioned in 4.6.2 and 5.4.3, when an AEA is assigned for two OAs, it is suggested that the AEA take care of such OAs alternatively with different levels of involvement. The implementation schedule for such case is shown in Figure 5.5.1, and this schedule should be applied only after MOFAUWR district offices make trials of the community approach in some communities and become accustomed to it. It is considered that at least a couple of years will be needed for that.

It is assumed that an AEA work in a total of 16 communities since 8 communities are normally located in an OA. The main and the sub OAs are switched at 4-year intervals⁸. The reason why a 4-year interval is suggested is because it will take three to five years for agricultural technologies to take root in a community. With this schedule, all the communities will benefit from MOFAUWR at the earliest time possible. With a switch of the main and sub OAs, it is proposed that apply the community approach be applied for 2 communities in the main OA and 1 community in the sub OA. Similarly, 2 communities in the main OA and 1 community in the sub OA will be added every 4 years. Those are the target communities, and it is recommended that MOFAUWR district offices select those target communities, when needed, depending upon the degree of cooperation and the possibility of community people to be independent.

As indicated in Figure 5.5.1, for the target communities, the planning workshop will be held every 5 years, and the review workshop will be held every year. For the non-target communities in the main OA, they will be visited by the AEA in his/her routine work since the current extension approach is applied. Regarding the non-target communities in the sub OA, they will be visited only when needed. In addition, it is noted that the final goal is for the community approach to be applied gradually for all the communities in the Study Area, and the conducting of the workshops should be gradually handed over to the community people in all the communities.

(2) Implementation Schedules for the Proposed Project

The implementation schedule for the proposed projects should be considered as described below.

1) Selection of the Communities for Project Implementation

There are about 20 OAs in each district, which will be too many for the district office and AEAs to implement projects at the same time. Thus, the target communities for the year of project implementation should be narrowed down from those listed in Figure 5.5.1, particularly at the initial period. In this regard, the first target communities for the implementation of any project should be the ones near the district offices since that will make it much easier for the offices to implement and monitor the project activities, and it will not require huge transportation costs. As mentioned above, it is suggested that a couple of years be considered until the district offices become accustomed to the community approach, and after that, the projects may be implemented accordingly as mentioned in Figure 5.5.1.

Below are other criteria to be used when selecting the communities.

⁸ If the number of AEAs in-charge increases in the future, AEAs should be assigned for both “X” and “Y” OAs in Figure 5.5.1 so that both can be the main OA. In this case, 3 communities in an OA may be targeted within 4 years.

- 1) The first communities should be selected from the ones marked “A” in Figure 5.5.1 where all the extension activities will be taken care of by AEAs.
- 2) The selected communities will function as the satellite points, from where the technologies introduced by the projects will be extended to the neighboring communities. To assure the project activities are replicable by the other communities, the communities should be located in strategic locations for exhibiting the project outputs to the other communities.
- 3) The communities have high potential for producing the expected outputs, particularly in terms of natural condition for the project for food security, and marketing opportunities for the project for increasing incomes.
- 4) The community people should be willing to implement the project, participate in the project activities, and exhibit the progress and results of the projects to the other community people.
- 5) The community has a respected and effective leader(s).
- 6) The community people are strongly united so that the Agricultural Committee may be easily formed and effectively functioning.
- 7) For the selection of “B” communities, the above criteria from 2) to 6) should be applied.

2) Project for Food Security

As indicated in 5.2, the objective of the Development Project 1 for Staple Food Production is to increase the productions of sorghum, rice and cowpea at least until the per capita food intake⁹ reaches the level of the per capita consumption in the entire country. The MOFAUWR district offices are responsible for the project implementation. After the initial stage of project implementation, the project should be expanded, particularly to the communities in the northern side of the Study Area as well as other areas where the people suffer from the shortage of staple food.

3) Projects for Increasing Income Levels

The Development Project 2-1 for Cash Crop Production and Marketing, the Project 2-2 for Livestock Development and Marketing, and the Project 2-3 for She Nut Processing and Marketing should be implemented based on the needs as well as the development potential of the communities. In comparison with the Project 1, the community people as well the communities to benefit from the three Projects should be more targeted. It means that all the three Projects should consider the people who are self-sufficient in food and strongly motivated to generate income as the beneficiaries. In addition, the potential for generating income, such as the access to markets, availability of water, soil conditions, etc., should be considered when selecting the communities.

