

Ministry of Agriculture, Forestry and Food Security
The Republic of Sierra Leone

**The Agricultural Development Project
in Kambia
in the Republic of Sierra Leone**

Final Report

Agricultural Technical Support Guidelines

**Part I
Main Report**

March 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

RECS International Inc.

Preface

In response to the request from the Government of the Republic of Sierra Leone, the Government of Japan decided to conduct the Agricultural Development Project in Kambia in the Republic of Sierra Leone. The execution of the Project was entrusted to the Japan International Cooperation Agency (JICA).

JICA selected the Project Team headed by Dr. Tetsuo Mizobe of RECS International Inc. consisting of experts in the respective fields. The Project Team was dispatched to the Republic of Sierra Leone for a series of fieldworks from March 2006 through January 2009.

The Project Team held discussions with the officials concerned of the related Government offices and organizations in close collaboration with the farmers in Kambia district, the target area. The Project Team also conducted pilot projects, trial cultivation and surveys. On returning to Japan, the Project Team, through the final work in Japan, set to compiling the present Final Report based on the results of the entire project works and, has hereby completed it.

It is my earnest hope that this report will contribute to the agricultural development in the Republic of Sierra Leone as well as the enhancement of the friendly relationship between Sierra Leone and Japan. Finally, I wish to express my deepest appreciation to all the officials concerned of the Government of the Republic of Sierra Leone and the others, especially the farmers in Kambia district, for their generous support and assistance to the Project.

March 2009

Kunihiro Yamauchi
Resident Representative
Japan International Cooperation Agency |
Ghana Office

Mr. Kunihiro Yamauchi
Resident Representative
Japan International Cooperation Agency
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March 2009

Letter of Transmittal

It is our pleasure to see the Agricultural Development Project in Kambia in the Republic of Sierra Leone come to a successful completion and to submit herewith its Final Report. In the present Report, necessary measures to strengthen agricultural support system in the target area are compiled as Agricultural Technical Support Guidelines. In the course of compilation, advice and suggestions from the Japanese Government offices concerned and JICA as well as discussions and comments from the Sierra Leonean Government offices concerned were reflected and incorporated.

With the severe civil war behind it, Sierra Leone is in the process of recovering its socio-economy struggling to overcome poverty and chronic food shortages. Yet, productivity in crops is still low and even today eight years after the civil war, self-sufficiency in rice production has yet to be achieved. For this, in Sierra Leone the establishment of stable food-supply system through increasing agricultural production is recognized as an important policy issue. To increase agricultural production, productivity needs to be improved, and technological development and extension for the improvement needs to be pursued. In developing technologies and techniques to improve productivity, given that most farmers are economically deprived, it is prerequisite that they are not only low-input and acceptable to both the farmers and extension workers but also adaptive to given agro-ecology.

In the present Project, pilot projects on rice production and pilot cultivation trials on vegetable crops, both participated by the local farmers, were conducted. Based on the results of the field examinations, agricultural technical packages and manuals have been formulated, and at the same time their extension measures have been proposed. The Agricultural Technical Support Guidelines submitted hereby are composed of contents with these technical materials and the extension measures as core components. It is our sincerest wish that the dissemination of the Agricultural Technical Support Guidelines throughout Kambia district will lead to strengthen the agricultural support system and increase the crop production centering on rice in the area.

At last, I would like to express our deepest appreciation to JICA, the Ministry of Foreign Affairs and the Ministry of Agriculture, Forestry and Fisheries of the Japanese Government as well as the Sierra Leonean Government and all those who were involved in this undertaking for their cooperation and encouragement. Without them, this Project could have never seen the fruitful end that it has.

Very truly yours,

Tetsuo Mizobe
Team Leader
JICA Project Team

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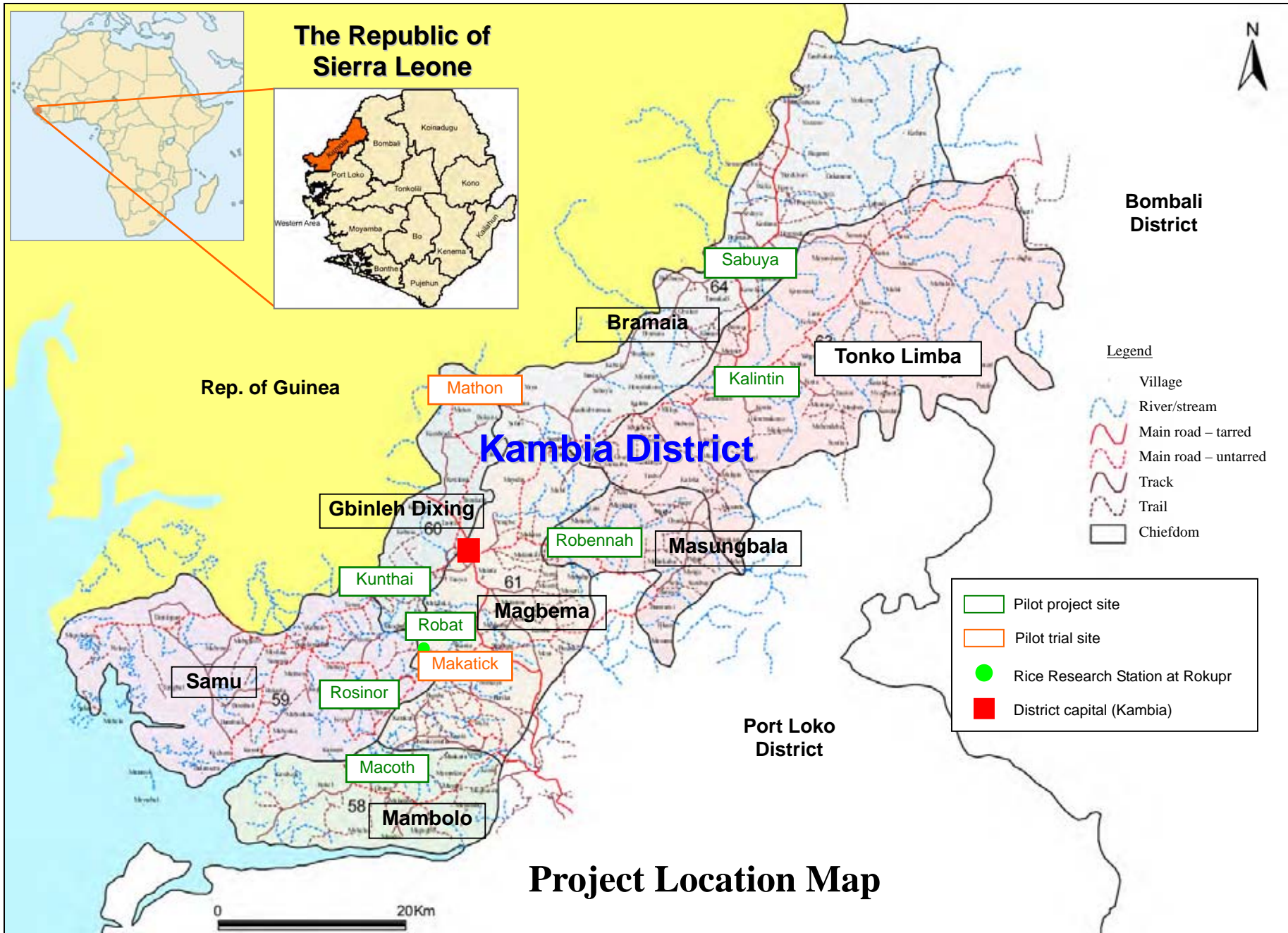
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The Agricultural Development Project in Kambia in the Republic of Sierra Leone

Final Report

Agricultural Technical Support Guidelines

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Exchange Rate (January, 2009)		
US\$ 1.00	=	Le 3,000
Le 1.00	=	US\$ 0.0003
US\$ 1.00	=	Yen 90.44

Abbreviations

ABC	Agricultural Business Center
ABU	Agricultural Business Unit
BES	Block Extension Supervisor
CBO	Community Based Organization
CP	Counterpart
D-TP	Draft Agricultural Technical Package
FAO	Food and Agriculture Organization
FEW	Frontline Extension Worker
FFS	Farmers Field School
GDP	Gross Domestic Product
HH	Household
IAR	Institute of Agricultural Research
IVS	Inland Valley Swamp
JICA	Japan International Cooperation Agency
JPT	JICA Project Team
LWDD	Land and Water Development Division
MAFFS	Ministry of Agriculture, Forestry and Food Security
MAFFS-K	Ministry of Agriculture, Forestry and Food Security, Kambia District Office
MLG	Ministry of Local Government
MOU	Memorandum of Understanding
NADP	National Agricultural Development Plan
NARCC	National Agricultural Research Coordinating Council
NGO	Non-Governmental Organization
PP	Pilot Project
PSC	Project Steering Committee
PT	Pilot Trial
RD	Record of Discussions
RARC	Rokupr Agricultural Research Center
RRS-R	Rice Research Station at Rokupr
RYMV	Rice Yellow Mottle Virus
SL-PRSP	Sierra Leone Poverty Reduction Strategy Paper
SMS	Subject Matter Specialist
TG	Agricultural Technical Support Guidelines
TM	Agricultural Technical Manual
TP	Agricultural Technical Package
TP-PH	Agricultural Technical Package on Post-Harvest Handling
TP-V	Agricultural Technical Package on Vegetable Production
UNDP	United Nations Development Program

Chapter 1 Introduction

Chapter 1 Introduction

1.1 Objectives of the Project

1.1.1 Background

Sierra Leone is in the process of reconstruction of the national economy devastated by the civil war. Scars of the civil war still remain all over the country and poverty has become prevalent and grave. In particular, production of food crops centering on rice as staple food has been halved compared to pre-civil war times, and the reduction in food supply has caused the food poor population to increase. Because of this, the promotion of food security through strengthening the agricultural sector is established as one of the three pillars of the *Sierra Leone Poverty Reduction Strategy Paper (SL-PRSP)* published in March 2005.

Considering these conditions, since July 2005 the Governments of Sierra Leone and Japan had sought, through a series of discussions, the ways to launch an agricultural development project in Kambia district, a traditionally main rice producing area in the Country. As a result of the discussions, both Governments agreed and signed the Record of Discussions (“the RD” hereinafter) to implement the Agricultural Development Project in Kambia (“the Project” hereinafter) in November 2005.

1.1.2 Objectives

The Project was implemented in accordance with the RD between the Japan International Cooperation Agency (JICA) of the Government of Japan and the Ministry of Agriculture, Forestry and Food Security (MAFFS) of the Government of Sierra Leone (see Annex 1). The RD prescribes the following objectives of the Project.

(1) Purpose

The Project aimed at strengthening a farmers-oriented agricultural technical support system in Kambia district. The overall goal of the Project was to improve productivity of food crops for self-sufficiency thereby contributing to food security in Kambia district, through the specific outputs indicated below.

(2) Outputs

The outputs that the Project was expected to realize through its implementation were as follows.

- a) Agricultural technical support system of MAFFS-K is improved.
- b) Agricultural technical package to improve agricultural productivity is formulated.
- c) Agricultural technical support guidelines for farmers are developed and established.

1.2 Project Area and Organizations

(1) Project area and prospective pilot project sites

The Project encompassed the entire Kambia district. The pilot projects for rice production were implemented at seven villages in seven chiefdoms: Kunthai in Gbinleh Dixing, Robannah in Masungbala, Robot in Magbema, Rosinor in Samu, Macoth in Mambolo, Kalintin in Tonko Limba and Sabuya in Bramaia. The pilot trials for vegetables production were executed at two villages in two chiefdoms: Mathon in Gbinleh Dixing, Makatick in Magbema.

(2) Counterpart agencies

On the Sierra Leonean side, two counterpart agencies (“CP” hereinafter) worked in tandem with the team of Japanese experts appointed by JICA (“the JICA Project Team” hereinafter): MAFFS Kambia district office (“MAFFS-K” hereinafter) and the Rice Research Station at Rokupr (RRS-R). The JICA Project Team set up its base of operation within MAFFS-K. The list of the members of MAFFS and RRS-R who participated in the Project and the JICA Project Team members is attached in Annex 4.

(3) Project Steering Committee

To ensure effective and successful implementation of the Project, a Project Steering Committee (PSC) was formed. The PSC was chaired by the Minister of MAFFS and was composed of (a) the Permanent Secretary, Director General and Deputy Director General of MAFFS, representative of the Right to Food Secretariat/Office of the Vice President, District Director of MAFFS-K, representative of RRS-R, representative farmers in Agricultural Business Units (ABUs), and those deemed appropriate and necessary from the Sierra Leonean side, (b) representatives of JICA Ghana Office, the JICA Project Team and those associated with JICA’s activities from the Japanese side, and (c) representatives of UNDP, FAO and other development partners.

1.3 Composition of the Agricultural Technical Support Guidelines

This is the final report of the Project referred to as the Agricultural Technical Support Guidelines (TG), compiling all the outcomes of the Project activities during the implementation period. TG is divided into four parts, from Part I to Part IV.

- Part I provides the background information of the Project, describes its approach to the formulation of the Agricultural Technical Packages (TPs) and Agricultural Technical Manuals (TMs), proposes dissemination plans for the TPs, and offers recommendations.
- Part II presents the TPs, consisting of the rice production/post-harvest handling

techniques and the vegetable production techniques. The TPs are compiled as technical references intended mainly for extension workers. They present recommended techniques to increase rice and vegetables production and improve post harvest handling of rice. It also provides theoretical explanation for each technique so that the extension workers could understand the background of the techniques.

- Part III presents TMs, which are in effect TPs translated into a language that farmers can understand. The TMs are compiled as extension materials to be used by frontline extension workers (FEW) to provide technical guidance to farmers. They explain how to cultivate the crops and how to do post harvest handling applying recommended techniques with simple words supported by illustrations and photographs.
- In Part IV, the results of the pilot projects on rice production and the pilot trials on vegetable production are detailed, and also the results of the farm management and rural socioeconomic survey, soil and plant survey, agricultural machinery survey, post harvest and handling survey, and the market survey are summarized. Moreover, the volume contains the materials used in the CP personnel training and the minutes of the PSC meetings.

1.4 Main Project Activities and Inputs

1.4.1 Main project activities

The Project was implemented through four phases over a three-year period starting in March 2006 and ending in March 2009. The main project activities and progress are summarized in Figure 1.4.1. The summary of the Project activities in each phase is as follows.

1) Phase 1

The JICA Project Team (“the JPT” hereinafter) presented the Inception Report that contained the Project objectives, goals, outputs and activities to the officials of MAFFS as well as representatives of donor agencies including FAO and EU. After the presentation, a questions-and-answers session was held. Then, the JPT traveled to Kambia and held meetings with MAFS-K and RRS-R separately to explain and discuss the Inception Report. An inception workshop was organized inviting the stakeholders in the district including NGOs, CBOs, representatives of farmers associations. In the workshop, the JPT explained the Project and the participants identified constraints in crop production through problem analysis.

2) Phase 2

In May 2006, the Project activities were fully initiated by JPT, MAFFS-K and RRS-R. Carried out in Phase 2 from May 2006 through March 2007 were the preparations of

MAFFS-K facilities necessary to proceed with the Project activities as well as the Baseline Survey and other surveys (e.g., the agricultural machinery survey and the preparation for the market survey) to grasp the existing conditions of rural villages in Kambia district. Further, a pre-pilot project was implemented with RRS-R to examine the existing agricultural technical packages. After these activities, the Agricultural Technical Packages and the implementation approach and methods for the following pilot projects for rice and the pilot trials for vegetables were discussed and the draft implementation plans were prepared in the latter half of the phase.

Main Project Activities	2006			2007			2008			2009
	Phase 1	Phase 2		Phase 3			Phase 4			
	Jan-Apr	May-Aug	Sep-Dec	Jan-Apr	May-Aug	Sep-Dec	Jan-Apr	May-Aug	Sep-Dec	Jan-Apr
1.1 Inception Report Workshop	■									
2.1 Development of institutional set up for project implementation		■	■	■	■	■				
2.2 Farm management and rural socioeconomic survey (Baseline survey)		■								
2.3 Analysis of baseline survey results			■	■	■	■				
2.4 Pre-pilot project at RRS-R for analysis of existing agricultural technical packages		■	■							
2.5 Field Survey (agricultural condition, soil and plant, agricultural machinery, marketing)		■	■	■	■	■				
2.6 Preparation of pilot project and pilot trial (selection of model farmers, project area)		■	■							
2.7 Examination of draft Agricultural Technical Packages(TPs)			■	■						
3.1 Implementation of pilot project for rice and its monitoring				■	■	■	■			
3.2 Implementation of pilot trial for vegetable and its monitoring						■	■			
3.3 Construction sheds and installation of post-harvest machineries						■	■			
4.1 Continuation of pilot project and pilot trial								■	■	■
4.2 Post -harvest and handling training on operation and maintenance of machineries							■		■	
4.3 Conduct of training for extension workers and farmers								■	■	
4.4 Development and formulation work for TPs								■	■	
4.5 Formulation of the Final Report(Agricultural Technical Support Guidelines)								■	■	■
4.6 Submission of the Final Report										▲
Preparation and submission of the Progress Report				△PR1	△PR2	△PR3	△PR4			△PR5
Organization of Steering Committee Meeting	●		●		●				●	●
Monitoring and Final Evaluation Survey							◎			◎

Figure 1.4-1 Main Project Activities

3) Phase 3

In Phase 3 that started in April 2007 and ended in March 2008, the pilot projects for rice and the pilot trials for vegetables were conducted in selected farmer's fields. Also, for post harvest processing, sheds for agricultural machines were constructed and first training sessions on the operation of the machines were implemented. Moreover, the compilation of the Baseline Survey results started and continued throughout the phase (which ended in December 2007 due to delays in data preparations). In the latter half of the phase, monitoring on the Project was conducted.

