D. Session 2
(Agricultural Development Projects by JICA)

1. Title: “Sustainable Development and Promotion of Rice for Food Security in Ghana”
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2. Title: “Outline of Kilimanjaro Agricultural Training Centre Phase II Project”
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SEMINAR ON PROMOTION OF RICE PRODUCTION AND DISSEMINATION IN AFRICA:

PAPER ON SUSTAINABLE DEVELOPMENT AND PROMOTION OF RICE FOR FOOD SECURITY IN GHANA

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1. Introduction

Agriculture continues to play a central role in the social and economic life of the nation. In 2000, the agricultural sector directly employed about 65% of the work force, accounted for 41% of total export volume and contributed 41% to Gross Domestic Product (GDP),. It is estimated that only about 35% of the "arable land area" of 13.6 million ha is actively cultivated, leaving in most zones scope for expansion.

The country is and will continue to remain heavily reliant on rainfed crop production for its food supply. Indications are, however, that the rainfall pattern is deteriorating over time leading to greater food insecurity. Even in areas where total seasonal rainfall is adequate on average, it may be poorly distributed during the year and variable from year to year.

Implications are that, the outlook for the food security of many developing nations including Ghana is a cause for serious concern. The problem of food security is exacerbated by the rapid growth of population and hence of the increase in demand for food. Provided that it is economically viable, increased investments into technologies and crop production practices could become a key source of agricultural growth as well as of poverty alleviation for farmers who otherwise unduly depend on low and erratic rainfall. It would help to increase the productivity of land, reduce, albeit to a limited extent, the need for extending the cultivated area for feeding the rapidly growing population.

Rice is among the four (4) major cereals, viz maize, millet and sorghum which are locally produced and consumed in Ghana. The demand far exceeds local production, resulting in large quantities being imported every year into the country.

Rice has become an increasingly important staple food commodity in the national economy of Ghana, due to the rising population, rapid urbanization, increasing per capita consumption, and trade liberalization. Despite the existing potential for increasing national rice production as a result of the presence of abundant favourable ecologies, Ghana imports about half of its rice requirements.

It has been estimated that the per capita consumption of rice has more than doubled from 14 kg/year in 1992 to 25 kg/year in 2000. The growing trend in the consumption of rice is due to increasing population, rapid urbanization, the relative ease of preservation and cooking, and the development of the rice trade as a result of trade liberalization.

Local rice production has varied between 70,000 and 150,000 tons each year in the 1990's with an average annual production of 130,000 tons over the last 5 years. Even though there are conflicting figures, it is estimated that imports have varied yearly between 150,000 – 250,000 tons. It is currently estimated that about US $100 million of scarce foreign exchange is spent on rice imports annually.

Rice demand has historically been met through local production, imports and food aid in Ghana. In the mid 1970's, Ghana was self-sufficient in rice, producing virtually 100% of its needs. For the last five (5) years, government's statistics show that the ratio has however been between 44-55%. It is worth noting that other statistical sources give self-sufficiency ratio of about 30-47%.

Table 1 (a)

(1) TOTAL RICE CONSUMPTION

(i) Average Annual Growth Rate (1983-92)	10.9%
Average Annual Consumption (1992)	223,000 mt
Average Annual Consumption (2000)	466,000 mt
(ii) Average Annual Consumption Per Capita (2000)	25 kg
Estimated Consumption (18 million population) 2000	450,000 mt

Table 1 (b)

TOTAL LOCAL RICE PRODUCTION

Total Rice Area (Approx.)	110,000 ha
National Average Paddy Yield	2 t/ha
Total Paddy Yield/Annum	220,000 t
Second Crop (Irrigated Rice)	10,000 ha x 3.5 t/ha = 35,000
Total Paddy Rice Production/Annum	255, 000 t
Total Polished Rice Production/Annum (60% Recovery)	153,000 mt
Rice Self-Sufficiency in Ghana	**34%**

** Ghana is thus able to supply only about one-third of its rice demand. (Dr. Oteng, UGARS)

2. RICE CULTIVATION PRODUCTION IN GHANA

2.1 Introduction

In Ghana, resource-poor farmers cultivate rice under a wide range of agro-ecologies. More than 75% of rice areas are under rainfed conditions. The annual rainfall varies between 800 to 2,400 mm and generally decreases from South to North and from West to East. The climate varies from the bi-modal rainfall equatorial type in the South to the typical mono-modal monsoon type in the North. The rainfed upland and hydromophic rice production is cultivated under the bush-fallow shifting cultivation systems. Rice is planted either as mono-crop or in a mixture with other food crops. In areas under bi-modal rainfall pattern, upland rice is planted in the main rainy season from March to July. Farm sizes in upland and hydromorphic areas are predominantly small to very small. About 60% of the farms are less than 1.2 ha. In rainfed and irrigated lowland areas, the farm sizes are much smaller, varying from 0.2 to 0.8 ha per farm and rice is planted as mono-crop; one crop per year under rainfed conditions and double crops under irrigated condition.

Most of the soils in the country are of low fertility. Much of the rain, especially at the start of the season, falls in intense storms of short durations causing heavy run-off, erosion and losses of soil fertility. The decline in the bush-fallow period associated with shifting land preparation is dominant and rice crops are exposed to a host of diseases, insects, and particularly weed competition. Rice yields in the country, therefore is still low. The incomes from rice production at present is low due to a combination of low rice yield, large post-harvest losses and low price of their rice, which is resulting from the use of inappropriate milling tools and equipment.

The Government of Ghana has given priority to a national programme aimed at attaining self-sufficiency in rice. The Government also established the Special Programme for Food Security since 1998 to help the farmers. Rice is a cash and food crop to the majority of farmers. Farmers in general consumed less than 30% of the rice produced and sell the remaining for needed cash. The increases in rice yield and production, therefore, could increase the incomes of farmers and reduce poverty in rural areas at the same time make rice more available to the population in major urban centres. The large quantity of rice that the Government has to import yearly to satisfy the population’s demand indicates that there is a ready and favorable market through which rice farmers in the country could sell their products at favorable prices. The increase in domestic rice production would enable the country to save foreign exchange from rice importation for the provision of basic services such as health care, education and reserved-food stocks for emergencies in order to reduce human insecurity.

2.2 Production Areas and Ecologies

Rice is produced in all the ten (10) regions of Ghana in three (3) major ecologies:

(i) Rainfed upland
(ii) Rainfed lowland/inland valley swamps
(iii) Under irrigation

The first two ecologies account for nearly eighty to eighty-five (80-85) percent of production. Yield levels are generally low 0.9 to 2.1 tons/ha except under irrigation where 4-6 tons/ha are obtainable.

The present national average rice yield (2.0 t/ha) is very low compared to the world average of 3.5 t/ha and is thus responsible in large part to the low rice self-sufficiency level (i.e. 30-47%) in Ghana. There is thus the need to increase productivity in the major rice production ecologies in Ghana, which are listed below.

	Average Paddy Yield (t/ha)	
	Present	Required
Rainfed Upland (Strict Upland)	1.0	1.5
Rainfed Lowland (Hydromorphic)	2.5	3.8
Irrigated Rice	4.5	5.5

Two species Oryza glaberrima and Oryza sativa are grown. Most varieties of Oryza glaberrima are often planted as upland rice by peasant farmers while varieties of Oryza sativa are grown as swamp rice.

The ecological types: irrigated, upland and inland valleys (midland and lowland)
Table 2.