⁹ The volume of the food intake is estimated as the volume of the production minus the sales as indicated in 1.6.3.

5.6 Implementation Costs

5.6.1 Costs for Project Implementation

The implementation costs for each development component are indicated in 5.2 at the community level. The costs are divided into three categories: material, training, and monitoring costs. The material and training costs are calculated per community based on the experience of the PDAs. The recurrent costs of MOFAUWR, and the fees of experts and the accompanying costs of a development partner are not included.

5.6.2 Cost Sharing and Benefit Revolving System

For the material costs of the projects for increasing incomes, the benefit revolving system (BRS) should be applied. This means that the project beneficiaries should bear the costs of the materials to be supplied by the project, and repay them to the community where they reside. The community should manage the BRS, and provide the second beneficiaries with the same quantity of the materials as the first beneficiaries receive. If this system goes successfully, its effectiveness will be apparent in the reduction in the implementation costs of the M/P. The details of the system and its effectiveness are given below.

(1) Concept of the BRS

It is considered that any project should be continued by its beneficiaries, even after the supports of outsiders are terminated. It is widely acknowledged that giveaways from the outsiders are likely not to be utilized and sustained as intended, because it is difficult for project beneficiaries to have the sense of ownership of the giveaways. For this reason, a project should not provide the beneficiaries with free inputs, but inputs with a “cost”. The concept of the Benefit Revolving System (BRS) is visualized in Figure 5.6.1.

It is intended that the BRS makes the beneficiaries accountable for the related development activities, and spreads their benefits widely to the other people in the community as well as the other communities. It is also expected that the BRS be the recommended way for implementing development activities under the serious financial constraints of MOFA if its concepts are understood and implemented accordingly by the stakeholders.

(2) Methods in the BRS

To initiate the implementation of the development plans, it is recommended that MOFA or any development partners (DPs) purchase necessary inputs as an initial supply for the groups of beneficiaries. What is important is to limit the total monetary value of these initial inputs to the level the first beneficiaries can realistically pay back by using the sales revenue from their agricultural products, since the inputs are essentially “debt” for the first beneficiaries. This should be decided at the planning workshop and beneficiary meetings, as mentioned in 5.4.3.

The first group of beneficiaries may be formed by the farmers who are interested in the activity and motivated enough to make it a success. If there are too many farmers, they should consult among themselves to lower the number to a manageable level. The first, that is more or less experimental, activities

are generally easier to manage on a small scale. Moreover, it will be difficult to finance the activity of a big group.

The first group of beneficiaries should utilize those inputs for achieving the project goal. Monitoring is necessary to ensure that the beneficiaries use the inputs in a productive manner that generates income. The beneficiaries are required to earn enough so that they may purchase the same amount of the same inputs by themselves and give them to the second group of beneficiaries in the community as inputs for the activities of the second group. The second group of beneficiaries is expected to repeat the same process. The second group of beneficiaries may also be formed by interested farmers.

The BRS assumes that each group of beneficiaries provides the inputs to a new group of beneficiaries only once. After providing a new group with the inputs, the former group shall continue the activities for generating their own incomes. By continuing this cycle, the benefits of the development activities will eventually spread into the entire community.