4) Phase 4

The main activities in Phase 4, the last phase of the Project completed in March 2009, were the continued implementation of the pilot projects and the pilot trials and the implementation of training in cultivation practices for the improvement of the technical skills of the extension workers and the farmers. In this phase, the final project evaluation was administered by JICA, through which the issues on the project implementation were clarified. Also, the PSC meeting was held at the end, at which the contents of the Agricultural Technical Support Guidelines (TG) were discussed.

1.4.2 Main project inputs

Throughout the Project implementation period, experts in the fields of agricultural development, extension, rice cultivation, vegetable cultivation, and post harvest processing were dispatched from Japan. In addition, those inputs that were procured and provided for the implementation and management of the Project are presented in Table 1.4-1. The detailed list of the inputs provided by the Japanese side for the Project is presented in Annex 3.

Table 1.4-1 Main Project Inputs for the Project

Materials and Equipment	Unit	Location
1. Motorcycles	24	MAFFS-K
2. Computers	3	MAFFS-K
3. Color printers	1	MAFFS-K
4. Photocopier	1	MAFFS-K
5. Furniture (desks, tables and chairs)	1 set	MAFFS-K
6. Generator	3	MAFFS-K, RRS-R
7. Post harvest machines	Rice mill 1 Rice mill 7 Thresher 7 Winnowers 7	RRS-R Pilot project Pilot project Pilot project
8. Power tiller	1	RRS-R
9. Farming tools (hoe, shovel, etc.)	1 set	Pilot project, Pilot trial
10. Seed rice and fertilizer	1 set	Pilot project
11. Rice and upland crops textbooks	1 set	MAFFS-K

Chapter 2 Background of the Agricultural Technical Support Guidelines

Chapter 2 Background of the Agricultural Technical Support Guidelines

2.1 Position of Agriculture in Sierra Leone

2.1.1 Role of agricultural sector in national economy

(1) Contribution to the GDP

The agricultural sector (crop, livestock, fishery, and forestry) in Sierra Leone accounts for about 48% of GDP (2006), followed by the services sector 38%, the industrial sector including mining and quarrying 14% (Table 2.1-1). The share of crops production including cereals centering on rice, groundnuts and perennial crops reaches more than 30% of the GDP. For the development of the national economy, it is thus vital to strengthen and support the agricultural sector. In addition, the agricultural sector remains the largest economic sector providing employment for about two-thirds of the population (Bank of Sierra Leone, *Annual Report*, 2007).

Table 2.1-1 Share of GDP by Sector (%)

Sector	1990-94	1995-99	2000-03	2006
1. Agriculture	40	53	48	48
Crops	25	37	32	33
Livestock	2	3	3	3
Fishery	10	10	10	10
Forestry	3	3	3	2
2. Industry	33	30	27	14
3. Service	27	17	25	38
Total (1+2+3)	100	100	100	100

Sources: 1) World Development Indicator Database, 2007

2) Bank of Sierra Leone, *Annual Report*, 2007

(2) Role as nutritional supply source

Per capita calorie intake in Sierra Leone decreased from 2,085kcal in 1980 to 1,943kcal in 2003 (Table 2.1-2).

Table 2.1-2 Trend of Calorie Intake

	1980	1995	2000	2003
Calorie (kcal)	2,085	2,012	1,919	1,943
Share in calorie intake by product (%)				
Crops	95	96	96	96
Livestock/fish products	5	4	4	4
Share in calorie intake (top 3) by crop product (%)				
Rice	48	42	46	35
Cassava	4	8	10	12
Vegetable oil	ND	1	1	10

Source: *Food Balance Sheet*, FAO, 2007

This is mainly attributed to the decrement in per capita rice consumption due to insufficient domestic production of rice that is the main calorie source of the nation. Rice alone covered about 50% of the total calorie intake per capita until 1980 but decreased to 35% in 2003. Production support for food crops with rice as the main crop is highly important and necessary in the light of nutritional improvement and food security.

2.1.2 Trend of agricultural production

(1) Arable land and cultivated area of major food crops

Sierra Leone has five agro-ecologies: upland, inland valley swamp (IVS), mangrove swamp, boliland, and riverain. The total arable land in 2002/03 is estimated at 5.4 million ha (*Crop Production Guidelines for Sierra Leone*, MAFFS, etc., assisted by FAO, 2005). Of the arable land, upland's share is the most at about 80%, followed by IVS 13%, mangrove swamp 4%, boliland and riverain 2% each. As shown in Table 2.1-3, the total cultivated area for major food crops in 2002/03 is estimated at 660,000ha, which corresponds to 12% of the total arable land. The share of rice as staple food is almost 50% of the whole cultivated area, followed by groundnuts and cassava.

Table 2.1-3 Cultivated Area of Major Food Crops in Sierra Leone (2002/03) unit: ha

Disrict	Rice	Ground nuts	Cassava	Millet	Maize	Sweet potatoes	Vegetables	Total	Rice (%)	Non-rice crops(%)
Bo	26,306	7,179	3,769	2,572	1,050	492	135	41,504	63	37
Bombali	18,182	36,240	17,880	4,914	2,311	4,689	1,718	85,934	21	79
Bonthe	6,320	3,240	10,144	0	704	106	105	20,620	31	69
Kailahun	22,320	5,160	5,450	547	2,637	225	298	36,638	61	39
Kambia	32,344	5,493	1,936	702	539	56	29	41,098	79	21
Kenema	49,540	7,584	7,436	3,069	1,074	567	448	69,718	71	29
Koinadugu	23,978	4,238	14,269	31,221	1,224	2,621	2,557	80,108	30	70
Kono	22,769	2,153	1,246	0	1,913	174	119	28,375	80	20
Moyamba	13,073	23,161	14,770	0	0	1,125	0	52,129	25	75
Porto Loko	49,025	5,019	2,493	1,259	1,893	285	361	60,335	81	19
Pujehun	32,963	3,825	3,585	161	631	270	77	41,513	79	21
Tonkolili	21,513	41,202	14,684	706	3,199	991	618	82,913	26	74
WA II	5,593	8,463	1,130	0	619	159	86	16,048	35	65
Total	323,926	152,955	98,794	45,151	17,793	11,761	6,551	656,932	49	51

Source: Formulated based on DATA PACK Agriculture, 2004

(2) Production trend of major food crops

The changes in major crops production and livestock populations from 2002, the year after the end of the civil war, are presented in Table 2.1-4. The production of rice, the staple food, started to decrease in 1991 when the civil began and to the worst record of 200,000 ton in 2001. After that, it started to rise gradually recovering to the level of 875,000 ton in 2006. However, production of rice decreased greatly in 2007. Cassava and sweet potato have shown notable increases in production as substitute crops for rice. Also, livestock populations have increased two to three-fold since 2002.

Table 2.1-4 Production Trends of Major Crops and Livestock

	unit: crops: 1,000 ton; livestock: 1,000 heads		2004	2005	2006	2007
	2002	2003				
1. Crops						
Rice (paddy)	422	445	526	526	875	637
Cassava	895	1,091	1,759	2,287	2,973	1,236
Sweet potato	45	74	153	153	168	158
Groundnut	98	117	152	104	115	118
2. Livestock						
Cattle	100	120	150	200	313	345
Goat	250	300	350	450	548	630
Sheep	200	235	300	375	469	540

Source: Discussion on the Draft Second Poverty Reduction Strategy, Ministry of Agriculture, Forestry and Food Security (MAFFS), 2008

2.1.3 Agricultural Development Policy

(1) Relation to agricultural development policy and SL-PRSP

The national agricultural development policy is linked with the Sierra Leone Poverty Reduction Strategy Paper (SL-PRSP: 2005-2007). In accordance with the SL-PRSP, MAFFS has implemented policies, development programs and investment schemes to meet the following objectives:

- a) Enhance the capacity of MAFFS through institutional strengthening and policy development to support the agricultural sector
- b) Achieve long-term national and household food security by 2007
- c) Increase rural income levels and employment
- d) Conserve the environment for future generations
- e) Promote exports to ensure balanced regional growth in agriculture and equitable income distribution and maximize foreign exchange earnings for the agricultural sector
- f) Contribute to establishing a sound macro-economic environment by promoting pro-poor sustainable growth

Those objectives align with the PRSP, in particular with Pillar Two that outlines a number of actions to achieve food security (at the farmers' level) and the growth of the agricultural sector, including:

- Promoting pro-poor growth for food security (in a healthy macroeconomic environment)
- Promoting food security (investment in agriculture, fisheries and rural infrastructure, etc.)
- Job creation (investment in infrastructure, e.g., energy, roads, transport, communications, etc.)

The SL-PRSP clarifies the following major issues and challenges in the agricultural sector:

- Low capital investment (especially by the private sector)
- Insufficient support for research technology generation and poor extension services
- Weak or total absence of agricultural support services, including viable technology-based inputs
- Poor network of roads, transportation and communications to support input delivery, product distribution and marketing
- Low participation of farmers in policy formulation process, alienating the small-scale farmers who dominate the agricultural sector, while urban-based farmers associations unable to bridge the gap between the policy makers and the farmers in small settlements
- Institutional weakness, especially the shortage of trained and qualified technical/professional staff and unreliable management information system

(2) Second SL-PRSP and agricultural policy

The Government of Sierra Leone prepared the second SL-PRSP that guides the economic and social development, especially the agricultural development policy by the new government for the next three to five years. In the policy, priority is still given to food security.

The second SL-PRSP addresses challenges in the development of the agriculture as summarized below.

- a) Inadequate budgetary support
Currently less than 3% of the national budget is allocated to agriculture and considering that nearly two thirds of the population depend on it, there is significant under-funding of activities in the sector.
- b) Weak extension system
The limited capacity of the current extension system hinders the delivery of training, information and guidance to farmers.
- c) Inadequate rural finance services
Access to finance services such as credit and savings facilities is extremely limited. This makes it difficult for farmers to obtain loans for the purchase of inputs and also to save money.
- d) Low and limited research activities
The low level of current research activities restricts advances in agricultural technology, efficient farming practices and productivity.

Since the end of the civil war, rice and cassava production has been on the rise as shown in Table 2.1-4. However, extreme food shortages still occur between July and October when rice is depleted. For this, it should remain that the agricultural policy of MAFFS renders support to SL-PRSP through increase in food crops production in the future.

Further, MAFFS declares the following as crucial development objectives to support agricultural development and improvement of farmers' livelihood.

- a) **Increasing agricultural productivity**
The use of small and medium-size agricultural machineries (e.g., tractors and power tillers) and the establishment of supply chains for agricultural inputs (e.g., fertilizers, pesticides and high yielding seed varieties) will increase. In addition, irrigation facilities will also be increased allowing farmers to increase the number of plantings that can be undertaken per year.
- b) **Promoting commercial agriculture through private sector participation**
Post harvest facilities (e.g., storage, drying floors, rice mills, threshers, animal feed mills and abattoirs) will be provided. Access to rural credit will be improved through the establishment of community banks and financial services associations.
- c) **Improving agricultural research and extension delivery**
National Agricultural Research and Extension policies, strategies and programs are to be formulated. Implementation of these will improve the quality of and the access to extension services provided to farmers.
- d) **Promoting efficient and effective sector resource management system**
The National Agricultural Development Plan (NADP) will be developed and implemented. This strategy will promote the establishment of databases of agricultural statistics as well as the creation of a sector coordination mechanism. These will strengthen sector policy formulation, planning, monitoring and evaluation, and resource management.
- e) **Mainstream cross-cutting issues in agriculture**
Workshops and sensitization campaigns will be organized to raise farmers' awareness about such important issues as gender, youth employment, health and environmental sustainability.

2.2 Agricultural Features in Kambia District

2.2.1 Social and economic condition

(1) General

Kambia district is located about 130km to the north of Freetown, the capital of Sierra Leone, and borders Guinea. The district is 3,100km² in area with a population of about 280,000 (2003). It is divided into seven administrative areas called “chiefdoms” including Mambolo, Samu, Gbinleh Dixing, Magbema, Masungbala, Tonko Limba, and Bramia. The district capital is Kambia Town, which is in Magbema chiefdom.

Agriculture is the main industry in Kambia district, in which 230,000 (80%) of the whole district’s population engage. Kambia district is one of the districts most severely affected by the civil war, and many residents fled to Guinea, the neighboring country, as refugees during the war. As a result of the civil war, the female population is about 16,000 larger than the male population (*Kambia District Development Planning, 2005*). The population is ethnically composed of Temne, Susu, Limba, Krio, Fula, Bulom, Loko, and Mende, and linguistically diverse likewise.

(2) Characteristics of rural communities and farmers

Though the general condition of Kambia district is as summarized above, most of reference materials and data on rural communities and farmers were destroyed during the civil war. Also, the conditions of rural villages and farmers were changed drastically by the civil war that lasted over 10 years. Because of this, the Farm Management and Rural Socioeconomic Survey (the Baseline Survey, hereafter) was conducted for one month period in July and August 2006 by MAFFS Kambia District Office (MAFFS-K) and the JICA Project Team to grasp the existing conditions of the rural communities and farmers.

The characteristics of the rural communities and farmers, which were revealed by the Baseline Survey, are summarized below.

1) Villages

1. Basic infrastructure	<ul style="list-style-type: none"> a) Most of the villages, roads are motorable throughout the year, but quality is very poor. b) Many villages have neither a regular market nor a health center. c) About 40% of the villages own a communal well for drinking. About 60% have a primary school. d) The residents generally depend on firewood for cooking.
2. Farmers’ organizations/gender	<ul style="list-style-type: none"> a) Farmers’ organizations and community-based organizations (CBOs) exist in many villages. b) In general, women engage in farming activities on equal terms with men.
3. Agricultural activity	<ul style="list-style-type: none"> a) The most common economic activity is rice cultivation both in lowlands and uplands. b) For swamp rice, the peak season of transplanting and harvesting is

	<p>August and from December to January, respectively. For upland rice that of sowing and harvesting is June and November, respectively.</p> <p>c) The majority of upland rice fields are mix-cropped with various crops including sorghum and legumes. Slash-and-burn shifting crop cultivation is practiced commonly in uplands and the fallow period is 6-9 years.</p>
4. Access to labor	<p>a) 90% of the surveyed households hired laborers for farming.</p> <p>b) Labor requirement for crop cultivation tends to be large for IVS and upland rice and small for lowland rice.</p> <p>c) The wage for hired labor is the highest in Gbinleh Dixing (US\$2.1/day) and the lowest in Mambolo and Bramaia (US\$1.0/day).</p>
5. Production loss	<p>The rate of crop loss during storage is 39% for most crops, and losses and damage are mainly caused by rats and weevils.</p>
6. Crops diseases and protection	<p>a) Abnormalities observed in rice plants include yellowish leaves, stunted growth, etc., most of which are the symptoms of nutritional disorders.</p> <p>b) Animals that cause crop damages are mainly monkeys, rats and birds.</p>
7. Livestock	<p>a) The most common livestock is poultry, followed by goat, sheep, cattle, and pigs, and they are raised mainly for sale and home consumption.</p> <p>b) The main feed for livestock is rice byproducts for poultry and grasses for goats, sheep and cattle.</p>

2) Households

1. Number of family and family labor	<p>a) The average household size in the district as a whole is 11.</p> <p>b) The labor force per household in the district is 7 on average.</p>
2. Cultivated area	<p>a) The cultivate area for rice is the largest in the mangrove swamp at 3.3 ha on average.</p> <p>b) More than 95% of the surveyed households has no agricultural machinery or work oxen.</p>
3. Rice production	<p>The average production volume of lowland rice per household (HH) is 28 bushels (700kg)/ha and is the largest in Mambolo at 98 bushel (2,450kg)/ha and the smallest in Tonko Limba at 11 bushel (275kg)/ha.</p>
4. Rice consumption	<p>a) Rice is produced mainly for home consumption .</p> <p>b) Only 19% of rice farmers have sold their rice in the past three years. The farmers did not sell their rice because the yield is too low (80%) and they use their rice to repay loans (20%).</p> <p>d) To sell upland crops, 63% of the farmers carried it to the market by themselves or depended on local distributors (23%).</p> <p>e) In the dry season, most farmers had two meals a day. In the rainy season, the farmers who ate three times a day decrease whereas those who ate only once a day drastically increase.</p>
5. Credit	<p>a) The most common source of credit is local traders (78%).</p> <p>b) There are a number of patterns of pay back loan, but the major patterns are loan in rice and pay in rice (73%) and loan in cash and pay in cash (64%)</p>
6. Income source	<p>The farmers' main income is from selling crops (70%) and their main expenditure is on food in all chiefdoms.</p>

2.2.2 Physiographical feature and cropping system

(1) Physiography and vegetation

The total area of the Kambia district is about 3,100 km², and most of the land lies at an altitude of 100 m or lower with the highest point at 150 m. The land can be divided into two physiographical categories: aquatic area in the south and terrestrial area in the middle and northern part (Figure 2.2-1).