	Irrigated	Upland	Inland Valleys		Total
1995			Valley Floors	Mid-Lower Slopes	
Areas (ha)	7,000	10,000	20,000	63,000	100,000
Yields	3.5	1.2	1.8	1.5	
Productions (t)	24,500	12,000	36,000	94,500	174,000
Output %	14	7	21	54	

	Irrigated	Upland	Inland Valleys		Total
2002			Valley Floors	Mid-Lower Slopes	
Areas (ha)	10,200	18,750	18,750	75,000	122,700
Yields	4.5	1	2	2.5	
Productions (t)	45,900	18,750	37,500	187,500	289,650
Output %	16	6	13	65	

Rice Production Data

1970s		**1980s**		**1990s**		**2000 –2010 (Projections)**	
Area (ha)	Production (tons)	Area (ha)	Production (tons)	Area (ha)	Production (tons)	Area (ha)	Production (tons)
78,000	73,000	116,000	105,000	130,000	281,000	214,000	535,000

The Rainfed Lowland (Hydromorphic) ecology represents about 75% of the rice area in Ghana and thus has the greatest influence in the determining national average rice yield. Hence an average paddy yield of 3.8 t/ha will approximately represent the national average. On the basis of a national average yield of 3.8 t/ha the annual production of milled rice could

increase from 153,000 mt to 271,800 mt per year. (Note that this includes second crop from 10,000 ha of irrigated fields).

This will represent 60% rice self-sufficiency, which is a major increase compared to the 30 - 47%. This option is achievable and must be pursued with great intensity.

2.3 Government Policy on Rice Promotion

In line with the objectives of the Ghana Poverty Reduction Strategy (GPRS), the Accelerated Agricultural Growth and Development Strategy (AAGDS), the Food and Agricultural Sector Development Programme (AgSSIP) of the Ministry of Food and Agriculture (MoFA), all of which seek to improve food security, reduce poverty and improve import substitution, the government has committed itself to boost domestic rice production, generate employment, save foreign exchange through import substitution, and reduce rice imports by 30% by the year 2004. Some of the government rice promotion projects are captured in the table below.

Rice Projects

Project	Institution/Agents	Activity	Remarks
Land conservation and small holder rehabilitation project	IFAD/MoFA	Low risk under production bunding off valley bottom	
Low risk project	World Bank/MoFA	Bunding of valley bottoms	
Lowland rice development project	AFD/MoFA	Water harvesting for rice production, input credit	1,100 ha developed, 2,500 farmers. Yield raised from 1.3 ton/ha to 2.5 ton/ha
Integrated water shed management in inland valley bottom Project (sawah)	JICA/CRI	Sample structional development at valley bottom and swamp	Increase in yields from 1 ton/ha to 3.4 ton/ha.
Inland valley rice development project	AfDB/MoFA		Yet to commence
Ghana irrigation development authority projects	GIDA/Various Donor Agents	Consolidation and improvement of the productive and marketing system	Low cropping intensity and deterioration of structures. Yields 4 to 6 ton/ha. Very high capacity for improvement.

2.4 The National Rice Development Committee

In order to achieve this aim of Government, MOFA inaugurated the National Rice Development Committee in 2002. The committee was charged to develop a wholistic programme for the increment of rice production to meet the requirements of government to achieve self sufficiency in rice production in the immediate future. The committee has proposed a plan with three components as follows:

a) Intensification of rice production in selected irrigation projects.
b) Conducting of a study leading to the mapping out of suitable areas for rice development projects in the rainfed lowland/hydromorphic ecology and updating of previous feasibility studies on irrigation projects earmarked for rice production.
c) Addressing the production, extension, processing and marketing needs of rice producing areas.

Emphasis will be placed in addressing the following issues:

- Import cuts will be programmed to avoid sudden shocks in the system
- Consumer tastes will be gradually required to shift to other commodities (i.e. maize, yams, plantain and cocoyams.
- Investors will be sensitized to invest in the rice business considering the huge potential market opened by the cuts.
- Government will direct investments to improve rice production technologies to achieve high yields and quality products under intensive and not extensive systems.

2.5 Short-term plan

It is important to look at the irrigation sector as the first option in the Government's attempt to reduce its rice import bill in the short-term.

The short-term plan focuses on irrigated ecology. Six irrigation projects have been selected to promote rice production under this plan. The irrigation projects are ICOUR, Afife, Dawhenya, Bontanga, Aveyime, IDA and Kpong Irrigation Project (KIP).

The objectives of this plan are:

- To increase local rice production through intensification of agronomic practices, with little or no area expansion
- To improve rice quality and increase local consumption
- To promote the production of *Bouake 189, Basmati var, TOX 3107* and *TOX 3108* and *GR 18* at the irrigation sites.

2.5.1 Strategies

- Intensify rice production the priority irrigation sites including following activities
- Rehabilitate the physical infrastructure of the irrigation sites
- Provide operation and maintenance (O&M) equipment
- Provide production credit to farmers
- Provide funding for paddy brokers
- Strengthen existing FBOs at the irrigation sites
- Conduct five (5) field training for 50 AEAs and farmers per irrigation site for 2 years.
- Organize stakeholder workshop for farmers processors and brokers quality requirements

2.5.2 Processing/Marketing

There is an urgent need to address the marketing problem of rice produced in the country. An aggressive marketing strategy needs to be adopted by training farmers, brokers and processors on branding, packaging and market pricing.

The thrust of rice improvement is to improve the quality of rice to the standard of the imported brand.

2.6 Medium-term plan
Development of rainfed lowland/hydromorphic ecology

In the medium-term, emphasis would be placed on the Rainfed Lowland/Hydromorphic ecology which is the most favoured ecology for increasing rice production in Ghana. The ecology has many attributes of which the following are important.

a) Most extensive ecology covering many great river basins
b) High natural soil fertility
c) Favourable plant water relationships
d) Next best average paddy yield (2.5t/ha) to the irrigated ecology (4.5t/ha)
e) Low risk ecology in terms of crop failure
f) Stands a good chance of raising productivity from 2.5t/ha to 3.8t/ha with improved technology.

It is estimated that the Rainfed Lowland/Hydromorphic area covers 75,000 ha. Out of the estimated area 60% is in the northern Ghana i.e. 45,000 ha.

Current projects and other identified to commence cover 7,900 ha, the remaining 67,100 ha will have to be developed. The task now is to embark on a survey to demarcate the areas which fall into this ecology and develop programmes to optimize their utilization

3. RICE PRODUCTION UNDER IRRIGATION: THE SSIAPP INTERVENTION

3.1 Irrigation Development and Rice Industry Promotion

Out of the 22 irrigation projects, 9 are mainly rice producing projects. Even though the area under irrigation for rice production is about 5,000-7,000 ha contributing about 16% of the rice production in the country, production under this ecology is not only more reliable and controlled but it produces good quality rice. It is projected that with improved technologies and 200% cropping intensity this can be raised to between 30-40% of the national production.

Intensification of rice production in selected irrigation projects is therefore considered as the short term thrust that will result in a tremendous increase in the rice production.

Currently, public irrigation schemes are operating at extremely low levels of efficiency due mainly to the deteriorated infrastructure, management weakness and lack of sense of project ownership by the primary beneficiaries. Consequently, the rice production system on these projects is poor and the industry is of minimum attraction to farmers. The system is characterized with low yields, mixed seeds, inappropriate technologies, poor marketing and quality. The consequences are that, the final product is unattractive to the consumers and cannot be compared with the imported rice.

Further to this notion a request was made by the Government of Ghana to the Government of Japan through JICA to assist in the improvement of irrigation practice. A technical co-operation was started in 1988, which later developed into a mini project and finally the Small-scale Irrigated Agriculture Promotion Project (SSIAPP) which is a project-type technical co-operation.

The main goal of SSIAPP is to establish a sustainable farming system for small scale irrigated farming and consequently to increase income of farmers on the two model projects (Ashaiman & Okyereko).

General achievements under the SSIAPP were established in all the outputs. The baselines surveys, component technology improvement, verification of farming systems, supporting systems and training collectively helped in the achievement of project purpose e.g. Improved capacity on irrigation farming technologies, management and training, and improved irrigation farming with transparent farming support systems.