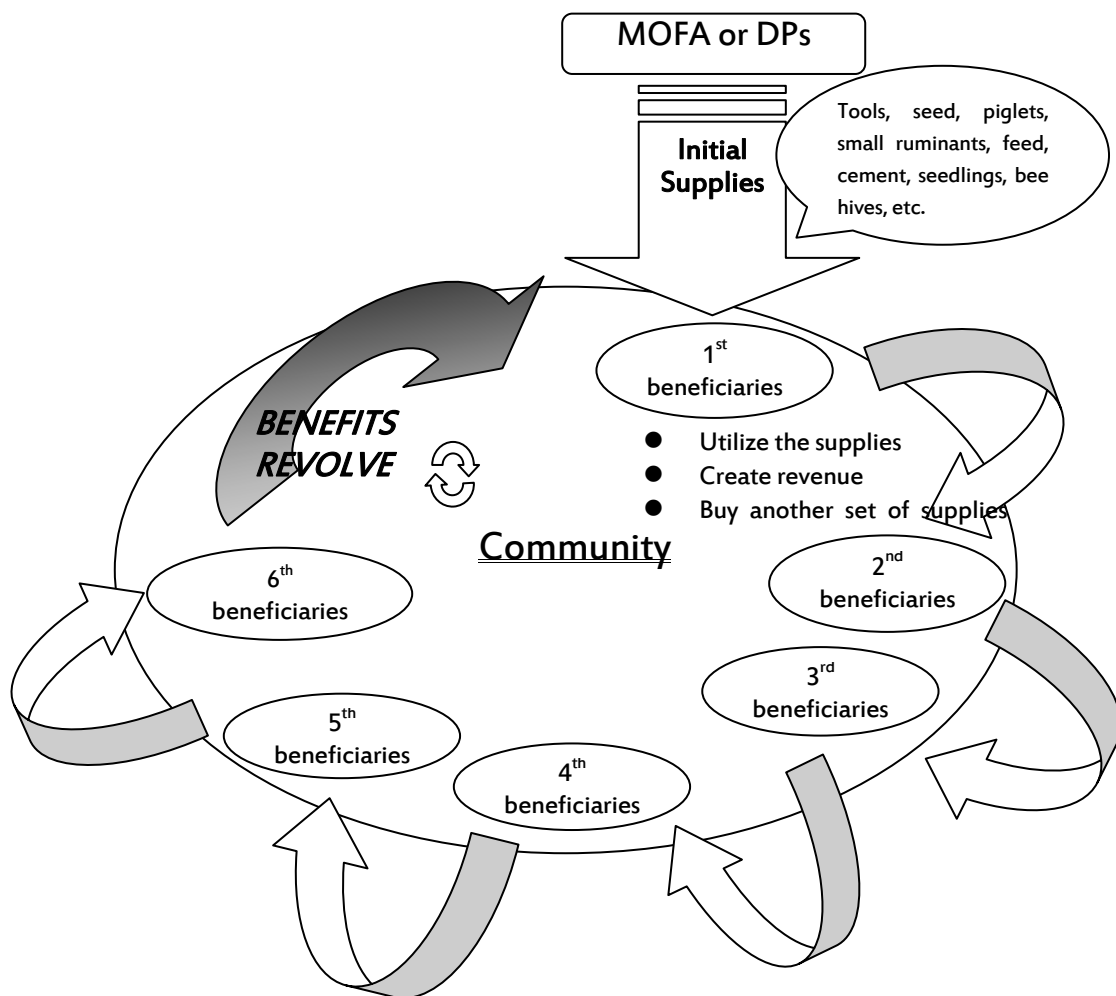


Figure 5.6.1 Benefit Revolving System

It should be noted that some of the inputs may be lost, broken, or stolen. In case of crops, the production may fail due to adverse weather. In case of animals, they may die due to diseases. Nevertheless, the outsiders such as MOFA or development partners should not be responsible for replacing such inputs. The objective of the BRS is to develop a sustainable development system. It should be recognized that the BRS is not a contract between the beneficiaries and the outsiders; rather, it is a contract among the community people. The beneficiaries should therefore discuss and decide what is to be done in case of accidents or other unexpected events. It is important that the outsiders provide minimum supply inputs but necessary guidance and follow-up for promoting the sustainability of the development activities.

The BRS is not simply a plan; it is also a contract that holds the beneficiaries accountable for the use of the given inputs and also a system that eventually spreads the benefits to other people. As the concept of the BRS is new to most of the community people, it may take time to institutionalize it. Until the beneficiaries fully understand that they have to abide by the BRS and that doing so is good for the community, the presence of the outsiders will be necessary.

(3) Implementation of the BRS

For the implementation of the BRS, each beneficiary group is requested to follow the steps indicated in Figure 5.5.2. Since those steps are in line with the implementation of the proposed projects, the implementing structure of the BRS should also be incorporated into the one for the implementation of the proposed projects. In order to keep the revenue from the BRS implementation, the beneficiaries need to open a group account at a nearby credit union or bank. The MOFA staff, particularly the AEAs and the DAOs, should provide assistance as necessary for opening and maintaining the account.

At the Planning Workshop

1. Form a group of a size that is appropriate for the implementation of the particular development activities and get the approval from the MOFAUWR staff in charge.



2. Understand the concept of the BRS with the given instructions

At the Beneficiary Meeting



3. Calculate the (approximate) total amount that is necessary to purchase all the inputs required.



4. Discuss how to generate enough income to purchase a new set of inputs using the inputs provided, and finalize the required inputs to be provided.



5. Determine the target date to purchase the new set of inputs for the next group of beneficiaries.

During the Development Activities



6. Receive necessary inputs from MOFA, DPs or the previous group of beneficiaries to carry out the related development activities.