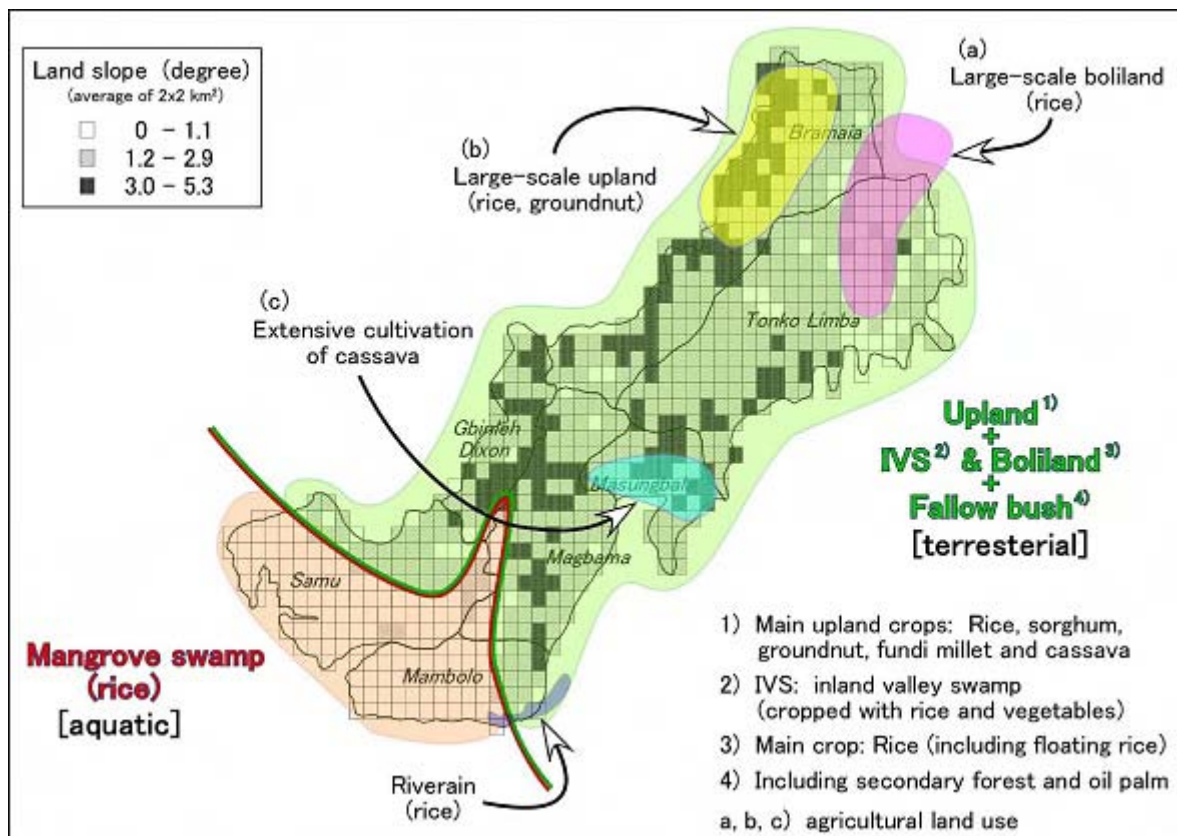


Figure 2.2-1 Physiographical Classification and Agricultural Land Use in Kambia District

The aquatic area in the south extends in the tidal section, which is represented by mangrove swamps and affected by seawater through the tidal creek (Figure 2.2-2). The mangal lies in saline coastal habitats, where the dominant species are *Rhizophora avicina* and *R. mangle*. Most of these species have, however, been cut down for rice (*Oryza sativa*) culture and used for firewood and charcoal production. Crawling grass (*Paspalum vaginatum*, locally called as 'Kireh-kireh'), an indigenous salt tolerant weed thrives now. The area occupies about 350 km² and additional land of estuarine sediments.

After the mid-rainy season, cultivation of rice plants becomes possible because rainfall and discharged fresh water push away seawater and wash out salts in the soils. On the other hand, dwelling sites are confined to elevated grounds, and vegetables are cultivated in backyards: upland crop production is minimal in the mangrove swamp area.

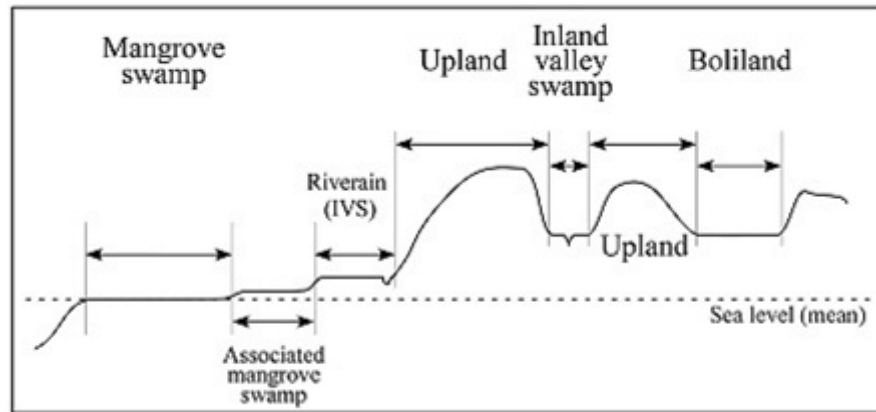


Figure 2.2-2 Cross-sectional Illustration of Agro-ecologies (Schematic)

The terrestrial area that sits on the West African craton is undulant, steeper in the middle and along the border of Guinea and gradual in the northeastern part. Tropical rain forests probably covered the whole area considering the climatic conditions of high temperature (29°C high and 24°C low on annual average) and precipitation (ca. 3,000 mm annually). At present, only a few virgin forests remain, and most of the land is covered with fallow bushes (or secondary forests) because the forested land has been intensively exploited for crop cultivation with slash-and-burn agriculture and for timber production.

Under the oil palm (*Elaeis guineensis*) trees scattered everywhere, various upland crops are grown. Inland valley swamps (IVSs) with sandy to peaty soils are cultivated for lowland rice if they are flat enough. There are two geographic and ecological terms unique in Sierra Leone: boliland and riverain (or riverain grassland). The former is an inland depression, which develops in the upper and middle reaches of a river. Because the boliland lies on flat terrain and the outlet is deposited with sedimentation, it is submerged during the rainy season. Floods reach several centimeters to several meters deep. The size of a boliland varies from several hectares to several thousand hectares depending on the geographical features. In Kambia district, large bolilands are found in the northeastern part due to the prevailing flat terrain and small ones are in the middle part.

Riverains extend on the river terrace, which is flooded during the rainy season. A large-scale riverain is seen in the southern part of the country (Bonthé and Pujehun districts). The scale of riverains in Kambia district is much smaller, about 3,000 ha located in the right bank of the Little Scarcies (from the southern part of Mambolo chiefdom to Port Loko district). The land is salt free throughout the year. The depth of flooding in riverains is similar to bolilands, several centimeters to several meters.

Gramineous plants thrive both in boliland and riverain because submergence lasts for 6 months or so, and arboreal trees cannot survive under such conditions. The land is used for grazing cattle during the dry season. The dominant plant is *Imperata cylindrica* in riverain grassland.

(2) Rice cultivation in various agro-ecologies

Rice, the staple food in Sierra Leone, is extensively grown in the agro-ecologies of mangrove swamp, riverain, boliland, IVS and upland (free-drained upland) that are distributed across the country. However, these can be broadly grouped into two categories: upland and lowland (Figure 2.2-3).

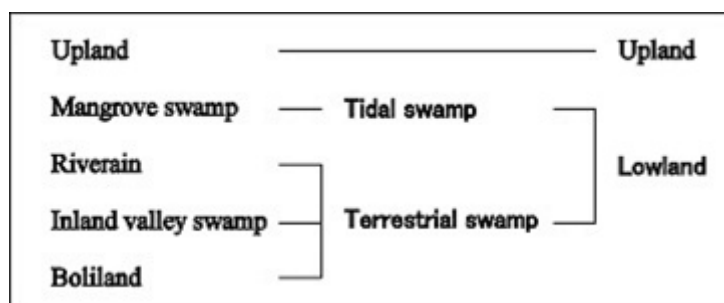


Figure 2.2-3 Classification of Rice Agro-ecologies in an Aspect of Water Regime

The main rice cultivation methods are (1) direct sowing in uplands and (2) transplanting in lowlands during the rainy season (Table 2.2-1). In both methods, farmers use photosensitive, long or medium-growth duration varieties. Rice is sown at the beginning of the rainy season (May and June) and harvested in October and November in uplands and from November to January in lowlands. In part (about 5-10%) of uplands and lowlands, farmers grow early or medium-growth duration varieties in preparation for a hunger period of pre-harvest time of the main crop.

Other cultivation methods practiced (in about 5-10% of the entire area) include (1) second cropping during the dry season both by direct sowing and transplanting in IVS and riverain, (2) direct sowing in lowlands (especially in mangrove swamp and boliland), (3) mechanized cultivation (only for plowing and harrowing) with direct sowing in boliland, and (4) floating rice cultivation in boliland and riverain (for which only Indochina blanc is used). In addition, ratoon rice in the main field in lowlands is actively harvested by panicles.

Table 2.2-1 Rice Cultivation Methods in Different Agro-ecologies

Agro-ecology	Distribution in Kambia district	Planting		2nd crop (a)	Mecha- nization (b)
		Direct sowing	Trans- planting		
Upland	Whole area (c)	⊙	x	x	x
Inland valley swamp	Whole area (c)	△	⊙	△	x
Boliland	Whole area (c)	○	○	x	○
Riverain	Localized	△	⊙	△	x
Mangrove swamp	Localized	△	⊙	x	x

Symbols: ⊙ main (dominant); ○ common; △ not-common; x none.

a) rice cultivation during dry season

b) plowing and harrowing only at sowing (sowing itself is by hands)

c) except mangrove swamp area

In uplands, rice is always the first crop after clearing the secondary forest, and several upland crops are grown for 1-2 years afterwards (Figure 2.2-4).

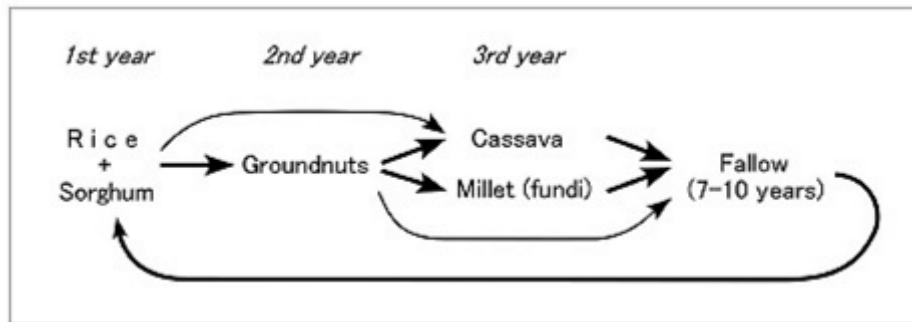


Figure 2.2-4 General Cropping Sequence in Slash-and-burn Agriculture in Kambia District

In lowlands, rice is grown in soils submerged almost throughout the entire cultivation period. In Kambia district (and in the entire country as a whole), there is no water-controlled rice field but there are IVSs that have been developed with some drainage and dikes. Several drainage schemes in the mangrove swamp were attempted to help wash out salts rapidly in the colonial time and the 1980's. However, it is doubtful if any of those drainage systems are still functional because they have never been maintained since then.

(3) Cultivation of upland crops

After rice cultivation at upland, farmers commonly grow groundnuts in the 2nd year and cassava (*Manihot esculenta*) or fundi millet (fonio, *Digitaria exilis*) in the 3rd year, and then, the land is fallowed for 7-10 years. Yet, the sequence of crops varies: e.g., cassava cultivation in the 1st or 2nd year, fundi millet in the 2nd year, etc. Sorghum (*Sorghum bicolor*) is mixed cropped with rice: its pure stand is rare. Sweet potato (*Ipomoea batatas*) is mainly grown in backyard garden. Vegetables (mostly chili pepper (*Capsicum annum*) and eggplant (*Solanum melongena*)) and cassava are grown on heaped mounds in IVS after harvesting rice.

2.2.3 Crop cultivated area and marketing

(1) Crop cultivated areas by chiefdom

Populations, the number of farmer households, and cultivated areas for major crops are presented by chiefdom in Table 2.2-2.

The populations and the number of farmer households in Samu and Magbema, the water transport base and the overland distribution base respectively, are relatively large. From the same table, the average rice cultivated area per household in Kambia district is inferred to be 0.9ha. Rice cultivated areas by chiefdom are 1.2ha in Mambolo, 0.6ha in Samu,

1.0ha in Gbinleh Dixon, 1.8ha in Magbema, 0.5ha in Masungbala, 0.6ha in Tonko Limba, and 0.9ha in Bramia, showing wide differences from chiefdom to chiefdom.

Table 2.2-2 Number of Farm Households and Cultivated Areas by Chiefdom and Its Share (2002/2003) unit: ha

Chiefdom	Population	Farm HH	Rice		Cassava	Millet	Groundnuts	Maize	Oil palm	Cashew	Citrus
			Swmp	Upland							
Mambolo	37,784	4,792	4,934	637	150	52	335	34	400	10	44
Samu	64,382	7,267	4,071	433	130	31	307	34	360	28	84
G.Dixing	17,614	2,174	1,480	707	405	72	614	50	280	11	146
Magbema	57,514	8,586	4,461	10,829	405	72	614	34	440	820	128
Masungbala	37,148	3,725	848	1,061	352	103	837	84	340	20	110
Tonko Limba	42,130	4,970	888	0	274	227	1,393	118	340	18	68
Bramaia	21,934	3,585	854	1,157	222	145	1,393	185	220	8	266
Total	278,506	35,099	17,536	14,824	1,936	702	5,493	539	2,379	914	846
Share(%)											
Mambolo	13.6	13.7	28.1	4.3	7.7	7.4	6.1	6.3	16.8	1.1	5.2
Samu	23.1	20.7	23.2	2.9	6.7	4.4	5.6	6.3	15.1	3.1	9.9
G.Dixing	6.3	6.2	8.4	4.8	20.9	10.3	11.2	9.3	11.8	1.2	17.3
Magbema	20.7	24.5	25.4	73.1	20.9	10.3	11.2	6.3	18.5	89.6	15.1
Masungbala	13.3	10.6	4.8	7.2	18.2	14.6	15.2	15.6	14.3	2.2	13.0
Tonko Limba	15.1	14.2	5.1	0.0	14.1	32.4	25.4	21.9	14.3	1.9	8.0
Bramaia	7.9	10.2	4.9	7.8	11.5	20.6	25.4	34.3	9.2	0.9	31.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Formulated based of DATA PACK Agriculture, 2004

(2) Marketing

1) Market channels

There are traders in many villages of Kambia district, who collect crops and sell them at local markets. The village traders are divided into collectors and retailers, and those who play the central role in distribution are collectors called petty traders. The collectors dispose his/her crops in two ways:

- a) to ship them to the four main markets in the district (Madina, Kambia II, Rokupr, and Bamoi Luma), and
- b) to sell them to regional traders directly (Figure 2.2-5).

The village trader is usually a small-scale merchant without own means of transportation, so he/she often carries goods to markets by bus. On the other hand, the regional trader more likely rents a truck to transport goods to markets in the metropolitan area.

The village trader is bound to credit transactions with farmers, as he/she pays the farmers for the crops after selling them at markets or to regional traders. Moreover, retailers and large-scale traders provide farmers with loans. Generally,

the farmers pay back double the amount not by cash but by crop (rice, palm oil, groundnuts, etc.). Margins (e.g., handling charge) at each level of distribution have yet to be identified.