The SSIAPP Follow-Up has been designed to extend the positive impacts experienced during the SSIAPP period to the other 20 irrigation projects. The overall goal is for the farming systems in all irrigation projects under GIDA to be improved.

The project purpose is to establish guidelines and strategies to improve the farming systems on each of the projects. The concept is in line with the GIDA strategy of farmer participation for sustainable crop production under irrigation.

3.2 Development of Rice Component technology:

Over a period of over five or so years, SSIAPP has taken upon it self the task of improving or developing technologies that, as it were, appropriate to rice cultivation at its two model sites. Certain activities were therefore lined up; and these were largely issues that were generated

from the low yields and poor quality of produce as in the baseline surveys carried out at the start of the project.

These include: -

i. Selection of appropriate rice varieties

Over fifty (50) varieties were collected from Phil Rice, WARDA, IRRI, ITTA, Japan (Japonica varieties), The Peoples Republic of China (Hybrid rice) and local varieties from the Universities, Research Institutions as well as indigenous varieties. These were screened and tried over a period of time and finally five promising varieties selected for multiplication and promotion on the irrigated projects. A rice catalogue was prepared.

ii. Study into tillage and leveling methods

Various cultivation/tillage methods were studied, and appropriate recommendations made. The hand tractor (Power tiller) with a leveling board attached was preferred and was therefore introduced. Manual leveling was also recommended.

iii. Establishment of Cultural Practices on Transplanting & Direct Sowing

Transplanting

Various experiments were conducted to confirm the appropriate procedures and practices that were to be adopted in the area of transplanting.

These were: - *Ideal seedling-age; Optimum number of seedlings for transplanting per hill and transplanting distances.*

Wet field Pre-germinated broadcast (Direct sowing)

Studies were also conducted into wet direct sowing as another cultivation option. This has proved successful in areas where labour cost is hire.

iv. Non- tillage rice cultivation

To cut down on production cost non-tillage system of production was introduced.

v. Salinity Investigations Trials

Salinity management trials under rice cultivation were conducted and salt tolerant rice varieties introduced.

vi. Establishment of Appropriate Fertilization Technology

Studies have been conducted into economic and efficient fertilization methods as well as maintenance and improvement of soil fertility using organic manure.

vii. Monitoring of Pest and Disease Occurrence and Damage:

Rice pests and diseases were identified and studies were also conducted on birds and rodents damage. Control measures for rice pests and diseases were established.

viii. Weed control methods

Weed control methods such as the use of herbicide, water level management on paddy fields, plant density and mechanical (hand pulling and use of rotary weeder) were experimented. Major weeds of paddy fields were identified. An album of weeds has been prepared.

ix. Others

Other cultivation methods that were studied into but were not recommended for various reasons were-:

- ❖ Dry direct seeding
- ❖ Ratooning

3.3 Verification Trials:

Verification of integrated technology was carried out on experimental plots, and verification of farming systems on farmer's fields. On farmer's fields, results indicated that yields of paddy increased from 4.5tonnes per ha. to 6.5 tones per ha. (transplanting method) and from 2.3 tones per ha. to 5.8tonnes per ha. (directly sown method). (see table 3a & 3b)

Table: 3a. Yield components (Transplanted)

Year	No.of panicles/hill	No.of panicles/m2	No.of spikelets/panicle	No.of spikelets/m2	% of ripened grains (%)	1000 grains weight (g)	Yield (t/ha)
2001	12.4	275.3	123.4	32,133	82.5	29.2	8.18
2000	10.2	226.4	117.9	26,693	90.8	27.6	6.65

Table: 3b. Yield components (Direct sowing)

Year	No.of panicles/m2	No.of spikelets/panicle	No.of spikelets/m2	% of ripened grains (%)	1000 grains weight (g)	Yield (t/ha)
2000	288	95.5	27,710	74.5	28.7	5.88

3.4 Supporting system for sustainable farming:

Sustainability was considered to be crucial if all the developments were to benefit the farmer. In this wise activities that were to sustain the system were evolved.

i. Seed production activity

With the support of SSIAPP seventeen (17) farmers were trained and registered as seed growers at Kpong Irrigation Project, the largest irrigation site in Ghana. Their activities are continuously being monitored.

Participatory seed production demonstration was conducted at both model sites, and at the end of it all some farmers were selected and trained to form the core of seed growers at the project model sites.

ii. Sensory Evaluation of some Rice Cultivars

To assist farmers maximize profit, marketing strategies like sensory evaluation of varieties are conducted periodically to assess consumer preference, in order to sustain production.

iii. Others

Respective units concerned handled other supporting activity i.e. input credit and machinery services.

3.5 Training and Extension System:

3.5.1 Extension system

Extension has been part and parcel of the SSIAPP activities from inception. The Rice Unit interacts with all rice farmers formally as well as informally. However, official extension lines instituted by SSIAPP during the five years implementation period were: -

i. Farming Systems Research and Extension

In this respect, the Rice Unit participated by conducting Farming Systems Preliminary Trials at both model sites. The trial was conducted to provide technical information and diagnosis of farmers' cultivation condition.

ii. Farmers' Field School

Field school for rice cultivation was held once a week for eleven (11) weeks running during the period of the farming systems preliminary trial.

iii. Rotary paddy weeder desermination

The Rice Unit collaborated with the Farm Machinery Unit to extend this technology to all rice cultivation sites under GIDA.

3.5.2 Training

A comprehensive training programme has been followed under both the SSIAPP and SSIAPP follow up. A kind of training which seeks to strengthen the capacity of farmers and more especially to extend the gains of SSIAPP to all other irrigation sites in Ghana.

National, regional and project site training were executed quarterly (4 times) last year for farmers and Extension Officers on all the 22 schemes under GIDA. In the case of rice farmers, eleven (11) sites were targeted. Again special practical rice technology training was organized for five (5) out of the eleven (11) rice projects, and one hundred and thirty –five (135) farmers benefited.

The purpose is of the training is to:

(i) To create the awareness of the farmers of their roles and responsibilities in the O&M of the projects for sustainability.

(ii) To increase crop and paddy production through the intensification of agronomic practices with little or no area expansion.

(iii) To improve rice quality and increase local consumption.

(iv) To promote the production of selected consumer driven varieties.

Over 2,500 farmers under different training programmes were conducted to build the capacity of farmers in various fields and were facilitated to actively participate in identifying and evolving solutions to problems on their projects to increase production

A national rice seminar was organized on the 4th of December 2002 under the project. The resource persons were invited from vital research, production and management institutions engaged in the rice industry in the country including GIDA. The main objective was to stress

the importance of the farmers and their organization in the rice industry and to highlight the role of GIDA in the industry.

4. THE NERICA PROGRAMME IN GHANA

4.1 Introduction

The low rice yields in the country, especially in rainfed upland and hydromorphic areas are due mainly to the low yield potential of the rice varieties, weed competition and declining soil fertility due to the shortening of the fallow period under the pressure of the increasing population. Recently, the West Africa Rice Development Association (WARDA) has developed a new generation of rice varieties by crossing O. g*laberrima* with O. *sativa* and named these varieties "New Rice for Africa" (NERICA). The major advantages are improved resistance to weeds, early maturing, high protein content, improved resistance to major biotic and biotic stresses related to upland rice in West Africa and suitability for low-input production systems. At present, the developed NERICA varieties are suitable only for rainfed upland and hydromorphic areas. However, breeding efforts are being continued by WARDA scientists and it is expected that new NERICA lines suited to rainfed and irrigated lowland areas are likely to be available soon.