7. Record all the information regarding the inputs such as type, quantity, quality, and price, and incomes generated by the activities.



8. Make sure cash is managed properly.

At the Review Workshop



9. Review the activities and the results, and if necessary, modify the plan.

Figure 5.6.2 Flow of Implementation of the Benefit Revolving System

5.6.3 Available Financial Sources in the Study Area

Most of the costs, particularly the initial costs, necessary for the implementation of the proposed projects should be covered by funds made available for the community people. There are a few financial institutions which the community people can access in the vicinity. Table 5.6.1 shows the financial institutions in the area where the PDAs were conducted, and their conditions for a loan. If the people still cannot get an assistance from those institutions, a development partner and MOFA need to assist them for attaining the development objectives in the M/P.

Table 5.6.1 Local Financial Institutions

District	Financial Institution	Conditions for a Loan	Community
LAWRA	Nandom Rural Bank	(Conditions are not opened to the public.)	Nandom
	Kuorbe Langtaa co-operative credit union *	<ul style="list-style-type: none"> - Must be a member of a farmers' group - Group should have saved with the Credit Union (CU) for at least six months and must have minimum shares of GHS20. - Group should be able to payback in 14 months. - Ceiling amount is 3times the amount saved by the group. - Interest rate is 19.5% per annum - No collateral required 	Nandom
	Lawra Area Rural Bank	<ul style="list-style-type: none"> - Must be operating a viable venture based on banks investigation. - Should have saved with the bank for at least six months. - Requires two guarantors who are customers of the bank and are credit worthy - Ceiling amount is 50% of the estimated cost for beginners and 2 times the total savings of borrower. - Interest rate is 31% but negotiable for farmers - Pay back starts after 3months and last for 12months or more depending on the amount in question. 	Lawra
	Ghana commercial bank	(Conditions are not opened to the public.)	Lawra
JIRAPA-LAMBUSSIE	Saint Joseph's Co-operative Credit Union	<ul style="list-style-type: none"> - Must be a member of the CU - Should have saved with the CU for at least six months. - Collateral is required if amount is more than GHS 900 - Interest rate is 19% for all members - Pay back period is 24months (max) - Ceiling amount is 2 times savings for beginners and 3 to 5 times savings for veterans. 	Jirapa
	Snapi Aba Trust	<ul style="list-style-type: none"> - Must in a group of at least 5 members and at most 10 members. - Group serves as a guarantor - Ceiling amount depends on scale of the project for which loan is taken. - Pay back period is 5months - Interest rate is 36% 	Jirapa
	Sonzele Rural Bank	<ul style="list-style-type: none"> - Should have saved with the bank for at least 6 months. - Should pass bank's initial investigation on the project for which loan is to be granted - Require 2 guarantors, who should be credit worthy. - Pay back period is 12months - Pay back could be in daily, weekly or monthly installments or in bulk. - Ceiling amount depends on scale of the project for which loan is taken. - Interest rate is 25% or more. 	Jirapa
NADOWLI	Daffiama Farmers Co-operative Credit Union	<ul style="list-style-type: none"> - Should be a member of the CU through a group. - Should have saved with the CU for at least 6 months. - Ceiling amount is GHS100 for farmers. - Interest rate is 19% - Pay back period is 6months - No collateral required, group serves as a guarantor. 	Daffiama
	Fian Farmers Co-operative Credit Union	<ul style="list-style-type: none"> - Should be a member of the CU through a group. - Should have saved with the CU for at least 6 months. - Ceiling amount is GHS100 for farmers. - Interest rate is 19% - Pay back period is 6months - No collateral required, group serves as a guarantor. 	Fian
	Sonzele Rural Bank	<ul style="list-style-type: none"> - Must be in a group which saves with the bank. - Should have saved with the bank for at least 6 months. - Should pass bank's initial investigation on the project for which loan is to be granted - Require 2 guarantors, who should be credit worthy (not for farmers) - Pay back period is 12months for individuals and 14months(negotiable) for farmer groups - Pay back could be in daily, weekly or monthly installments or in bulk. - Ceiling amount depends on scale of the project for which loan is taken. - Interest rate is 19% or more. 	Nadowli

Note* : - 200 farmers were given loans in 2009 up to a total tune of GHS 24,000

- Grace period of 2months is given to farmers who are unable to meet the deadline for payback.