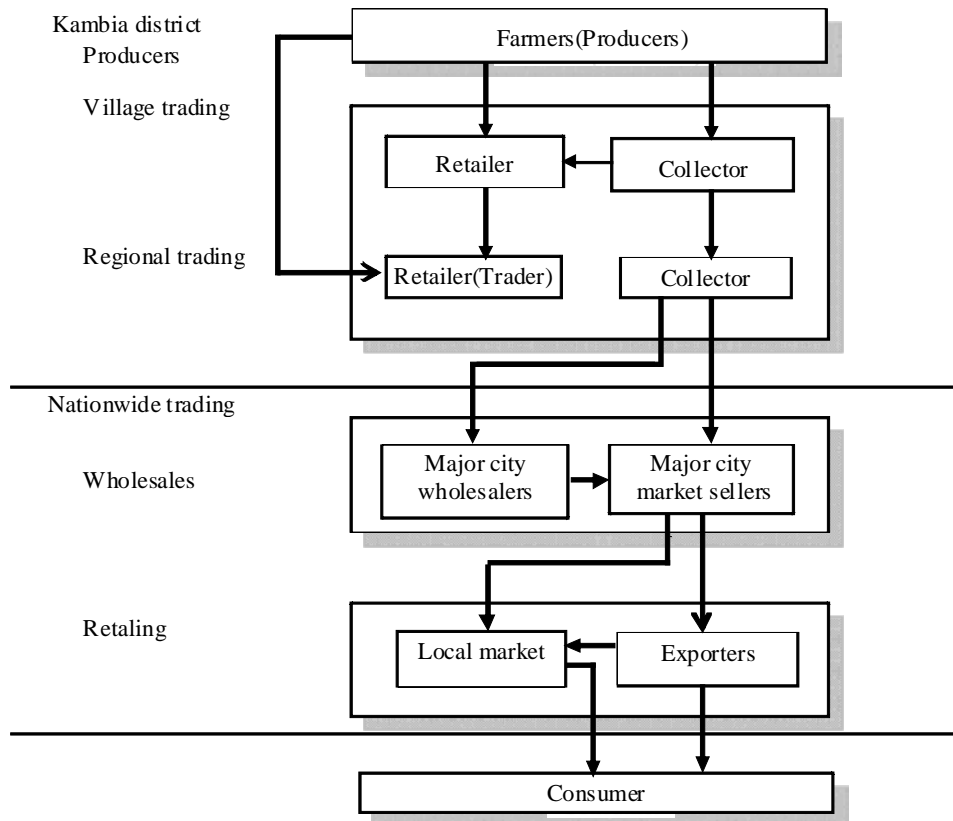


Figure 2.2-5 Market Channel of Main Crops

2) Fluctuation of retail price

a) Retail price of rice

In Kambia district, rice is distributed mainly in three forms: parboiled rice, imported rice and milled rice. Parboiled rice and imported rice are supplied to the markets all through the year. Milled rice appears at the markets right after harvest but almost none is distributed during the rainy season.

The retail price of rice increases during the changeover period from July through October and decreases from November through March. For popular parboiled rice, the retail price is the range of Le 1,350-1,500 (US\$0.45-0.50)/kg at the lowest to Le 2,400-2,800/kg (US\$0.80-1.00) at the highest with about Le 2,000(US\$0.70)/kg at the middle (Figure 2.2-6).

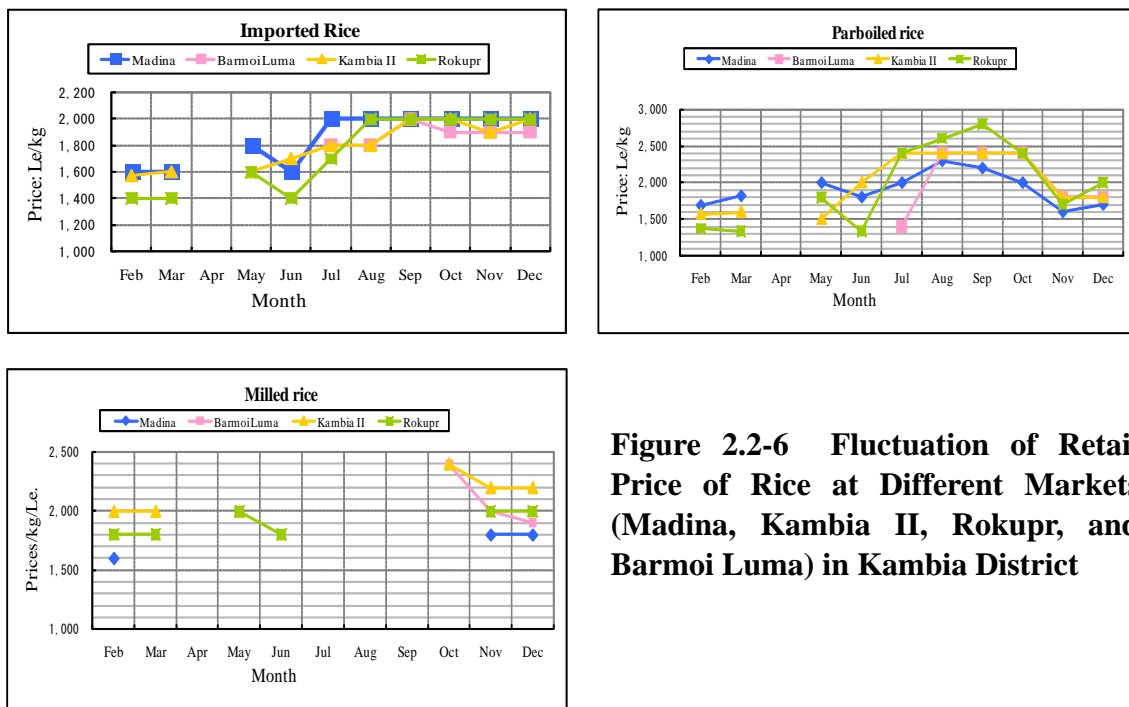


Figure 2.2-6 Fluctuation of Retail Price of Rice at Different Markets (Madina, Kambia II, Rokupr, and Barmoi Luma) in Kambia District

b) Retail price of other crops

Cassava and cassava gari

Cassava and cassava gari are generally regarded as substitute food for rice, which is the staple food. The retail price of cassava is Le 400-600/kg on average per year and it tends to increase from August to October when the supply of rice becomes scant. Cassava gari, a processed product of cassava, sells at higher retail prices for Le 1,200-1,500/kg on average throughout the year..

Leaf vegetables

Of the leaf vegetables, cassava leaves, potato leaves and *krainkrain* has the highest retail price at Le 1,000/kg on average a year except at Madina Market. Since Madina Market is distinctively a producers' market, the retail prices of leaf vegetables tend to be relatively low compared to markets located within a city area such as Kambia II.

Pepper, groundnut oil and palm oil

The retail price of pepper (dried) almost reaches Le 10,000 (US\$3.3)/kg. This clearly indicates that pepper is a highly cashable crop. Groundnut oil and palm oil, primary process products, maintain stable retail prices throughout the year. The price of these products are the highest at over Le 5,000 (US\$1.5)/kg on average per year at any market.

c) Retail price of fertilizer

The retail price range of NPK and urea per kg is Le 2,600-5,000 (US\$0.8-1.7). These fertilizers are generally sold by butter cup (about 220g) at market, and their distribution is unstable all through the year. Since fertilizers are imported goods, it is difficult to purchase them in a large quantity at a time.

2.2.4 Post-harvest

(1) General features

According to the Chiefdom Vulnerability Assessment (FAO, 2003), in Sierra Leone, major crops always experience up to 30-40% post harvest losses, due to lack of post harvest machinery, poor storage and processing facilities.

In Kambia district, post harvest and handling of rice depend either on manual husking and milling at farm household or on mechanical milling by private sector. Total processing capacity of rice mill and storage capacity are said to be insufficient, and the quality of milled rice is low due to high contamination with impurities as the rice mills are not equipped with sifter or length grader, etc (Inter-Agency Assessment Report, Kambia District, 2001, July). Insufficient storage capacity causes a considerable portion of harvested crops to be left unattended and the available storage facilities to overflow.

Under such conditions the technical improvement of post harvest handling from harvest to storage and its extension are important from the viewpoint of reduction of losses.

(2) Post harvest activities

Based on the Baseline Survey results (MAFFS-K/JICA), the outline of post harvest activities mainly rice is summarized as below:

1) Drying floor

In the major food crops, the most common drying floor is ground. More than 70% of lowland rice, groundnut and upland rice are drying at the ground. For cassava (gari), however, it is dried on mat (53%), followed by tarpaulin (36%). The biting is by far the most common way to test the dryness of lowland rice and upland rice as reported by 88% and 90% of the household, respectively. For cassava (gari), biting is also most common (41%) but a sizeable portion of the farmers appeared to rely on rattling sound and pounding as well. In contrast, most farmers tested the dryness of groundnut by its rattling sound.

2) Winnowing methods

Overall, regardless of crops, use of handmade winnow is the most common method of winnowing across the chiefdoms. However, the farmers rely on the wind to winnow lowland rice especially in Mambolo and Sam. Sieves is used more than

handmade winnow for cassava (gari), in Magbema.

3) Storage types

Regardless of crop or chiefdom, bags are the most common means of storage (46% for lowland rice, 81% for cassava (gari), 60% for groundnut, and 41% for upland rice), followed by wooden boxes (27%, 12%, 21%, and 34%, respectively) and baskets (18%, 6%, 17%, and 22%, respectively).

(3) Post harvest machinery

Introduction of post harvest machinery is one of the measures to increase agricultural production through decreasing of the production loses. However, they are very expensive in general and in Kambia district, there are a small number of machinery including vehicle and motor cycle. Especially in the rural areas, bicycle is the most sophisticated machine. Unless the operation and maintenance is done properly, economic life of the machinery ceases before recovering the investment cost, thus the sustainability is not assured.

2.2.5 Agricultural support system

(1) Research and extension

1) Research

After long process of restructuring, SLARI has been established recently as an umbrella organization of all the research institutes in the Country, such as Njala University, Institute of Agricultural Research (IAR), and Rice Research Station at Rokupr (RRS-R), the latter of which was renamed Rokupr Agricultural Research Center (RARC).

Infrastructure of RARC including senior staff quarter, administration and research laboratory, which had been destroyed during the civil war, has been rehabilitated partially. The researchers have started coming back, and the normal operation of the Center is expected to resume in early 2009.

The mandate of RARC is not much different from that of the former RRS-R, which had been specialized in the research in rice, and other cereal crops and vegetables. According to the brochure of RRS-R, they have accomplished, since its establishment in 1934, many outcomes of various researches including release of 33 high yielding rice varieties for both upland and lowland, demonstration of efficient type of tractor and cost-effective power tiller, establishment and development of various cultivation techniques. They have also developed packages of rice cultivation techniques for each of four rice growing ecologies: upland, inland valley swamp (IVS), boliland and mangrove swamp.

However, those results have not effectively been disseminated down to the farmers

at grass roots level, as far as the Kambia district is concerned, despite of its advantageous location. The use of high yielding varieties have been very limited, adoption of recommended cultivation techniques have been very little.

2) Extension

Agricultural extension is supposed to be one of the most important roles that MAFFS should play for the benefit of farmers. There is a hierarchical structure of extension at the district level. In MAFFS Kambia Office (MAFFS-K), 24 seats are allocated for frontline extension workers (FEWs) who interact directly with farmers at grass roots. They are evenly divided (eight each) and assigned into three blocks, each of which are under the responsibility of block extension supervisors (BESs). FEWs and BESs are supervised by the subject matter specialist (SMS) of the crops/extension division.

Although the structure of extension system has been established, the system itself has not been functioned for long by various reasons.

The skills of extension workers (both FEWs and BESs) are inadequate, which hampers effective extension. Although most of them have long experience as extension agents, they have not been able to update their knowledge and skills in agriculture due to lack of training opportunities as well as lack of information on new agricultural technologies.

There are no extension materials in the office. Besides, most extension workers are aged, lacking in enthusiasm for acquiring new technologies and conveying them to farmers. Inadequate mobility and low salary are other factors to lower their incentives.

As for rice cultivation, they do not know background theory of various techniques and lack experience in cultivation. They are generally very poor in mathematics, which is essential ability to tell farmers about seed requirement and fertilizer dosage, based on their acreage.

SMS of the crop/extension division is mandated to deputize the district director, which often make him too busy to carry out original works. FEWs and BESs usually do not have specific task to execute or report except when they are told by MAFFS-K through the SMS, like seed rice distribution, collection of seed rice.

(2) Infrastructure

1) Road

The status of infrastructure development in the Kambia district is very poor. Even an international highway connecting Freetown with Conakry has yet been paved.

The condition of the section between Kambia and Rokupr junction becomes worst in late rainy season, especially October. It takes nearly 50 minutes even by 4WD vehicle to pass this section of merely 15 km long, due to many deep pools across the road and bumpy surface. Feeder roads are poorly maintained, which sometimes become impassable when muddy or severely eroded.

All these conditions hamper smooth transport of agricultural products and other commodities, resulting in the decrease in the flow of both commodities and people.

2) Irrigation and drainage

Land and water development division (LWDD) of MAFFS-K is responsible for irrigation and drainage development especially in IVS. However, due to inadequate funding in this field, very little works have been done. Actually very few development activities are observed in lowland rice field. Development projects after the civil war have been implemented quite limited, and because of no follow up or maintenance, those developed areas have been deteriorated in a short time. Farmers have not been involved in the project activities.

(3) Inputs supply

There is no regular supply of inputs including fertilizer and agro-chemicals. They can be found them occasionally at larger weekly market like Barmoi, Madina, etc. Irregular supply of inputs is largely attributed to very low demand due to very high price that most farmers cannot afford in large quantity.

(4) Agricultural tools and machinery

Agricultural metal tools like large hoe are manufactured by local blacksmiths.

Agricultural machinery is seldom found except tractors owned and operated by MAFFS-K. Total of ten tractors have been distributed to MAFFS-K. An NGO based in Kambia owns one tractor for hire service.

2.3 Project Justification

(1) Importance of increasing food crop production

As mentioned above, the agricultural sector (crop production, livestock, fishery, and forestry) in Sierra Leone accounts for 48% of GDP (2006) contributing the most to the national economy. The share of food crops production including cereals with rice as the most dominant crop, cassava, and groundnuts reaches more than 30% in the GDP. For the development of the national economy, it is crucial to strengthen and support the agriculture sector with these key crops.

Per capita calorie intake in Sierra Leone decreased from 2,085kcal in 1980 to 1,943kcal in

2003. This is mainly attributed to the decrement in per-capita rice consumption due to insufficient domestic production of rice that is the main calorie source of the nation. Rice alone covered about 50% of the total calorie intake until 1990 but decreased to 35% in 2003.

According to the SL-PRSP (2005), the population of the food poor who are unable to intake 2,700kcal of nourishment per day accounts for 50% of the entire population. Production support for food crops with rice as the main crop is essential in the light of national economic development, poverty reduction, nutritional improvement, and food security.

(2) National rice requirement

According to the Medium Term Expenditure Framework (2006-2008) by MAFFS, the national rice requirement for 2004 was estimated at about 516,500 ton (Table 2.3-1). Self-sufficiency of rice in 2004 was only 66%. The total paddy rice production in 2007 was about 637,000 ton, equivalent to 382,000 ton of milled rice. Based on the estimated milled rice production, self-sufficiency of rice in 2007 is calculated to be 73%. The total self-sufficiency of rice as the main food crop has yet to be achieved.

Table 2.3-1 Rice Production and Requirement (2004)

Farm size (ha)	No. of farms	Av. farm size (ha) *	Total area (ha)	Yield ton/ha	Total production (t)		
					Paddy	Milled	
<0.5	266,005 (42%)	0.4	97,085	1.2	121,133	78,736	
0.5-1.0	276,481 (43%)	0.8	216,525	1.0	218,876	142,271	
>1.0	99,654 (15%)	1.7	166,936	1.1	180,681	117,442	
Total	642,140 (100%)	0.8	480,546	1.1	520,690	338,449	
National requirement (ton)						516,499	
Self sufficiency (%)						66	

Source: Formulated based by Medium Term Expenditure Framework (2006-2008), MAFFS, 2005.

Note: * Average farm size (ha) = Total area (ha)/ No. of farms

Approximately 85% of the rice farmers in Sierra Leone are small-scale farmers with average land area of 0.4-0.8ha. Their average yield of rice is about 1 ton/ha. Yield of rice in Sierra Leone has been less than 1 ton for over the past 40 years (USDA, PS & D, Outline, 2008). Obviously, there has been no improvement in yield so far.