4.2 Research Activities

In Ghana, the NERICA varieties have been introduced and tested in different regions since 1997 by the Research Institutions i.e. Crop Research Institute (CRI) Savanna Agricultural Research Institute (SARI) and the University of Ghana Agric Research station, Kade, (ARS-Kade). Based on the results from the participatory varietal selection and on-farm trials conducted during 2000-2002 period, the research systems in the country has identified the eight following NERICA lines to be suitable for rainfed upland and hydromorphic areas in the countries: WAB 450-I-P-157-1-1, WAB 450-24-3-2-P18-HB, WAB 450-I-B-P160-HB, WAB 450-I-B-P38-HB, W AB 450-I-B-P163-2-1, W AB 450-I-B-P163-4-1, W AB 450-5-1-BLl-DV6, and W AB 450-I-B-P133-HB. These lines produced yields that are equal to those of best local checks, but have shorter growth duration and better weed competitiveness than local varieties. The dissemination of these NERICA varieties coupled with efficient rice integrated crop management and rice-based cropping systems such as rice-cowpea, rice-leguminous crops, rice-cover crop could substantial increase rice yield and production. These activities, also, could stabilise the shifting cultivation systems for conservation of natural vegetation in upland and hydromorphic areas. Ghana is a member of the African Rice Initiative, which was established in 2002 to promote the transfer of NERICA to farmers.

Similarly, the National Research Systems has identified several high-yielding varieties of rice, which were developed by CG-Institutions. Rice varieties IRI2979-24-1, TOX 310856-4-2-2-2, WITA 3, WIT- A 4 and WIT -A 7 yielded 4 to 5 tonnes/ha under hydromorphic and rainfed lowland ecologies in the country. The improved variety Sikamo introduced from IIT A is becoming popular with rice farmers. The dissemination of these varieties with rice integrated crop management systems could increase yield, while reducing the cost in rice production. Moreover, the incomes of farmers could be further increased with the introduction of tools, implements for reduction of losses during post-harvest operations. The introduction of innovations in the transformation/processing of rice grains and biomass into value-added products would create rural employment opportunities.

4.3 The Special Programme for Food Security (SPFS) Strategy and Approach for Nerica Promotion

The long-term objective of this project is to contribute to the implementation of the Government's policies and priorities in the agricultural sector, in particular, food security and poverty alleviation of the rural population, through the dissemination of NERICA and improved rice varieties, rice integrated crop management systems, and technologies for the full utilization of rice grains and biomass to increase the productivity of rice production systems in the country.

The project has focused on increasing staple food (rice) production in low-input farming systems, through the introduction and dissemination of innovative and improved technologies to poor farmers and other vulnerable groups in the country under the framework of the Special Programme for Food Security (SPFS).

The country has a service to promote the seed industry including Nerica. However, the quantity of certified seed of rice produced by the private sector under the national seed industry is still very minimal; only about 200 tons/year. The Government of Ghana is promoting the formation of farmers' association to help farmers in matter relating to credit and input supply.

(1) *Adapted SPFS Participatory approach:* The SPFS participatory training and extension approach will be adapted to address the needs of poor farmers. The Farmer Field School (FFS) approach, which is based on non-formal adult education techniques and experiential learning will enhance farmers' capacity to take informed field management decisions.

(2) *Technical and financial assistance to Farmers' Associations:* The project development activities will be implemented through local Farmers' Associations with the objective of building their capacity to become self-reliant in the future.

4.4 Project's Objectives, Outputs and Activities

1: Transfer NERICA and improved rice varieties, and rice integrated crop management systems, to increase the productivity of rice production in rainfed upland, hydromorphic and lowland areas in Hohoe and Kadjebi Districts in Volta region, Kwaebibirem and Birim South Districts Eastern region, in Sefwi-Wiawso and Juabeso-Bia Districts in Western region, and Tolon-Kumbungu and Savelugu-Nanton Districts in Northern region.

2: Transfer appropriate equipment and tools for the harvest, post-harvest operations and the technologies for the transformation/processing of rice grains and biomass into value-added products.

3: Strengthening of the capacity of farmers' associations.

4: Strengthen the production and distribution including the seeds of NERICA varieties.

5. THE NERICA PROGRAMME AT IDC (SSIAPP)

Some preliminary trials on Nerica have been carried out at the Irrigation Development Centre as part of SSIAPP activities over the past four years. Nine interspecific rice varieties (sativa x glaberrima) developed at WARDA were brought to the centre for trial after the JICA Expert on Rice Cultivation had attended a workshop for rice researchers at Cote d'lvoire during the early part of the year 2000. The objective then was to observe the performance of these varieties under both upland and lowland (irrigation) conditions.

Results of the preliminary trial indicated that the Nerica varieties which were developed essentially for upland cropping, were largely more suitable as a rain fed crop, and therefore yields were higher (7tonnes/ha) under upland condition than under lowland condition (5tonnes/ha).

In 2001 the Ministry of Food and Agriculture (MoFA) requested SSIAPP to evaluate the yield of four (4) specific lines of Nerica at its experimental field at Ashaiman. Yields recorded were between 2-3 t/ha (Table 4 & 5).

Table 4: Preliminary Evaluation of NERICA varieties. (Dry season 2001 Ashaiman)

Varieties	No. of Tillers /hill	Plant ht. (cm)	Days from T/P to heading	Maturity (DAT)	Yield (kg)/ha
WAB 450-1-B-P-38-HB	14	104	52	87	2761
WAB 450-1-B-P-91-HB	24	105	56	89	1954
WAB 450-11-1-1-P31-HB	15	109	56	89	1742
WAB 450-1-B-P-160-HB	15	139	62	93	2251

Table 5: Yield components of NERICA varieties

Varieties	No. of Pani. /hill	No. of Spike./pani.	Ripening ratio (%)	1000 grains weight (g)	Yield (g)/m2
WAB 450-1-B-P-38-HB	11	158	90	40.7	1413.3
WAB 450-1-B-P-91-HB	11	164	74	29.3	868.3
WAB 450-11-1-1-P31-HB	13	190	73	28.5	1140.8
WAB 450-1-B-P-160-HB	13	241	79	29.0	1593.5

NERICA SEED MULITPLICATION AT IDC/SSIAPP

In March 2003, F.A.O in line with the UNDP's programme of Nerica development and extension requested the Ministry of Food and Agriculture (MoFA) Ghana, to multiply foundation seeds for supply to peasant farmers around the country. As a result of excellent facilities at Ashaiman, FAO through MoFA (Ghana) and JICA in collaboration agreed and requested SSIAPP to establish the seed multiplication project at IDC.

Following the request, SSIAPP received a total of 152 kg of foundation seed made up of eight (8) varieties of Nerica from two research institutions i.e. Crops Research Institute (CRI) and the Savannah Agricultural Research Institute (SARI) both in Ghana, and has carried out the multiplication of the eight (8) varieties.

Close examination of the material revealed that they were largely contaminated (see the picture below). Quality was not good enough and this was confirmed on the field during the growth stages.

Quality of seed that were produced however was at an unacceptable level since the foundation seed was largely contaminated. SSIAPP is at the moment waiting to receive fresh stock of foundation seed from WARDA to continue with the multiplication project. SSIAPP is also considering using the old stock and regenerating if on the field three times (3 times) over a period of one year. Complete selection of the regenerated material is possible to release higher quality seeds.

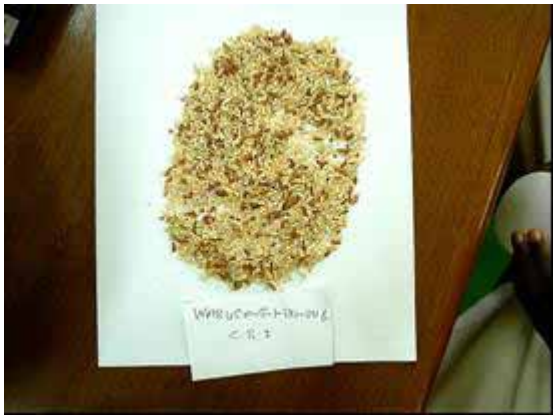


Fig.1. Husked seeds

As depicted below, production activities were carried out as follows: -

1.Land Preparation:

SSIAPP experimental field No.4 – 7 (approx. 0.8ha) were prepared for the seed multiplication.