As the trend of low rice yield and increase in the population (2.2% annual growth rate for 2002-2007) continues, self-sufficiency of rice is difficult to achieve. Expansion of the rice cultivation area is one of the ways to increase rice production. However, it would require large fiscal expenditure and, given the actual national economic condition in Sierra Leone, it is not easy task. For this, techniques to improve rice productivity should be

developed first and foremost.

As mentioned in Chapter 1, the goal of the Project is to contribute to increasing food production through the development of yield improvement techniques and their dissemination especially for rice. Furthermore, increase in food production would lead to the national food security, the most important policy concern in Sierra Leone. Therefore, the implementation of the Project is considered to be not only justifiable but also crucial.

References

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Ministry of Agriculture, Forestry and Food Security (MAFFS) (participated with FAO), Sierra Leone Chiefdom Vulnerability Assessment, 2003

World Food Program (WFP), Rural Food Security, Livelihoods and Nutrition Survey & Household Food Security Profiles, 2003

**Chapter 3 Formulation of Agricultural
Technical Packages and Manuals**

Chapter 3 Formulation of Agricultural Technical Packages and Manuals

3.1 Formulation of Agricultural Technical Packages

3.1.1 Formulation of Technical Package on rice production

(1) Procedure for formulating Technical Package on rice cultivation

The Agricultural Technical Package (TP) on rice cultivation was formulated according to the procedure shown in Figure 3.1-1.

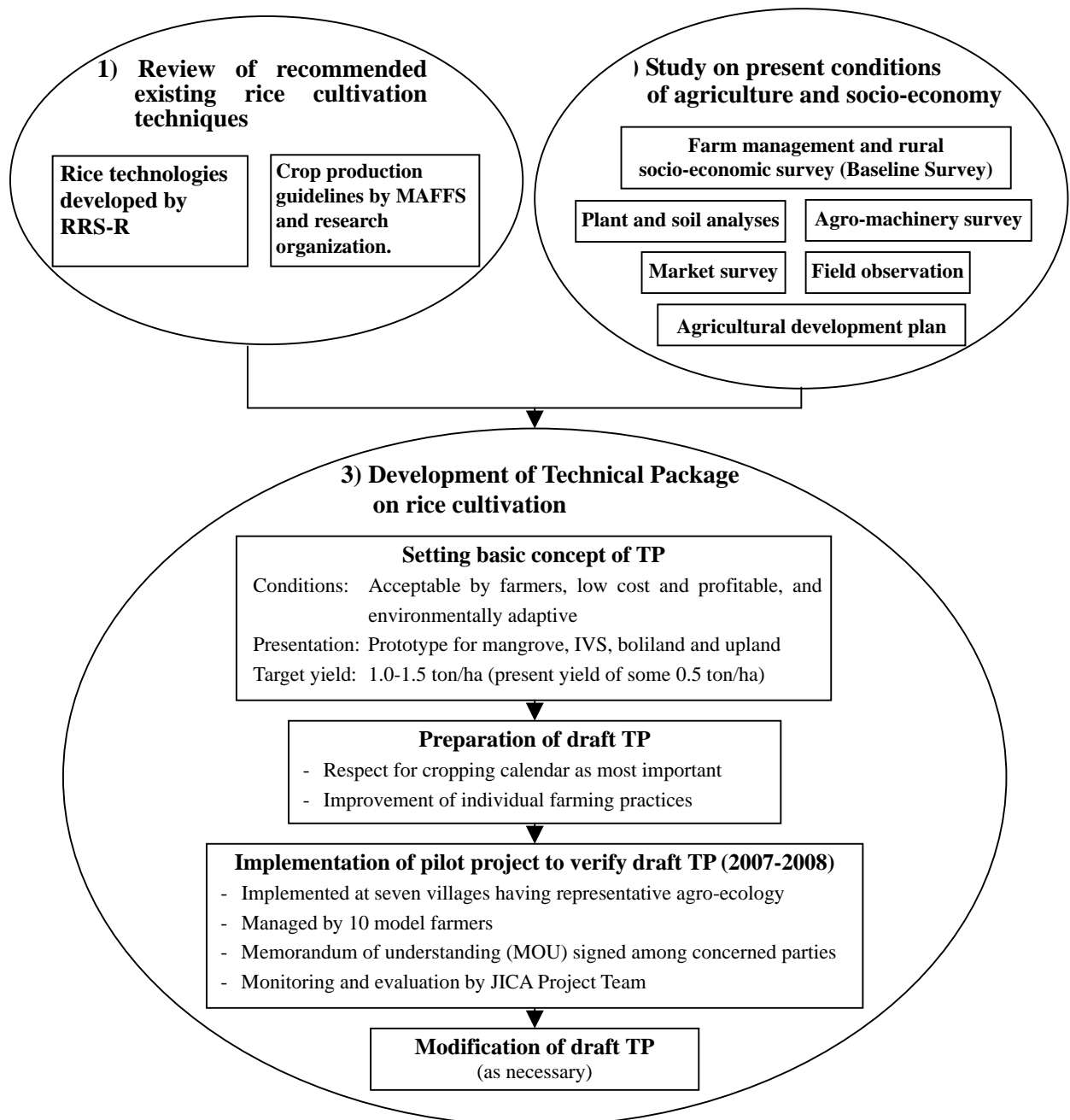


Figure 3.1-1 Procedure for Formulating Technical Package on Rice Cultivation

1) Review of existing recommended rice cultivation techniques

There are two sources of rice cultivation techniques. They are (i) the rice technologies developed by Rice Research Station at Rokupr (RRS-R) and (ii) the crop production guidelines prepared by MAFFS, National Agricultural Research Coordination Council (NARCC) and its constituent offices including Institute of Agricultural Research (IAR), RRS-R and Njala University.

In the 1980's, RRS-R developed rice technologies based on research findings accumulated over the years. These technologies were compiled by agro-ecology and distributed as *Summary of Useful Rice Technologies* in the form of leaflet. The leaflet contained information on a variety of seeds suitable for each agro-ecology with their maturation period and potential yield, dosage of seeds per unit area for direct sowing, nursery period in case of transplanting, land preparation methods, the number of seedlings per hill when transplanting, dosage of basal fertilizer application, recommended time of weeding, dosage and timing of top dressing, and some post-harvest aspects to be paid attention.

On the other hand, the Crop Production Guidelines by MAFFS presented more comprehensive and detailed rice production techniques, including recommended varieties by agro-ecology, cropping calendar and cultural practices such as nursery practices, water control, fertilizer application, weed management, pest and diseases management, and harvest and post harvest handling.

Although the techniques presented in the above references appear to be reasonable in scope, more detailed information is needed for practical extension when extension workers explain those techniques to farmers. Also, those techniques tend to require relatively high levels of inputs such as fertilizer.

2) Study on present conditions of agriculture and socio-economy

During the course of the Project, various surveys were conducted to grasp the present conditions of agriculture and rural life in the Kambia district. They included:

- a) Farm management survey and rural socio-economic survey (Baseline Survey) covering 134 villages and 1,995 households in the entire district
- b) Agro-machinery survey on the distribution and operational conditions of various types of machinery totaling about 220 machines in the district
- c) Market survey to monitor the change in the price and availability of agricultural commodities at the main markets in the district
- d) Field observation of the actual farming practices adopted by the farmers and the performance of rice cultivation
- e) Plant and soil analyses to determine inherent soil fertility

The results of these surveys are presented as Annexes in this report.

The surveys' results revealed the precarious conditions of agriculture and the livelihood of rural farmers: agriculture as almost the sole income source, over-dependence on rice, low productivity, scarcely available and expensive inputs, no habit of keeping seed rice for the next season, low level of mechanization, poor infrastructure, little contact with extension workers, poverty, low educational levels, etc.

3) Development of Technical Package on rice cultivation

The aforementioned findings suggest that the existing rice cultivation techniques should not be adopted directly, especially those that require the use of fertilizer and agro-chemicals, both of which are too expensive for the average farmers to afford. Because of this, it was decided to try to develop more user-friendly and realistic technical packages, which are easy for the extension workers to understand and the farmers to adopt at the grassroots level.

The following basic concepts were set in developing TP:

(a) Purpose of TP

TP is designed to improve productivity of rice as staple food.

(b) Scope of TP

TP covers all the four main agro-ecologies distributed in Kambia district, including mangrove swamp, inland valley swamp, boliland, and upland.

(c) Target users of TP

TP is intended for: extension workers in the Kambia District and the model farmers in the target villages for the Pilot Projects.

(d) Conditions of TP

TP complies with the following conditions:

- The techniques contained are self-supportive.
 - They can be accepted and adopted by the farmers (technically sound).
 - They are low-input and profitable (financially feasible and viable).
- The techniques contained are environmentally adaptive.

(e) Establishment of target yield

A target yield is established with the average rice yield at present as the standard. The average (weighted) yield (of rough rice) in the seven chiefdoms is inferred to be about 0.5t/ha from the Baseline Survey results. Based on the inference, the target yield is tentatively set at 1.0-1.5t/ha to secure stable production of rice for self-sustenance throughout the year.

In line with these basic concepts, a draft technical package (D-TP) was prepared in early 2007. In the preparation of D-TP, the rice technologies and crop production guidelines were referred. However, greater attention was paid to the existing cropping calendar and timely farming practices.

The D-TP was put to trial for two years in 2007 and 2008 through the pilot project (PP) at the farmers' fields to verify its effectiveness. PP was implemented at seven villages, one in each chiefdom. In the chiefdom, one village in a representative ecology was selected from the target villages that were studied in the Baseline Survey. In each village, ten model farmers were selected to form a farmers' association to be responsible for implementing PP. To clarify the role of each party involved in PP, a memorandum of understanding (MOU) was prepared and signed by the model farmers, MAFFS-K and the JICA Project Team (JPT).

Within the model farmers' association, a group leader, an assistant leader, a secretary, a treasurer, and an organizer were selected to assure effective and efficient group works. The land for PP was prepared by the model farmers, while inputs and tools necessary for PP implementation were provided by JPT. PP was closely monitored by MAFFS-K and JPT throughout the trial period.

The results of the PP in 2007 were carefully assessed with reference to the objectives and conditions of TP. PP was also appraised by the extension workers of MAFFS-K as well as the model farmers in terms of TP's adoptability. Then, necessary modification was made for another round of PP executed in 2008.

The main points of TP include:

- a) Timely crop management based on well planned cropping calendar
- b) Rational seed rate
- c) Proper land preparation (plowing and puddling)
- d) Appropriate transplanting methods (young seedlings, shallow planting, reduced number of seedlings per hill, etc.)
- e) Bund making for water control, etc.

3.1.2 Formulation of Technical Package on post-harvest handling

The Agricultural Technical Package on post-harvest handling (TP-PH) was formulated in the following steps.

- (1) Grasping present conditions of post-harvest handling

The present conditions of post-harvest handling in Kambia district were grasped through: (i) literature survey, (ii) the Baseline Survey, (iii) agro-machinery survey, and (iv) questionnaire survey on post-harvest handling at the seven pilot project villages.

Supplementary field observation was also conducted at harvest time.

As a result, the following facts were revealed:

- a) Almost all the post-harvest processing is performed manually, which is laborious and inefficient.
- b) The division of works by gender is not apparent in general, although heavy manual labor are assigned mainly to men.
- c) For most farmers, post-harvest handling is constrained by lack of storage, lack of drying floor, pest damage (rodents and bugs), and lack of milling machine.
- d) Post-harvest machinery, especially rice huller, is widely distributed over the rice production areas of Mambolo and Samu chiefdoms.
- e) Many rice hullers are operated privately by the owners.
- f) Those post-harvest machines such as rice mills and threshers that were donated to the community tend to become inoperative within two years due to poor maintenance and management.
- g) The farmers in the pilot project areas feel that most yield losses occur at harvest (cutting), transporting, drying, threshing and winnowing processes.
- h) Parboiling process is also considered to cause losses.

(2) Setting the objectives of TP-PH

Based on the above, the following two objectives were set in formulating TP-PH on post-harvest handling.

- a) To reduce post-harvest handling losses
- b) To improve the efficiency of post-harvest handling works to lessen women's workload

(3) Introduced techniques

Each post-harvest handling process is explained with technical suggestions to reduce losses. On the other hand, the use of pedal (manual) thresher, manual winnower, and motorized rice huller is introduced to improve the efficiency of the process. Accordingly, technical instructions on operation and maintenance of those machines are provided.

3.1.3 Formulation of Technical Package on vegetable production

The Agricultural Technical Package on vegetable production (TP-V) was developed to support women's groups that are mainly engaged in vegetable cultivation in lowland areas during the dry season.

(1) Procedure for formulating Technical Package on vegetable production

The procedure for formulating TP on vegetable cultivation is shown in Figure 3.1-2.

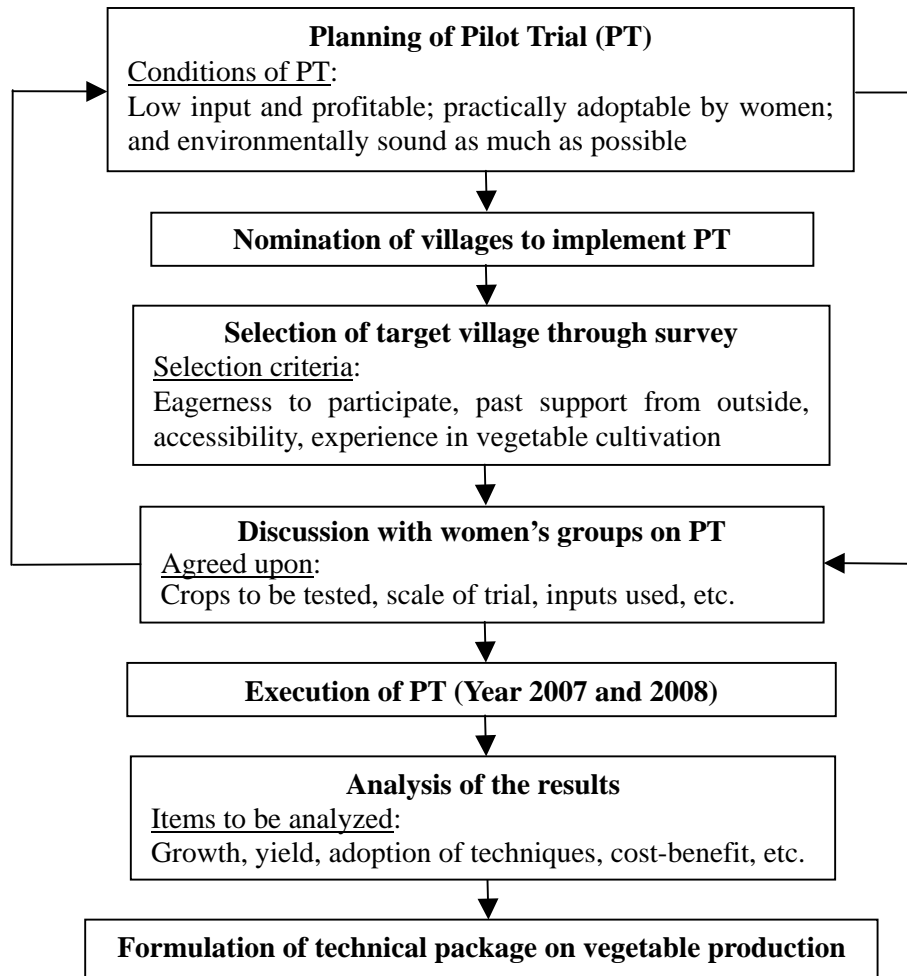


Figure 3.1-2 Procedure for Formulating Technical Package on Vegetable Production

(2) Pilot trial for TP-V

A pilot trial was planned to verify the effectiveness of the proposed techniques by JPT to be introduced to enhance the productivity of vegetables. In the light of the socio-economic conditions of the rural areas in Kambia district, the following three basic conditions were set for the techniques to be introduced:

- a) Low input and profitable
- b) Practically adoptable by women
- c) Environmentally sound

The pilot trial was conducted once in 2007 and the second time in 2008 at two villages in two chiefdoms. Prior to the implementation, the contents of PT and the role of each party were discussed with and agreed by the target women's groups. Three vegetable crops, watermelon, eggplant and pepper, were selected for the pilot trial. In 2007, the proposed new techniques were tested in the dry season to verify their effectiveness on crop performance in comparison with the traditional farming practices. In 2008, those techniques that were found to be effective in 2007 were repeated in another pilot trial to

confirm necessary modifications, while those of which the effectiveness was unclear were excluded. It should be noted, however, that TP-V was intended for the dry season cropping, but the pilot trial in the second year was conducted in the rainy season due to time constraints.

(3) Introduced techniques

The techniques introduced in TP-V emphasize the following:

- a) Raising quality seedling
- b) Thinning out
- c) Rational use of chemical fertilizer
- d) Application of bio-pesticide using locally available materials

3.2 Formulation of Agricultural Technical Manuals

The Agricultural Technical Manuals (TMs), formulated based on the TPs, are intended primarily for extension workers as extension materials to help disseminate new farming techniques to farmers at the grassroots level. While the TPs explain the background theories of new techniques, the TMs present methods to apply those techniques in the field. In this sense, the TMs could be considered as a translated version of the TPs for the farmers. The TMs consist of three parts: TM on rice cultivation, TM on post-harvest handling of rice, and TM on vegetable cultivation.

TM on rice cultivation presents improved cultural practices for higher yield of rice in lowland and upland. It also explains basic theories on the rice plant's life cycle and yield components. It emphasizes the importance of preparing a farming plan, particularly farming calendar and the respect for it. TM on post-harvest handling consists of two parts: (i) the manual on methods to reduce losses in post-harvest handling, and (ii) the operation and maintenance manual for three types of agro-machinery: pedal thresher, manual winnower and motorized rice huller. While the TP on post-harvest handling deals more with the post-harvest losses, the manual puts much emphasis on the operation and maintenance of machinery.

TM on vegetable cultivation deals with cultivation methods for three vegetables: water melon, eggplant and chili pepper. For each crop, cultivation methods are explained referring to each stage of crop growth and emphasizing the new techniques introduced. It also provides a checklist for the extension workers by which to make sure that the farmers follow correct procedures.

These TMs contain many photographs and illustrations to help the users understand the introduced techniques. The FEWs are expected to learn theories behind the new techniques from the TPs and disseminate the techniques to the farmers in the field using the TMs. Advanced farmers are also expected to use the TMs as well as the TPs and take the initiative in disseminating the new techniques to other farmers.

Chapter 4 Proposed Dissemination Plan of the Agricultural Technical Packages

Chapter 4 Proposed Dissemination Plan for Agricultural Technical Packages

4.1 Issues on the Dissemination of the Agricultural Technical Packages

The effectiveness of the introduced techniques to increase crop yield was examined through the pilot projects and pilot trials, and those techniques that proved to be effective were compiled as the Agricultural Technical Packages (TPs). During the Project period, however, the TPs were provided for trial only to the model farmers in the pilot villages, and their impact was limited to the model farmers and their neighboring farmers. In the next stage, the TPs need to be further disseminated in the whole Kambia district. Considering the urgent needs for production increase and poverty reduction, all the farmers in Kambia district should be informed of the TPs and instructed on their application as fast as possible.

In order to disseminate the TPs further and fast, the following issues need to be addressed.

- How to disseminate the TPs effectively and efficiently to the farmers at the grassroots level in the entire district of Kambia
- How to strengthen the agricultural technical extension function under the decentralization process
- How to develop the capacity of the frontline extension workers (FEWs)
- How to confirm the effects of the TPs on yield increase and profit generation

4.2 Strategies for Disseminating the Agricultural Technical Packages

Taking the aforementioned issues into account, the following four strategies are set for formulating a plan for disseminating the TPs.

(1) Promotion of farmer-to-farmer extension

To disseminate the TPs effectively and efficiently, the agricultural extension should be directed towards the farmers. To promote farmer-to-farmer extension, trial and demonstration farms should be established at farmers' fields in strategic locations as arms of technical extension activities.

The trial and demonstration farms should be managed by committed farmers' groups after training and utilized as practical training sites for not only the group members but also the neighboring farmers and FEWs. The TPs should be tried, verified and demonstrated at the farms under the close supervision of skilled technical experts.

(2) Substantiation of the agricultural technical extension in the field

The most important factor to ensure the effective dissemination of the TPs is to develop the

capacity of FEWs and the farmers' groups that are expected to play a key role to implement technical extension in the field. Their skills in crop production should be developed through intensive training.

Another important factor is to substantiate the agricultural technical extension system. Although the function of agricultural extension was institutionally devolved to the local government, there has been no such a system established at the district council level. In reality the function is still under the control of MAFFS-K, at which agricultural technical extension has been dormant for a long time. MAFFS has recently established an agricultural extension division to strengthen its function. While the next institutional setup is not clear at present, practical extension activities on the dissemination of the TPs in the field should be substantiated.

(3) Further promotion of the TPs

To further extend the dissemination of the TPs, mass media should be utilized, especially radio, for it is the main source of news and information for the majority of the local residents. During the Project, a radio extension program was produced by MAFFS-K with the assistance of JPT to disseminate cultivation techniques introduced in the TPs. The program was then broadcast by a local community radio station, and it reached many farmers in the area instantaneously. Such radio programs should be produced and repeated frequently to spread the techniques in the TPs the local farmers.

Also, the TPs are considered to enhance various existing training programs such as Farmers Field Schools (FFS), community development projects, Agricultural Business Centers (ABCs), etc. The hosting organizations of those programs should be approached and encouraged to incorporate the TPs into their programs.

(4) Efficient operation

For the TPs to spread and produce the expected results fast and firmly, an executive office should be established newly for the TPs dissemination. The office should be autonomous and financially independent, and staffed with a limited number of highly committed, skilled and responsible members. The office should collaborate with the district council as well as MAFFS-K forming a joint executive team of officers to administer and coordinate dissemination activities.

(5) Close monitoring and evaluation

The dissemination plan should be carefully monitored throughout its implementation period to examine the impact and results of the dissemination activities. Various indicators should be set at an early stage of the implementation so that the progress and the course of dissemination could be checked and confirmed, the effects of the TPs monitored, and the TPs modified as necessary.

4.3 Dissemination Plan

Based on the strategies set above, a dissemination plan (“the Plan” hereafter) of the TPs is proposed.

4.3.1 Framework of the Plan

- (1) Purpose: To disseminate the TPs effectively and efficiently
- (2) Implementation period: Three (3) years
- (3) Target farmers: All the farmers in Kambia district

4.3.2 Implementation phases

The Plan will be implemented in two phases: (i) preparation phase, and (ii) dissemination phase. Works and activities to be executed in each phase are described below.

(1) Preparation phase

1) Establishment of office

An executive office for the TPs dissemination (“the Office” hereafter) is established in Kambia town. The Office has enough space for 14 staff members and a meeting room, and it should be furnished with office furniture, a generator and office equipment including computers, printers and a photocopier. It should also have Internet facilities and water supply. Also, two vehicles and nine motorcycles are provided for the Office.

2) Staff recruitment and training

The Office is staffed with 14 members, headed by one managing director with two experts as his/her assistants, one for rice and the other for vegetables, with seven facilitators, two coordinators and two support staff. It is assumed that the managing director and the two experts are recruited externally and the facilitators, coordinators, and support staff necessary for the Office operation are recruited locally. They are selected through CV screening, short-listing, interview, and examinations (both written and field).

Possible requirements for the facilitators include: age below 40, bachelor’s degree in agriculture (minimum requirement), practical experience in agriculture for at least three years, sufficient communicative skill in Temne, Susu or Limba in addition to Krio and English, sufficient mathematical skill, valid motorcycle license, and willingness to take on challenging tasks. After recruitment, they receive training in trainer’s skills and the TPs from the managing director and the experts. They also receive on-the-job training in the field at the pilot project/trial sites cooperating with the model farmers.

3) Selection of farmers' groups

The farmers' groups that will cooperate with the Office in establishing and managing a trial and demonstration farm at their farms are identified and selected. A total of 56 groups (one in every section of Kambia district) are expected to participate. Those groups are selected considering the accessibility to their farm, agro-ecology to which the prospective trial and demonstration farm belongs, soil fertility (productivity), past record of natural disasters, willingness of the group, past performance and reputation of the group, etc.

A memorandum of understanding (MOU) is prepared and signed between each farmers' group and the Office to make sure that each party understands its role in the Plan. While the farmers' groups cultivate crops applying the TPs, manage the farm properly, and keep necessary records, the Office provides necessary inputs and equipment for the Plan implementation.

4) Training of farmers and extension workers of MAFFS-K

The core members of the selected farmers' groups as well as the extension workers of MAFFS-K are provided with a series of training sessions by the Office on the background theories of the techniques in the TPs. The TPs trial, demonstration and training at the farmers' field are explained. Necessary preparations for the trial and demonstration farm are initiated.

5) Preparation of radio program and posters

For the TPs to reach the farmers throughout Kambia district, a series of radio extension programs is produced. Those farming practices that are emphasized in the TPs are incorporated in the program and broadcasted timely in the respective seasons. The program produced in the Project implementation period should be utilized with necessary modifications. Posters showing important techniques in the TPs in photographs or illustrations are also prepared and distributed to the villages in the district.

6) Formulation of monitoring and evaluation schedule

A monitoring and evaluation schedule is formulated to examine and confirm the progress of the Plan. Several monitoring points are selected, for which a monitoring schedule is set. The monitoring is conducted by the Office staff in cooperation with the members of the farmers' groups. The farming practices being tried, growth of the rice plant and its stage are recorded periodically. Unusual climate conditions are also recorded.

As for evaluation, verifiable indicators and the means of verification are determined based primarily on the results of the Baseline Survey conducted in

2006. The indicators may include the adoption rate of each technique, seed rice amount, yield, and income, and they are verified through interviews with the target farmers. A supplemental baseline survey may be conducted as necessary.

(2) Dissemination phase

1) TP trial, demonstration and training

The selected farmers' groups cultivate crops at the designated farms applying the TPs for trial and demonstration, while the Office closely supervises the management of the farms. A series of training are held for important farming activities such as land preparation, nursery preparation, transplanting, weeding, water management, and fertilizer application. To each training session, not only the target farmers' group members but also neighboring farmers and FEWs are invited.

The TP trial, demonstration and training is conducted at 28 sites in the first year and at another 28 sites in the second year. The entire 56 sites are covered in two years. In each year, the seven facilitators of the Office tour and supervise those sites with each covering four sites a year.

2) Dissemination through radio broadcast

To supplement the direct dissemination of the TPs by the Office and the selected farmers' groups, a series of radio extension programs is broadcasted. In principle, one program is produced every month and broadcasted weekly for the month. Each program is prepared in English and broadcasted in Krio. The summary of the programs is also broadcasted in the local languages (Temne, Susu and Limba) spoken in Kambia district. The model farmers are invited to tell their experience in the programs. Listeners' responses are collected regularly and reflected in the contents of the next program.

3) Dissemination through other facilities

The TPs could be promoted capitalizing on other extension facilities such as FFS. Trainers are dispatched on request to train the participant farmers in FFS. Other potential facilities include the ABCs that provide the farmers with various types of support. The Office distributes TMs and the posters to local ABCs where they are made available to the visitors.

4) Monitoring and evaluation

According to the formulated monitoring and evaluation schedule, the Plan's progress is checked periodically throughout the second year. The routine monitoring results are analyzed each time, and necessary action is taken. At the

end of the second year, a comprehensive monitoring is conducted to scrutinize the overall conditions of all the 56 sites. The Plan's progress is evaluated every year based on the records collected through the monitoring, referring to the set of indicators.

4.3.3 Implementation schedule

The implementation schedule of the Plan for three years is shown below.

Phase Activities	Year 1		Year 2		Year 3	
	1st half	2nd half	1st half	2nd half	1st half	2nd half
1 Preparation						
- Office establishment	■					
- Recruitment of staff and training	■	■				
- Selection of farmers groups		■				
- Training of farmers and FEWs		■		■		
- Monitoring plan formulation		■				
2 Dissemination						
First round dissemination						
- Trial and demonstration, group training, study tour, etc.			■	■		
- Radio extension program			■	■		
- Monitoring				■		
Second round dissemination						
- Trial and demonstration, group training, study tour, etc.					■	■
- Radio extension program					■	■
- Evaluation						■

Figure 4.3-1 Implementation Schedule of the Plan

4.4 Institutional Arrangements

The proposed Office is autonomous and financially independent. As explained in Section 4.2 (2), while the function of agricultural extension was devolved to the local government, it still is practically controlled by MAFFS-K since the district council has yet to be ready to take on the function. However, agricultural extension activities of MAFFS-K have not been organized due to many constraints. Under the circumstances, the Office is expected to play a leading role in agricultural technical extension focusing on the TPs dissemination in collaboration with MAFFS-K and the district council.

It is planned that The Office, MAFFS-K and the district council of Kambia form a joint team called the Technical Package Dissemination Team as shown in Figure 4.4-1. The Office supports MAFFS-K and the district council in logistics and training. The team holds a regular meeting monthly at which the progress of the Plan is reported and issues discussed if any.

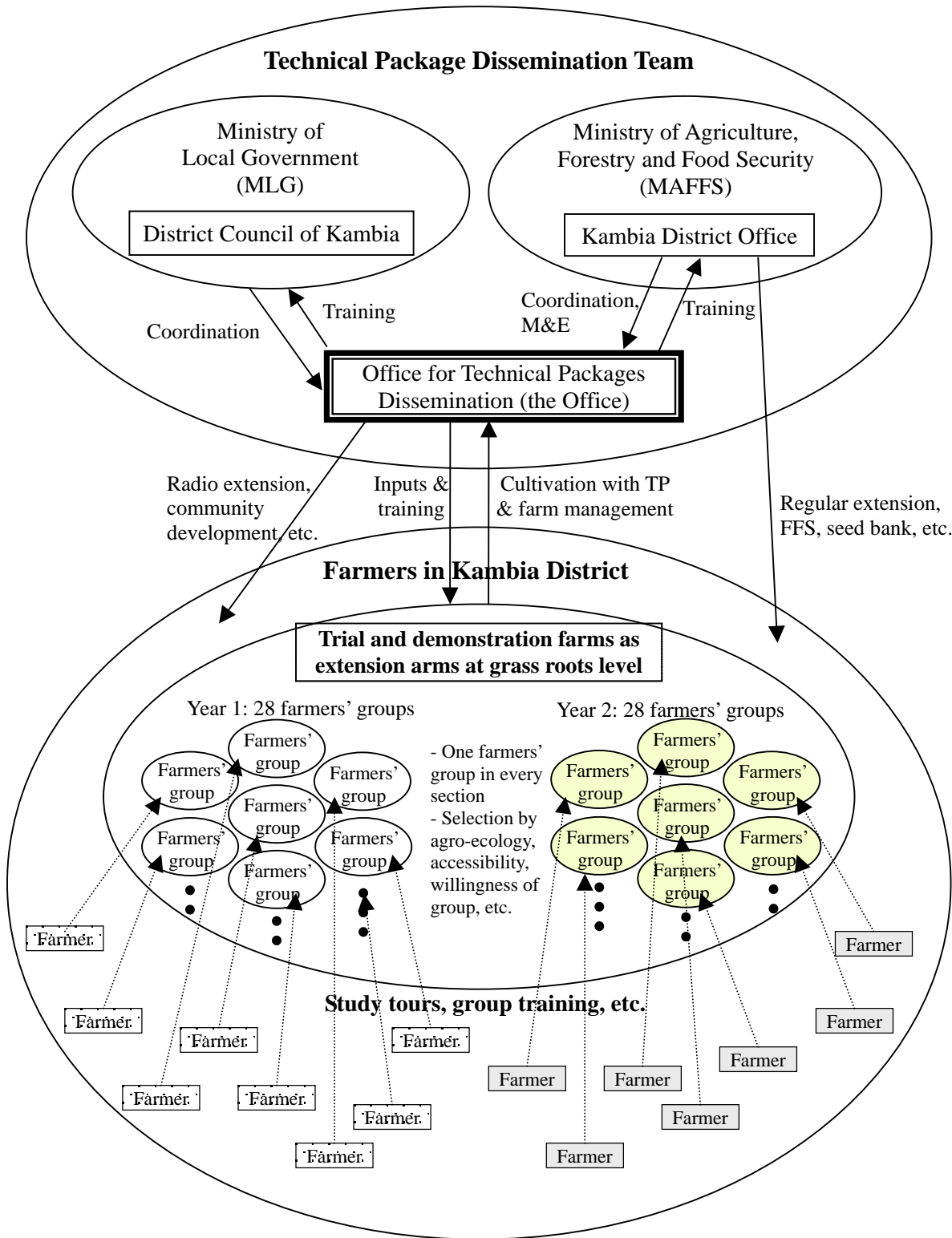


Figure 4.4-1 Schematic Institutional Setup for Technical Package Dissemination

Chapter 5 Recommendations

Chapter 5 Recommendations

The following recommendations are made to further improve and strengthen the agricultural support system in Kambia district.

(1) Dissemination of the TPs

Through the pilot project in the seven villages, the TPs were proved effective and adopted by not only the model farmers but also their neighboring farmers. Those techniques adopted and appreciated by the farmers include i) the transplantation of two to three seedlings per hill with shallow planting, which substantially reduced the amount of seed rice, and ii) the adherence to the cropping calendar for an appropriate nursery period and timely weeding, which improved the initial growth of rice and yield.