Fig.2. Prepared field (No.5)

2.Raisaing of seedlings:

Nursery beds were prepared on one of the plots (No.6.), and pregerminated seeds sown.

Fig.3 Nursery

3.Transplanting of seedlings:

Well-developed seedlings at 21DAS were transplanted. Before transplanting, basal fertilizer (NPK) was applied, field puddle d and leveled, and a marker comb used to draw lines to guide in manual transplanting. Planting distance was 20 X 20cm. Single seedling was transplanted per hill.

Fig.4. Marking lines for T/P

Fig.5. Uprooting of the seedlings

Fig.6&7 Transplanting

4.Crop care and field maintenance:

Other agronomic practices like weeding and top-dressing of fertilizer (Nitrogen) were carried out following the normal recommendations. Plant growth was satisfactory but high percentage of off-types made rouging very difficult.

Fig. 8&9 Field at tillering stage.

5.Maturity and Harvesting:

An inspection of the field at maturity stage by a team of experts declared the fields unacceptable as a good material due to very high contamination of off-types as indicated earlier on. The crop was therefore harvested as food grain.

SEMINAR ON PROMOTION OF RICE PRODUCTION & DISSEMINATION IN AFRICA

SUSTAINABLE DEVELOPMENT AND PROMOTION OF RICE FOR FOOD SECURITY IN GHANA

Presenters: Sammy M. Akagbor *(Director Operations Department - GIDA)* & Albert F. Swatson *(Agronomist - GIDA)*

INTRODUCTION

AGRICULTURAL IN GHANA

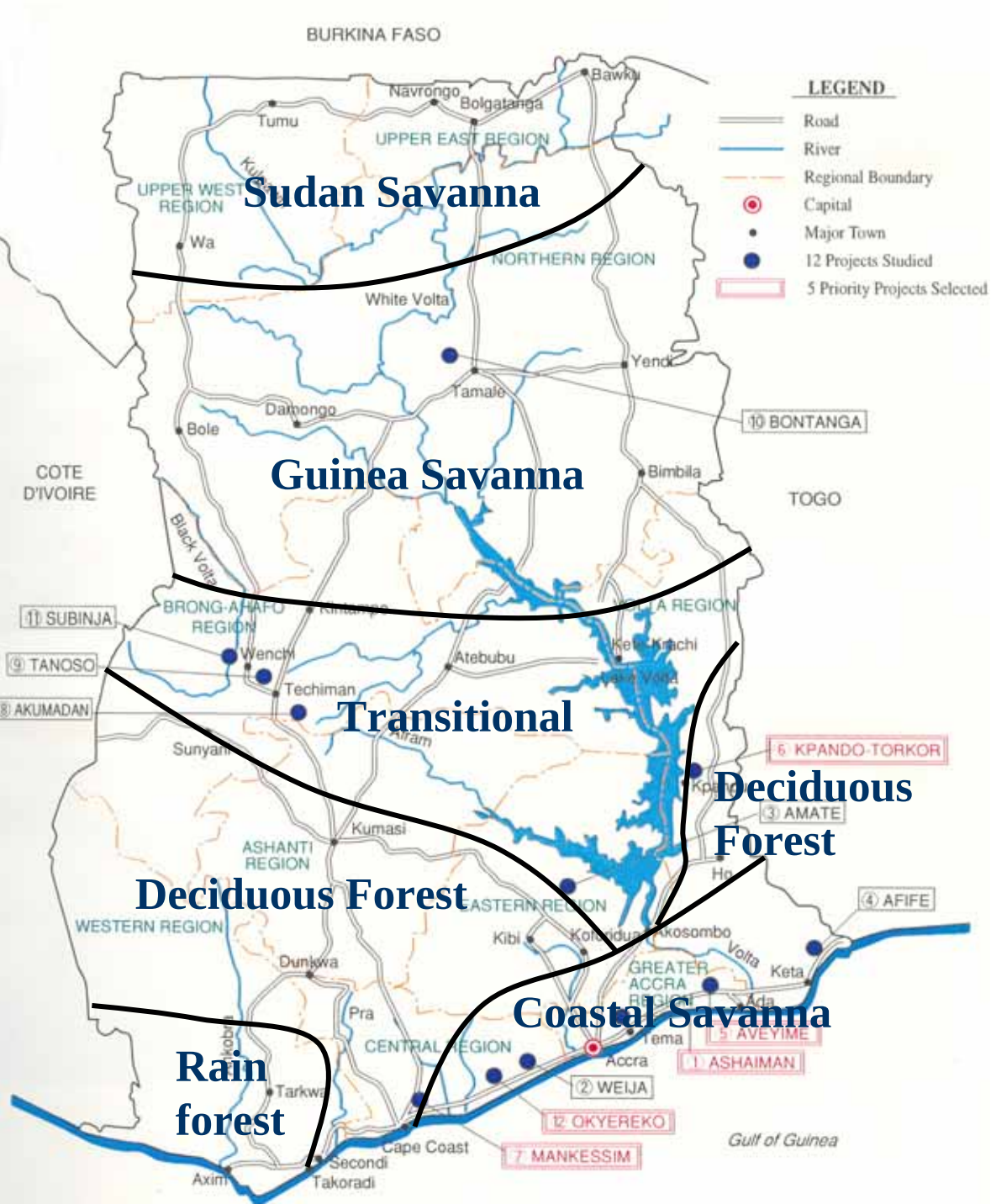
1. Agricultural & Food Security
2. Cereals for Food
3. Rice as Staple Food
4. Rice Production & Development
5. Rice Demand & Imports