Having been proved effective, the TPs should be disseminated to the whole Kambia district. Taking the current socio-economic situation in the rural areas of Kambia district into consideration, efforts to propagate the TPs should start as soon as possible.

(2) Further improvement of the TPs in combination with applied and field research

Although proved effective, there is much room for improving the TPs further. Among others, fertilizer management needs to be looked into. Through the two-year pilot project, it is realized that the profits derived from the increased yield of rice by the application of fertilizer hardly cover the fertilizer cost under the present economic conditions.

Currently, chemical fertilizers are expensive and not readily available, and most farmers cannot afford them. On the other hand, rational fertilizer application is almost the only way to increase the yield of crops significantly given the infertile soils in the region. Further, as only compound fertilizer and urea are available in Sierra Leone at present, the combination of nutrient amount recommended in the technical package developed by RRS-R is hardly realized by most farmers. Should the government intervene in the supply of fertilizer to support the farmers, it must make efforts to develop efficient ways of applying fertilizer.

Given the high cost, fertilizer management techniques should be examined further both by research and in the field. The least amount of fertilizer application to obtain the maximum yield, the optimal combination of three major elements (N, P, and K), the effects of micro-nutrients such as zinc and manganese on the growth of crops, the appropriate timing of fertilizer application, etc., should be studied and identified. Only then, appropriate fertilizer management techniques that are low cost but profitable could be devised and recommended. On-farm water control measures such as bund and drainage construction should also be promoted along with other improved practices especially in IVS to increase the efficiency of fertilizer absorption by crops.

(3) Further capacity building for MAFFS-K staff

Systematic agricultural extension activities have long been dormant at MAFFS-K. Most extension workers consider that their main duty is to deliver inputs and machinery services. Through the implementation of the pilot projects and the pilot trials, it was realized that the capacity of MAFFS-K staff was insufficient in general for technical extension work. For example, their knowledge in practical cultivation techniques of rice in relation to the crop's life cycle is rather limited. Also, extension materials such as technical manuals and guidebooks have never been available to them.

Moreover, they are lacking in the necessary calculation skill in agricultural extension. In the field, it is often necessary to convert the requirement of a specific nutrient per unit area into the fertilizer dosage and calculate the seed requirement using a certain variety under the given plant spacing and the number of seedlings per hill for the farmer's field. Although they were provided with a series of training in their calculation skill during the Project period, further capacity development is indispensable through training (both theoretical and practical) and experience.

(4) Adequate budget allocation to agricultural extension activities

Besides the capacity development for the agricultural extension staff, logistic support to allow them to make regular visits to farm areas has long been neglected. In the Project, many field extension workers were provided with a means of transportation and technical extension materials necessary for agricultural technical extension to the farmers under their responsibility. The Government of Sierra Leone should disburse necessary budgets for the extension workers to engage in agricultural extension services using the TPs.

(5) Standardization of measuring units

As reported in Part IV Annex 3.6, the volumetric weight of rice per bushel was found to vary from place to place in Kambia district. Despite the fact that the Government defines the volumetric weight of rice as 25kg per bushel, it varies from 29kg to 54kg in different locations in Kambia district. These differences can be attributed to the size of measuring containers used being not identical (e.g., boxes, three-pence pan, etc.) and the number of three-pence pans equivalent to one bushel being unequal depending on the location.

This customary measuring practice brought about various problems not only for the farmers but also for the Project. For example, the farmers usually express the area planted with rice and rice production in the number of three-pence pans or bushels of seed rice. As the volumetric weight of rice is unequal across the region, it is difficult to estimate accurate area and production. Also, some farmers end up receiving less money than they are entitled to by selling rice at a lower unit price because of the different measuring unit that is less favorable used by the trader or customer.

It is urged that the measuring units of rice be standardized as soon as possible. MAFFS should take the initiative in the standardization effort by defining the standard volume of a three-pence pan and the number of three-pence pans equivalent to one bushel. Dissemination of this standard is considered to be an important duty for the agricultural extension workers.

(6) Seed sourcing

One of the difficulties that the Project encountered during the pilot project implementation was to secure pure seed rice. The Project obtained seed rice from the Seed Multiplication Project at Kobia in the first year (2007) and RRS-R in the second year (2008). However, in both years, seeds that were considerably low quality and even those of different varieties were mixed, which seriously affected the pilot project.

If seed rice contain varieties of different maturity periods, it becomes quite difficult to determine the time of harvest. As a result, considerable losses in both the quantity and the quality of rice occur at harvest. In order to improve the quality of seed rice, the Government of Sierra Leone should enforce the supervision of seed production, as the seed multiplication is transferred to private sector.

(7) New approach to agricultural technical extension

As mentioned previously, the agricultural extension function is now supposed to be the responsibility of the local government under the decentralization policy. However, the local government is still lacking in both human and logistical resources to fulfill it.

Meanwhile, the Government of Sierra Leone has recently formulated the second Poverty Reduction Strategy Paper (SL-PRSP II), in which efforts to improve agricultural production are prioritized. To support the farmers, the improvement in agricultural research and extension service delivery is specifically highlighted. A new agricultural extension system is currently examined at MAFFS.

As proposed in Chapter 4, to facilitate the decentralization process, it is necessary to strengthen the capacity of the local government (District Council of Kambia) and MAFFS-K, support the SL-PRSP II process and to disseminate the Agricultural Technical Packages across Kambia district. It is recommended that the Plan be examined carefully, modified if necessary and implemented as soon as possible.

Annexes

- Annex 1 Record of Discussion
- Annex 2 Project Design Matrix and Plan of Operation
- Annex 3 List of Equipments Provided by the Japanese
Government
- Annex 4 List of Project Members

Annex 1 Record of Discussion

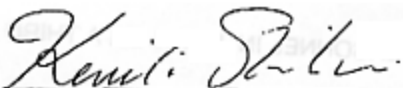
RECORD OF DISCUSSIONS BETWEEN
THE JAPAN INTERNATIONAL COOPERATION AGENCY
AND
AUTHORITIES CONCERNED OF THE GOVERNMENT
OF THE REPUBLIC OF SIERRA LEONE
ON JAPANESE TECHNICAL COOPERATION
FOR THE AGRICULTURAL DEVELOPMENT PROJECT IN KAMBIA

Resident Representative of Japan International Cooperation Agency (hereinafter referred to as "JICA") Ghana Office made discussions for the purpose of working out the details of the technical cooperation program concerning the Agricultural Development Project in Kambia (hereinafter referred to as "the Project") in the Republic of Sierra Leone.

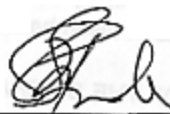
JICA exchanged views and had a series of discussions with the Sierra Leonean authorities concerned with respect to desirable measures to be taken by JICA and the Government of the Republic of Sierra Leone for the successful implementation of the above-mentioned Project.

As a result of the discussions, JICA and the Sierra Leonean authorities concerned agreed on the matters referred to in the document attached hereto.

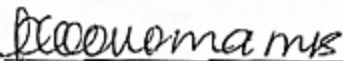
Freetown, Sierra Leone, 18 November, 2005



Mr. Kenichi Shishido
Resident Representative
Ghana Office
Japan International Cooperation Agency



Hon/Sama S Monde, Ph.D.
Minister
Ministry of Agriculture, Forestry and
Food Security
The Republic of Sierra Leone



Mrs. Konah C. Koroma
Development Secretary
Ministry of Development and Economic
Planning
The Republic of Sierra Leone

THE ATTACHED DOCUMENT

I. COOPERATION BETWEEN JICA AND THE GOVERNMENT OF THE REPUBLIC OF SIERRA LEONE

1. The Government of the Republic of Sierra Leone will implement the Agricultural Development Project in Kambia (hereinafter referred to as "the Project") in cooperation with JICA.
2. The Project will be implemented in accordance with the Master Plan, which is given in Annex I.

II. MEASURES TO BE TAKEN BY JICA

In accordance with the laws and regulations in force in Japan, JICA will take, at its own expense, the following measures according to the normal procedures under the Technical Cooperation Scheme of Japan.

1. DISPATCH OF JAPANESE EXPERTS

JICA will provide the services of the Japanese experts as listed in Annex II.

2. PROVISION OF MACHINERY AND EQUIPMENT

JICA will provide such machinery, equipment and other materials (hereinafter referred to as "the Equipment") necessary for the implementation of the Project as listed in Annex III. The Equipment will become the property of the Government of the Republic of Sierra Leone upon being delivered C.I.F. (cost, insurance and freight) to the Sierra Leonean authorities concerned at the ports and/or airports of disembarkation.

3. TRAINING OF THE SIERRA LEONEAN PERSONNEL IN JAPAN OR A THIRD COUNTRY

JICA will receive the Sierra Leonean personnel connected with the Project for technical training in Japan or a third country(ies) according to the necessity.

III. MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE REPUBLIC OF SIERRA LEONE

1. The Government of the Republic of Sierra Leone will take necessary measures to ensure that the self-reliant operation of the Project will be sustained during and after the period of Japanese technical cooperation, through full and active involvement in the Project by all related authorities, beneficiary groups and institutions.
2. The Government of the Republic of Sierra Leone will ensure that the technologies and knowledge acquired by the Sierra Leonean nationals as a result of Japanese technical cooperation will contribute to the economic and social development of the Republic of Sierra Leone.
3. The Government of the Republic of Sierra Leone will grant in the Sierra Leonean privileges, exemptions and benefits as listed in Annex IV and will grant privileges, exemptions and benefits no less favorable than those granted to experts of third countries or international organizations performing similar missions to the Japanese experts referred to in II-1 above and their families
4. The Government of the Republic of Sierra Leone will ensure that the Equipment referred to in II-2 above will be utilized effectively for the implementation of the Project in consultation with the Japanese experts referred to in Annex II.
5. The Government of the Republic of Sierra Leone will take necessary measures to ensure that the knowledge and experience acquired by the Sierra Leonean personnel from technical training in Japan or a third country(ies) will be utilized effectively in the implementation of the Project.
6. In accordance with the laws and regulations in force in the Republic of Sierra Leone, the Government of the Republic of Sierra Leone will take necessary measures to provide at its own expense:
 - (1) Services of the Sierra Leonean counterpart personnel and administrative personnel as listed in Annex V;
 - (2) Land, buildings and facilities as listed in Annex VI;
 - (3) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the Equipment provided by JICA under II-2 above;
 - (4) Means of transport and travel allowances for the Japanese experts for official travel within the Republic of Sierra Leone;

- (5) Suitably furnished accommodation for the Japanese experts and their families;
7. In accordance with the laws and regulations in force in the Republic of Sierra Leone, the Government of the Republic of Sierra Leone will take necessary measures to meet:
 - (1) Expenses necessary for transportation within the Republic of Sierra Leone of the Equipment referred to in II-2 above as well as for the installation, operation and maintenance thereof;
 - (2) Customs duties, internal taxes and any other charges, imposed in the Republic of Sierra Leone on the Equipment referred to in II-2 above; and
 - (3) Running expenses necessary for the implementation of the Project.

IV. ADMINISTRATION OF THE PROJECT

1. The Director General of the Ministry of Agriculture, Forestry and Food Security (hereinafter referred to as "MAFFS"), as the Project Director, will bear overall responsibility for the administration and implementation of the Project.
2. The District Director of MAFFS in Kambia as the Project Manager will be responsible for the managerial and technical matters of the Project.
3. The Japanese Chief Advisor will provide necessary recommendations and advice to the Project Director and the Project Manager on any matters pertaining to the implementation of the Project.
4. The Japanese experts will give necessary technical guidance and advice to the Sierra Leonean counterpart personnel on technical matters pertaining to the implementation of the Project.
5. For the effective and successful implementation of technical cooperation for the Project, a Project Steering Committee will be established whose functions and composition are described in Annex VII.

JOINT EVALUATION

Evaluation of the Project will be conducted jointly by JICA and the Sierra Leonean authorities concerned, during the last six months of the cooperation term in order to examine the level of achievement.

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VI. CLAIMS AGAINST JAPANESE EXPERTS

The Government of the Republic of Sierra Leone undertakes to bear claims, if any arises, against the Japanese experts engaged in technical cooperation for the Project resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in the Republic of Sierra Leone except for those arising from the willful misconduct or gross negligence of the Japanese experts.

VII. MUTUAL CONSULTATION

There will be mutual consultation between the JICA and the Government of the Republic of Sierra Leone on any major issues arising from, or in connection with this Attached Document.

VIII. MESURES TO PROMOTE UNDERSTANDING OF AND SUPPORT FOR THE PROJECT

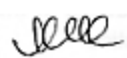
For the purpose of promoting support for the Project among the Sierra Leonean people, the Government of the Republic of Sierra Leone will take appropriate measures to make the Project widely known to the Sierra Leonean people.

IX. TERM OF COOPERATION

The duration of the technical cooperation for the Project under this Attached Document will be three (3) years from December, 2005.

- | | |
|------------------|--|
| ANNEX I | MASTER PLAN |
| ANNEX II | LIST OF JAPANESE EXPERTS |
| ANNEX III | LIST OF MACHINERY AND EQUIPMENT |
| ANNEX IV | PRIVILIGES, EXEMPTION AND BENEFITS FOR JAPANESE EXPERTS |
| ANNEX V | LIST OF SIERRA LEONEAN COUNTERPART AND ADMINISTRATIVE PERSONNEL |
| ANNEX VI | LIST OF LAND, BUILDINGS AND FACILITIES |
| ANNEX VII | PROJECT STEERING COMMITTEE |

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ANNEX I MASTER PLAN

1. Title of the Project

Title of the Project is "the Agricultural Development Project in Kambia".

2. Coverage of the Project

The Project will be implemented in three (3) pilot sections in the Kambia district.

3. Objectives of the Project

3-1 Overall Goal

Productivity of food crops for self-sufficiency is increased in the Kambia district to contribute food security.

3-2 Project Purpose

The technical support system for farmers is strengthened with farmer's participation in the Kambia district.

4. Outputs of the Project

1. Institutional arrangement of the technical support system for farmers is formulated in the Kambia district
2. Technical package for improved agricultural productivities is established in model farmers
3. Guideline of the technical support system for farmers is developed and utilized in practice

5. Activities of the Project

- 1) Institutional arrangement of the technical support system for farmers is formulated in the Kambia district
 - (1-1) Research agricultural activities in the pilot sections in corporate with Rice Research Station in Rokupr
 - (1-2) Make immediate extension plans based on the above research
 - (1-3) Clarify role among stakeholders* for the technical support system for farmers (e.g. MAFFS, FBOs, Researchers, Donors)
 - (1-4) Hold regular meetings for stakeholders' coordination
 - (1-5) Accumulate relevant information in MAFFS district office for the technical support system for farmers
 - (1-6) Train the MAFFS extension workers on extension planning and management
- 2) Technical package for improved agricultural productivities is established in model farmers
 - (2-1) Identify appropriate agricultural technologies in corporate with Rice Research Station in Rokupr
 - (2-2) Introduce appropriate agricultural technologies to model farmers
 - (2-3) Introduce appropriate farming implement to model farmers(e.g. rice mills)
 - (2-4) Educate model farmers on post-harvest techniques
- 3) Guideline of the technical support system for farmers is developed and utilized in practice

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- (3-1) Make plans of pilot agricultural activities and implement them in the areas surrounding model farmers to develop the technical support system for farmers
- (3-2) Develop extension methods based on monitoring by extension workers
- (3-3) Make clear strategies of financial plans
- (3-4) Evaluate the technical support system for farmers and formulate extension plans

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ANNEX II LIST OF JAPANESE EXPERTS

- Chief Advisor / Extension Planning
- Project Coordinator / Agronomy
- Other experts will be dispatched when necessity arises (e.g. agricultural machinery installation, agricultural economics, farmer group organization)

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ANNEX III LIST OF MACHINERY AND EQUIPMENT

- Agricultural machinery, equipment and spare parts (e.g. rice mill, power tiller)
- Equipment for storage construction (e.g. cement, iron roof)
- Equipment for extension(e.g. vehicle, motorcycle)
- Teaching materials & communication equipment including audio-visual equipment
- Equipment for common and general use

The machinery, equipment and other materials to be provided are limited for those that are necessary for the transfer of technology and for implementing the project activities by Japanese experts and will be purchased in Sierra Leone.

The contents, specifications and quantity of the equipment to be provided each year will be discussed, in principle, every year by the Japanese experts and the Sierra Leonean counterpart personnel based on the annual plan of the Project, within the allocated budget for each fiscal year.

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ANNEX IV PRIVILIGES, EXEMPTION AND BENEFITS FOR JAPANESE EXPERTS

In Accordance with the laws and regulations in force in the Republic of Sierra Leone, the Government of the Republic of Sierra Leone will grant the following:

1. Exemption from income tax and other charges of any kind imposed on or in connection with the living allowances remitted from abroad for the Japanese experts.
2. Exemption from income tax, export duties and any other charges imposed on personal household effects of the Japanese experts and their families, including one motor vehicle per expert.
3. The Government of the Republic of Sierra Leone will use all available means to provide medical and other necessary assistance to the Japanese experts and their families.
4. To issue, upon application, entry and exit visas for the Japanese experts and their families free of charge.
5. To issue identification cards to the Japanese experts and their families to secure the cooperation of all governmental organization necessary for the performance of their duties.

Exemption from custom duties for import and export of machinery and equipment by the Japanese experts in connection with the Project activities.

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ANNEX V LIST OF THE SIERRA LEONEAN COUNTERPARTS AND ADMINISTRATIVE PERSONNEL

For the successful conduct of the project, the Government of the Republic of Sierra Leone will assign the following members to the project;

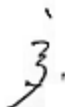
[Counterpart Personnel]

- (1) The Ministry of Agriculture, Forestry and Food Security(MAFFS)
 - a) Director General
 - b) District Director of MAFFS in Kambia
 - c) Full-time counterpart personnel in each of the following divisions:
 - Planning Evaluation Monitoring and Statistics
 - Land and Water Development
 - Block/Frontline Extension

[Administrative Personnel]

The Sierra Leonean side agreed to assign administrative support personnel to ensure the effective operation of the Project, and to make efforts to cover the remuneration of these support personnel as much as possible. The list of personnel as agreed is as follows.

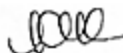
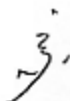
- Secretary
- Driver
- Other staff necessary for the implementation of the Project



ANNEX VI LIST OF LAND, BUILDINGS AND FACILITIES

The Government of the Republic of Sierra Leone will provide the following facilities to the project;

1. Land, buildings and facilities necessary for the project
2. Room and space necessary for installation and storage of equipments
3. Office space and necessary facilities for the Japanese experts
4. Other facilities mutually agreed upon as necessary



ANNEX VII PROJECT STEERING COMMITTEE

The Project Steering Committee (hereinafter referred to as "PSC"), which will consist of personnel from both the Japanese and the Sierra Leonean sides, will be established for the smooth and effective implementation of the Project.

1. Functions

PSC will meet once a year or whenever the necessity arises, in order to fulfill the following functions:

- (1) To formulate the Annual Plan of Operation of the Project,
- (2) To review the overall progress of the Project and achievement of the technical cooperation programme as well as the Annual Plan of Operation,
- (3) To review and exchange views on major issues arising from or in connection with the Project.

2. Composition

(1) Chairperson

Minister of the Ministry of Agriculture, Forestry and Food Security

(2) Members

a) Sierra Leonean side

- Permanent Secretary of the MAFFS
- Director General of the MAFFS
- Deputy Director General of MAFFS
- Representative, the Right to Food Secretariat/Office of the Vice President
- District Director of MAFFS in Kambia
- Representative, Rice Research Station in Rokupr
- Representative, Farmers in Agricultural Business Units (ABUs)
- Other personnel as required

b) Japanese side

- Japanese experts
- Representatives of JICA Ghana Office
- Other personnel relating to JICA activities, if necessary

c) Others

- Representatives from UNDP ABU Project
- Representative from FAO Farmer Field School Project
- Representatives from Development Partners, if necessary

Note: Officials from the Embassy of Japan may attend PSC as observers

Annex 2 (1) Project Design Matrix

February, 2008

Project area: Kambia District (mainly 7 pilot project villages)

Project period: February 2006-January 2009

Counterpart agencies: Ministry of Agriculture, Forestry and Food Security (MAFFS); MAFFS Kambia District Office (MAFFS-K); Rice Research Station, Rokupr (RRS-R)

Summary	Objectively verifiable indicators	Means of verification	Important Assumption
Overall Goal Productivity of food crops for self-sufficiency thereby contributing to food security in Kambia district is improved		MAFFS-K annual report	The agricultural policy aiming principally at improving domestic self-sustenance in food crops with rice as the main crop will not change.
Project Purpose Agricultural technical support system in Kambia district is strengthened	1. Progress in the institutional arrangements for agricultural extension at MAFFS-K 2. Progress in the preparation of agricultural technical package prototype for rice in each agro-ecology 3. Progress in the preparation of the agricultural technical support guidelines incorporating the measures for extension of the agricultural technical package	1. MAFFS-K annual report 2. Progress report /Project completion report 3. Progress report/ Project completion report	
Outputs 1. Agricultural support system of MAFFS-K is improved 2. Agricultural technical package to improve agricultural productivity is formulated 3. Agricultural technical support guidelines for farmers is developed	1.a. Progress in the provision of tools and equipment for agricultural extension at MAFFS-K b. The accumulate of information for the existing conditions of agricultural production and rural villages by chiefdom c. The records of agricultural extension workers in participating in training and workshops 2.a. The cultivation manual of rice for the pilot project areas b. Vegetable cultivation manual for the pilot trial district c. The manual for the maintenance and the use of the post-harvest processing machinery d. Economic analysis results of agricultural technical package 3. Implementation method and measures to disseminate the agricultural technical package to farmers in Kambia district	1a. Progress report/Project completion report b. Various survey reports c. MAFFS-K annual report 2. Progress report/Project completion report 3. Progress report/Project completion report	There will be no natural disasters caused by abnormal weather such as droughts and floods while the pilot projects are in progress.
Tasks/Activities 1.a. To understand the organizational and implementing structure of MAFFS-K and RRS-R b. To procure and arrange tools and equipment for MAFFS-K and RRS-R c. To conduct farm management and rural socioeconomic surveys (Baseline Survey) d. To conduct surveys in the related fields e. To conduct training 2.a. To conduct a pre-pilot project b. To formulate the implementation plan of pilot projects (including selection of target villages and model farmers, consensus building with the target villages) c. To procure and arrange tools and equipment for the pilot projects d. To formulate a draft agricultural technical package e. To implement and monitor the pilot projects f. To formulate a plan for the introduction of post-harvest processing machinery (including maintenance and management system and consensus building) g. To implement pilot trials on vegetable production h. To formulate a draft training plan for stakeholders i. To examine the direction of agricultural development in Kambia district 3.a. To examine implementing system necessary for the extension of the agricultural technical package b. To formulate agricultural technical support guidelines	<p style="text-align: center;">Inputs</p> <p style="text-align: center;">Japanese side</p> [Dispatched experts] - Leader/Agricultural development/Marketing - Extension/Farmers' organizing - Cultivation training (rice) - Cultivation training (field crops) - Post-harvest processing - Women's group support - Administrative coordination [Materials, tools and equipment] - Tools and equipment for MAFFS-K and RRS-R - Means of transportation for MAFFS-K extension workers - Books and reference materials related to agriculture and extension for MAFFS-K - Materials, tools and equipment for the pilot projects (e.g., fertilizer, seeds, rice mills, rice threshers, etc.) [Stakeholders training] Sierra Leone, Japan or other country	<p style="text-align: center;">Sierra Leonean side</p> [Counterpart personnel] - MAFFS-K - RRS-R [Physical facilities] 1. Project office 2. Shed for tools and equipment 3. Electricity, water and communication facilities [Local cost] - Expenses for the project implementation	<p style="text-align: center;">Pre-condition</p> Groups and individuals including model farmers, agricultural associations, NGOs, and women's groups in the pilot project areas will cooperate.

Annex 3 List of Equipments Provided by Japanese Government

(1) List of Fuel, Fund and Allowances

	items	unit price (Le)	unit price (\$)	unit price (yen)	Qty	amount (Le)	amount (\$)	amount (yen)	procurement	location	frequency of Use	Condition	
1	4WD vehicle	---	33,335	---	2	---	66,670	---	2006.6.2	MAFFS-K	daily	Good	
2	Motorcycle	---	3,050	---	24	---	73,200	---	2006.5.23	FEWs houses	daily	Good	
3	Projector	---	249	---	1	---	249	---	2005.6.22	MAFFS-K	daily	Good	
4	Desktop Computer	---	2,016	---	1	---	2,016	---	2006.5.22	MAFFS-K	daily	Good	
5	Desktop Computer	---	1,758	---	2	---	3,516	---	2006.8.31	MAFFS-K	daily	Good	
6	Laptop Computer	---	---	187,619	1	---	---	187,619	2007.3.6	MAFFS-K	daily	Good	
7	Color Printer	---	533	---	2	---	1,066	---	2006.5.22, 9.7	MAFFS-K	daily	Good	
8	Copier	---	4,500	---	1	---	4,500	---	2006.5.22	MAFFS-K	daily	Good	
9	Generator	---	14,413	---	1	---	14,413	---	1998.3.30	MAFFS-K	daily	Good	
10	Portable Generator (18.75KVA)	9,000,000	---	---	1	9,000,000	---	---	2006.10.20	RRS-R	daily	Good	
11	Portable Generator (2.5KVA)	1,700,000	---	---	1	1,700,000	---	---	2006.12.11	RRS-R	rechecking of the	---	
12	Rice mill (1000kg/ha)	9,000,000	---	---	1	9,000,000	---	---	2006.10.20	RRS-R	at project	Good	
13	Powertiller (8HP)	3,500,000	---	---	1	3,500,000	---	---	2007.3.5	RRS-R	daily	Good	
14	Air Conditioner	1,100,000	---	---	5	5,500,000	---	---	2007.3.12	MAFFS-K	daily	Good	
15	Furniture (desks and tables, etc)	1,600,000	---	---	1	1,600,000	---	---	2006.6.16	MAFFS-K	daily	Good	
16	Seed rice for pilot project	900,000	---	---	1	900,000	---	---	2007.3.7	Pilot Project (9)	at project	Good	
17	Fertilizer for pilot project 2007	150,000	---	---	38	5,700,000	---	---	2007.5.18	Pilot Project (9)	at project	Good	
18	Fertilizer for pilot project 2008	145,000	---	---	20	2,900,000	---	---	2008.5.22	Pilot Project (9)	at project	Good	
19	Hoe	22,000	---	---	10	220,000	---	---	2008.5.26	Pilot Project (9)	at project	Good	
20	Hoe	20,000	---	---	10	200,000	---	---	2008.5.29	Pilot Project (9)	at project	Good	
21	Hoe	18,000	---	---	10	180,000	---	---	2008.5.20	Pilot Project (9)	at project	Good	
22	Hoe	22,000	---	---	20	440,000	---	---	2008.6.4	Pilot Project (9)	at project	Good	
23	Shovel	20,000	---	---	6	120,000	---	---	2008.6.19	Pilot Project (9)	at project	Good	
24	Shovel	18,000	---	---	4	72,000	---	---	2008.8.28	Pilot Project (9)	at project	Good	
25	Rice mill	4,900,000	---	---	7	34,300,000	---	---	2007.3.12	Pilot Project (7)	at project	under in	
26	Thresher	2,660,000	---	---	7	18,620,000	---	---	2007.3.12	Pilot Project (7)	at project	under in	
27	Winnower	2,450,000	---	---	7	17,150,000	---	---	2007.3.12	Pilot Project (7)	at project	under in	
28	Watering can	145,000	---	---	4	580,000	---	---	2007.11.16	Pilot Trial (2)	at project	Good	
29	FAO Crop Guidelines	23,000	---	---	35	805,000	---	---	2007.2.10	MAFFS-K	daily	Good	
30	Rice and upland crop textbooks	---	---	189,450	1	---	---	189,450	2007.3.12	MAFFS-K	daily	Good	
	Total	37,393,000	59,854	377,069		112,487,000	165,630	377,069					
			Equivalent in USD			37,496	165,630	3288	Total Equivalent in USD 206,414				

(2) List of Equipment and Materials Provided by Japanese Government

		year	items	amount (Le)	amount (yen)	C/P
1	Baseline survey	2006	Fuel expenses and allowances for survey team		474,025	MAFFS-K
		2006.8.30	Fuel expenses and allowances for data input of the results	21,775,000		MAFFS(PEMSD)
		2006	Fuel expenses for rechecking for the results	2,025,000		MAFFS(PEMSD)
2	Pilot project	2007	Fuel expenses and allowances for C/P during preparation	6,311,000		MAFFS-K
		2006	Fund for implementing the pre-pilot project	3,370,000		MAFFS-K
		2007	Fuel expenses and allowances for monitoring 2007		57,585,000	MAFFS-K
		2008	Fuel expenses and allowances for monitoring 2008		34,620,000	MAFFS-K
3	Others	2006.Dec	Cost for the agricultural machinery surveys	4,014,000		MAFFS-K
		2007.2.15	Cost for the market surveys	2,328,750		MAFFS-K
		2007	Fund for the electrification of MAFFS-K	8,640,000		MAFFS-K
		2007	Fuel expenses for the generator of MAFFS-K 2007		10,552,500	MAFFS-K
		2008	Fuel expenses for the generator of MAFFS-K 2008		6,575,000	MAFFS-K
		2007	Cost for the market surveys	372,600		MAFFS-K
		2007	Cost for the vegetable survey and pilot trial 2007	2,092,000		MAFFS-K
		2008	Cost for the vegetable survey and pilot trial 2008	1,028,000		MAFFS-K
			Total	51,956,350	109,806,525	
			Equivalent in USD	17,319	957,629	
			Total Equivalent in USD	974,948		

Annex 4 List of Project Members

JICA Project Team

Name	Position	Affiliation
Tetsuo Mizobe	Team leader/ Agricultural development/ Marketing	RECS International Inc.
Takashi Kimijima	Deputy team leader/ Extension/ Farmers' organizing	RECS International Inc.
Junichi Yamaguchi	Cultivation training (rice)	RECS International Inc.
Junnosuke Harada	Cultivation training (field crops)	RECS International Inc. (Kaihatsu Management Consulting Inc.)
Hideo Watanabe	Post harvest and handling (May 06 to Jun 06)	RECS International Inc.
Yorio Iitsuka	Post harvest and handling (Jan 07 to Mar 07)	RECS International Inc. (JDS)
Harunobu Inoue	Post harvest and handling (Jul 07 to Jan 09)	RECS International Inc.
Tomohiko Suganuma	Administrative coordination (Mar 06 to Jun 07)	RECS International Inc.
Azusa Mishima	Women's groups support/ Administrative coordination (May 07 to Jan 09)	RECS International Inc.

Sierra Leonean Side

Name	Position	Affiliation	Remarks
Patrick Hammer	Director General (Mar 06 to Jul 06)	MAFFS	
Emmanuel K. Allieu	Director General (Mar 06 to Feb 08)	MAFFS	
Francis A.R. Sankoh	Director General (Feb 08 to Jan 09)	MAFFS	
B. J. Bangura	District Director of Agriculture (Mar 06 to Apr 06)	MAFFS-K	
Brima S/ Mansaray	District Director of Agriculture (Apr 06 to Feb 08)	MAFFS-K	
Brima A. Kanu	District Director of Agriculture (Feb 08 to Jan 09)	MAFFS-K	
Sayo Tarawalli	SMS	MAFFS-K	In charge of Kunthai PP
Fomba K.James	SMS	MAFFS-K	In charge of Robennah, Macothe PP
S.I.Turay	SMS	MAFFS-K	In charge of Robat PP
Salamu Saidu	SMS	MAFFS-K	In charge of Rosinor PP

A.B.S.Kabba	SMS	MAFFS-K	In charge of Kalintin, Sabuya PP
Idriss Foana	BES	MAFFS-K	In charge of Kunthai PP
E.E.Bangura	BES	MAFFS-K	In charge of Robennah, Robat, Macoth PP
Muminie Bangura	BES	MAFFS-K	In charge of Kalintin, Sabuya PP
R.J.F. Gbla	FEW	MAFFS-K	In charge of Kunthai PP
S.S.Kamara	FEW	MAFFS-K	In charge of Robennah PP
Joseph Sesay	FEW	MAFFS-K	In charge of Robat PP
F.B.Sei	FEW	MAFFS-K	In charge of Rosinor PP
D.M.Kamara	FEW	MAFFS-K	In charge of Macoth PP
B.K.Mansaray	FEW	MAFFS-K	In charge of Kalintin PP
J.M.Pessima	FEW	MAFFS-K	In charge of Sabuya PP
Lilian Kamara	Agricultural Instructor	MAFFS-K	In charge of Pilot Trial
J. B. Kamara	FEW	MAFFS-K	In charge of Pilot Trial
Abdulai Jalloh	Acting Director General	RARC	
Charles A. Dixon	Senior Research Scientist	RARC	
A.B.Kamara	Senior Research Officer	RARC	
M.S.Mansaray	Senior Research Scientist	RARC	

PP: Pilot Project

SMS: Subject Matter Specialist

BES: Block Extension Supervisor

FEW: Frontline Extension Worker

RARC: Rokupr Agricultural Research Center, Former RRS-R (Rice Research Station, Rokupr)