RICE CULTIVATION IN GHANA

i. General - 75% under rain-fed conditions

ii. Rice production areas and ecologies

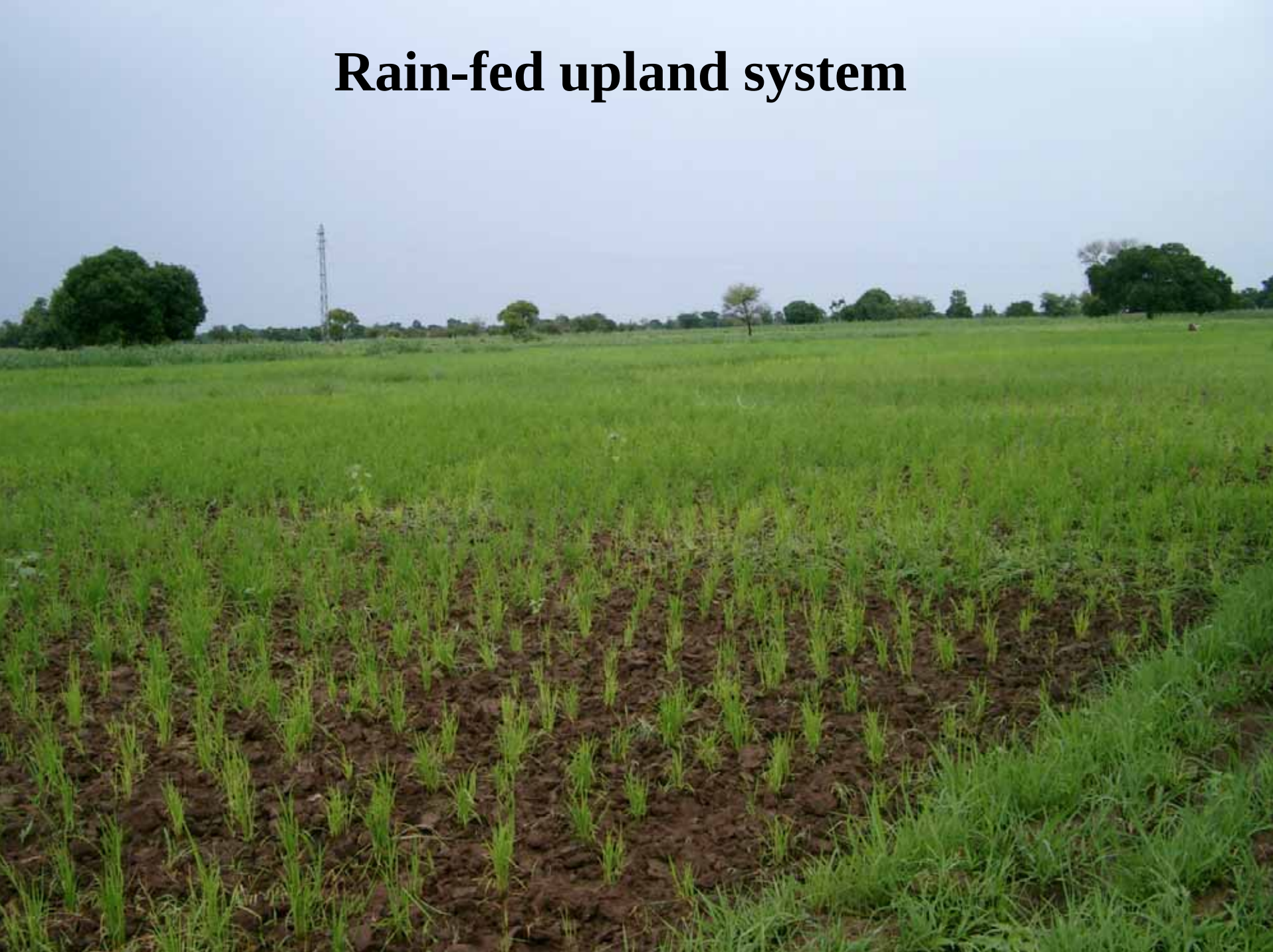
a) **Ghana Map**


BURKINA FASO
LEGEND
Road
River
Regional Boundary
Capital
Major Town
12 Projects Studied
5 Priority Projects Selected
Sudan Savanna
Guinea Savanna
Transitional
Deciduous Forest
Deciduous Forest
Coastal Savanna
Rain forest
Navrongo
Bawku
Bolgatanga
Tumu
UPPER EAST REGION
UPPER WEST REGION
Wa
NORTHERN REGION
White Volta
Yendi
Tamale
Damongo
Bole
10 BONTANGA
COTE D'IVOIRE
Bimbila
TOGO
Black Volta
11 SUBINJA
BRONG-AHAFO REGION
9 TANOSO
Wenchi
Techiman
Atebubu
8 AKUMADAN
Sunyani
Afram
6 KPANDO-TORKOR
3 AMATE
ASHANTI REGION
Kumasi
4 AFIFE
WESTERN REGION
EASTERN REGION
Kibi
Akosombo
Volta
Dunkwa
GREATER ACCRA REGION
Keta
Ada
Pra
CENTRAL REGION
Tema
5 AVEYIME
Accra
1 ASHAIMAN
2 WEIJA
Tarkwa
12 OKYEREKO
Cape Coast
7 MANKESSIM
Gulf of Guinea
Secondi
Takoradi
Axim


WESTERN SAHARA
ALGERLA
MAURITANIA
ENEGAL
MALI
AMBIA
NIGEL
GUINEA
BURKINA FASO
SIERA LEONE
COTE DIVOIRE
GHANA
BENIN
NIGERIA
LIBERLA
ACCRA


LOCATION MAP

Rain-fed upland system



Rain-fed upland to midland system


Rain-fed upland system

Bush fallow / Rain-fed upland to low land system

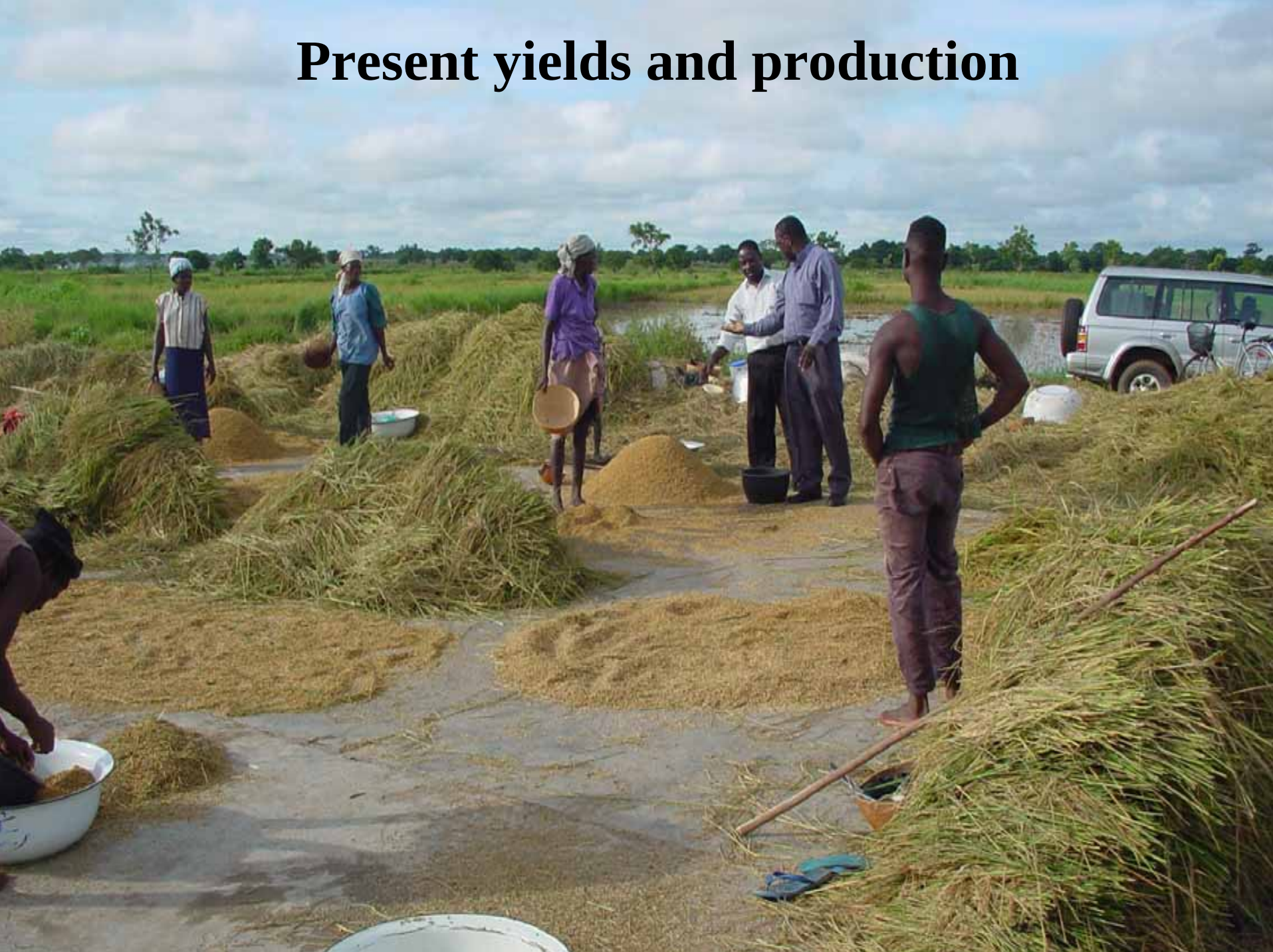
Rain-fed low land system

Rain-fed low land / valley bottom system

Irrigated areas

Post harvest handling (threshing)

Present yields and production



iii. Comparative ecological production capacities

	Irrigated	Upland	Inland Valleys		Total
1995			*Valley Floors*	*Mid-Lower Slopes*	
Areas (ha)	7,000	10,000	20,000	63,000	100,000
Yields	3.5	1.2	1.8	1.5	
Productions (t)	24,500	12,000	36,000	94,500	174,000
Output %	14	7	21	54	

	Irrigated	Upland	Inland Valleys		Total
2002			*Valley Floors*	*Mid-Lower Slopes*	
Areas (ha)	10,200	18,750	18,750	75,000	122,700
Yields	4.5	1	2	2.5	
Productions (t)	45,900	18,750	37,500	187,500	289,650
Output %	16	6	13	65	

GOVERNMENT POLICY ON RICE PRODUCTION

- **The Ghana Poverty Reduction Strategy (GPRS)**
- **Rice producing projects**

Project	Institution/Agents	Activity	Remarks
Land conservation and small holder rehabilitation project	IFAD/MoFA	Low risk under production bunding of valley bottom	
Low risk project	World Bank/MoFA	Bunding of valley bottoms	
Lowland rice development project	AFD/MoFA	Water harvesting for rice production, input credit	1,100 ha developed, 2,500 farmers. Yield raised from 1.3 ton/ha to 2.5 ton/ha
Integrated water shed management in inland valley bottom Project (sawah)	JICA/CRI	Sample structional development at valley bottom and swamp	Increase in yields from 1 ton/ha to 3.4 ton/ha.
Inland valley rice development project	AfDB/MoFA		Yet to commence
Ghana irrigation development authority projects	GIDA/Various Donor Agents	Consolidation and improvement of the productive and marketing system	Low cropping intensity and deterioration of structures. Yields 4 to 6 ton/ha. Very high capacity for improvement.

- **The national rice development committee**

  i) Objectives

  ii) Short term plan

  iii) Mid term plan


House of
REMMA


REMMA RICE
AFIFE
PERFUMED
RICE
PRODUCT OF GHANA
5 Kgs NET
DISTRIBUTED BY HOUSE OF REMMA
50 Kgs NET
PERFUMED
RICE
PRODUCT OF GHANA

RICE PRODUCTION UNDER IRRIGATION
(THE SSIAPP INTERVENTION)

- **Irrigation Development and Rice Industry**

  a) Production system

  b) Capacity of production

- **JICA Technical Assistance**

- **The SSIAPP**

  a) Component technology in rice

  b) Verification trial

  c) Supporting systems

  d) Training and extension

  e) The SSIAPP follow-up


SS1 APP(FU) ACTIVITY
Demonstration of Manual Rotary
Paddy Weeder.
-Afofi Irrigation Project.

THE NERICA PROGRAMME IN GHANA

- **Background**
- **Research activities**

  i) Participatory varietal selection (on-farm trial)

  ii) 9 varieties selected

  iii) Integrated cropping

  iv) Other varieties also developed (Tox 3108)

- **SPFS (Special Programme for Food Security)**
- **Strategies & approach to NERICA promotion and production**
- **Objectives & outputs**

THE NERICA PROGRAMME IN IDC (SSIAPP)

- Preliminary Activities
- NERICA activities for MOFA
- Stock seed for MOFA


Thank You

A CHALLENGE FOR PROMOTION OF IRRIGATED RICE CULTIVATION IN TANZANIA

KILIMANJARO AGRICULTURAL TRAINING CENTRE PHASE II PROJECT (KATC II)

Kilimanjaro Agricultural Training Centre Phase II Project (KATC II) is one of JICA's technical Cooperation Projects in Tanzania. The project commenced on 1st October 2001 and is planned to end on 30th September 2006.

Justification;
Many irrigation schemes in Tanzania have received heavy investments from the Government with a lot of donor support. However, where agronomic practices are not seriously addressed, productivity has stagnated or even declined over the years, therefore farmers have remained poor due to low incomes.

Project Purpose
KATC II Project aims at improving scheme management and rice productivity at farmer's level through residential and in-field training programs for scheme managers, technical personnel, and irrigators.

Approach
Six irrigation schemes, one from each irrigation zone, were selected and designated as "model sites". Project activities for each model site are conducted step by step as follows;

1. Field surveys using participatory approaches to identify training needs of farmers, scheme management and technical personnel.
2. A carefully selected group of 20 irrigators known as "key farmers" attend a three weeks irrigated rice cultivation course at KATC together with their scheme technical personnel. Knowledge and skills on improved rice cultivation, water management, fabrication and utilization of improved simple farming tools, management of farmers organizations, environmental issued, gender mainstreaming, farmer to farmer extension methods e.t.c. are taught through discussions and practical experiences.
3. In-field training in the model sites targeting groups of "intermediate farmers". These are five member groups of farmers formed through the initiatives of the key farmers, who are also the key players during in-field training.
4. Follow-up visits by KATC trainers to provide technical guidance and to check on implementation of action plans, demonstrations, and verification trials e.t.c.
5. "Farmer-to-farmer extension". Model sites taking the initiative to spread the technology to all the other farmers in the schemes applying the same techniques of forming small farmer groups and conducting result and method demonstrations. At the same time. District Councils using the model sites to spread the technology to all other schemes in the districts, and Zonal Irrigation Offices using the model sites to spread the technology to all other schemes in the zones.

Achievements;
All project activities have proceeded as planned. What remains is impact evaluation in those model sites where one or two seasons have elapsed since the first in-field training. Just from observation one can already see very clear positive changes in some of the model sites.

Problems;
Some model-sites have been badly affected by drought and have suffered severe water shortage during the last two seasons. Those schemes may take longer to register significant improvements in productivity of rice.

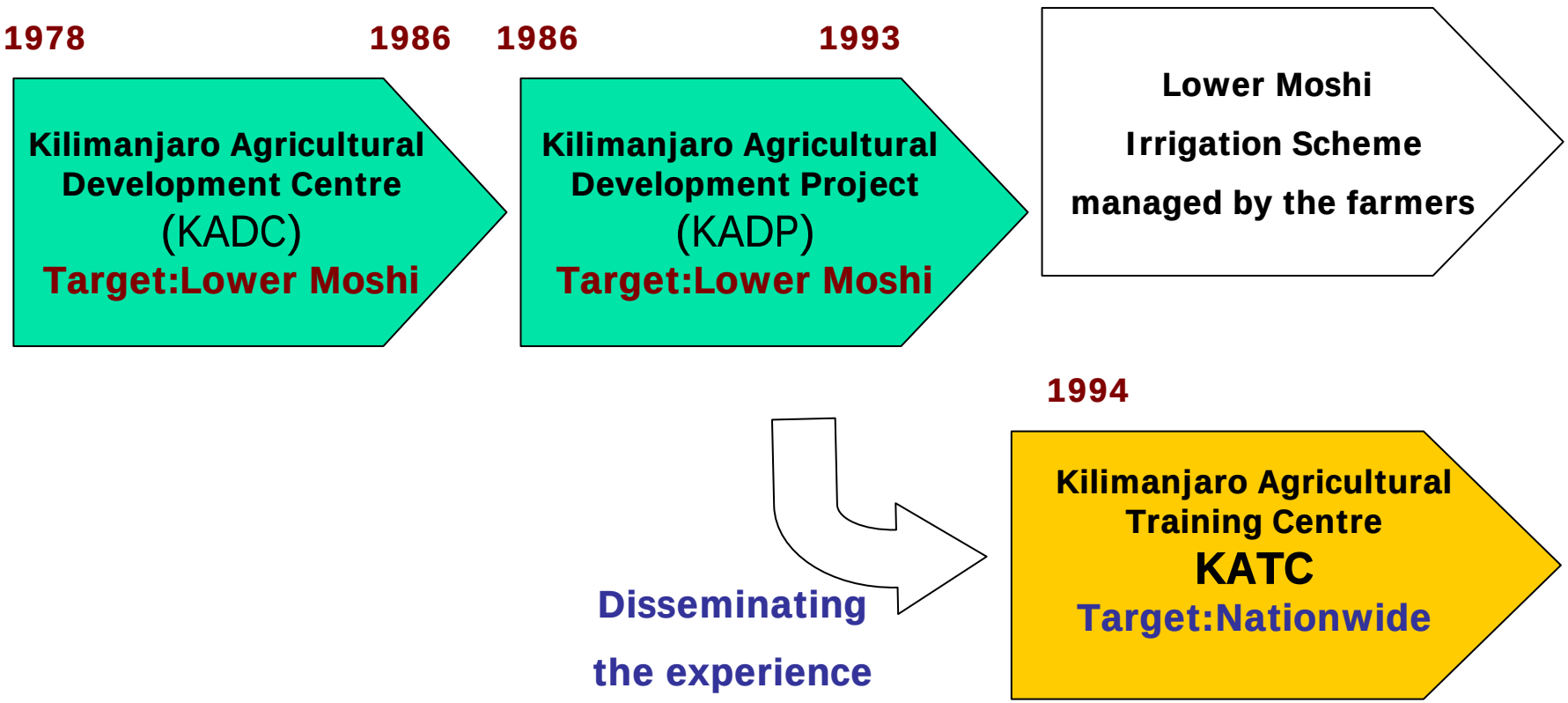
Future prospects;
Rice productivity increase in the model site should not be taken as an end in itself, but as a means toward rice productivity increase in all irrigation schemes in Tanzania. Therefore, the achievements in the model sites have to be disseminated to all other schemes starting from the schemes in the districts where the model sites are situated. This means that district councils have to play a very important role in disseminating the technology and the KATC approach to other schemes even after KATC II is over, using the model irrigation schemes as the base.

Kilimanjaro Agricultural Training Centre

Phase II Project

Kilimanjaro Agricultural Training Centre (KATC)

Before KATC II in Kilimanjaro



Lower Moshi Irrigation Scheme

Lower Moshi Irrigation Scheme

- Area: 1,100ha (Paddy)
  1,200ha (Upland crop)
- Managed by cooperative society
- No. of coop. members: 2,092
  (male: 1,632, female: 460)
- Main crop: Paddy
- Rice crop season: 3 seasons (overlapping)
  Jan/May, May/Sep, Sep/Jan
- Climate:

  Rainy season: March/May, Oct.

  Dry season: June/Feb.

  Rainfall: 500 to 800mm/year

  Mean Temp.: 21 to 26 centigrade
- Altitude: 800m above sea level

Rice Cultivation Standard in Lower Moshi

- Yield: about 5 to 6.5t/ha
- Varieties: IR54, IR64
- Line transplanting:
  20cmx20cm
- Young seedling
  (about 21 to 30 days)
- 2 to 3 seedlings/hill
- Fertilizer:
  N: 150kg/ha
  P_2O_5: 40kg/ha

KATC Project (Phase I)

- Project period:1994-2001
- Target groups: Extension officers, irrigation technicians, mechanisation officers, key farmers, etc.
- Type of training: Residential courses, Outreach course, Follow-up guidance
- Achievement: More than 2000 participants trained

KATC II Project Purpose (In Tanzania)

Productivity of rice increases in the model sites through the KATC's training.

Indicators

1. Increase Rice Yield

(Average rice yield per unit area of sample farmers in model sites increases by 9-24% by 2005)

2. Improve Efficiency of Rice Production

(By 2005, the net return rate from rice in all the model sites increases compared to those of 2002.)

(By 2005, properly irrigated area increases in all the model sites compared to those of 2002.)

Nakahuga (Mtwara Zone)

- Location: Songea Rural District, Ruvuma Region
- Area: 42 ha
- No. of Farmers: 45 (Male: 28, Female: 17)
- Main Crops: Paddy, Maize, Tobacco
- Rice Crop Season:
  1st: June to Nov.
  2nd: Dec. to April

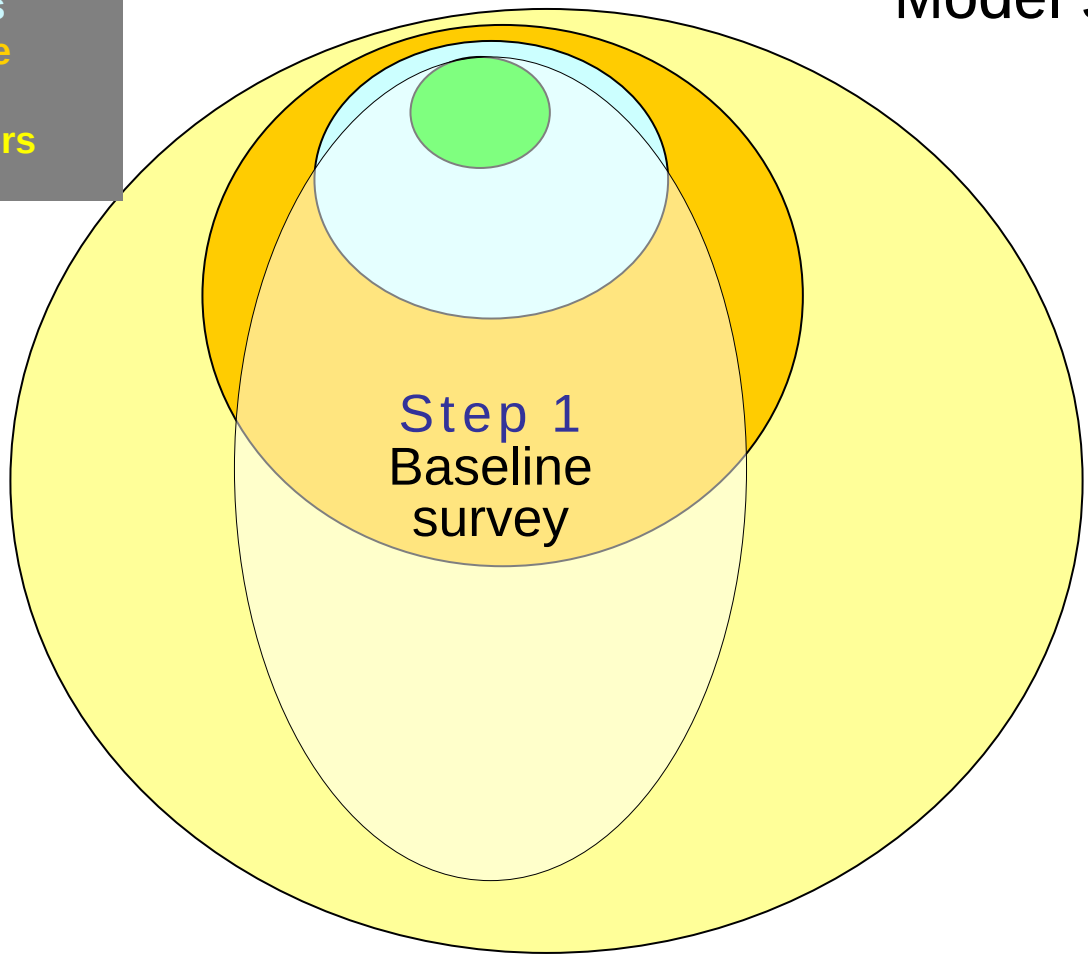
Identified Problems

1. Farming Tool
2. Market
3. Gender
4. Leadership

KATC II Approach (1)

Leaders and VEO
Key farmers
Intermediate farmers
Other farmers

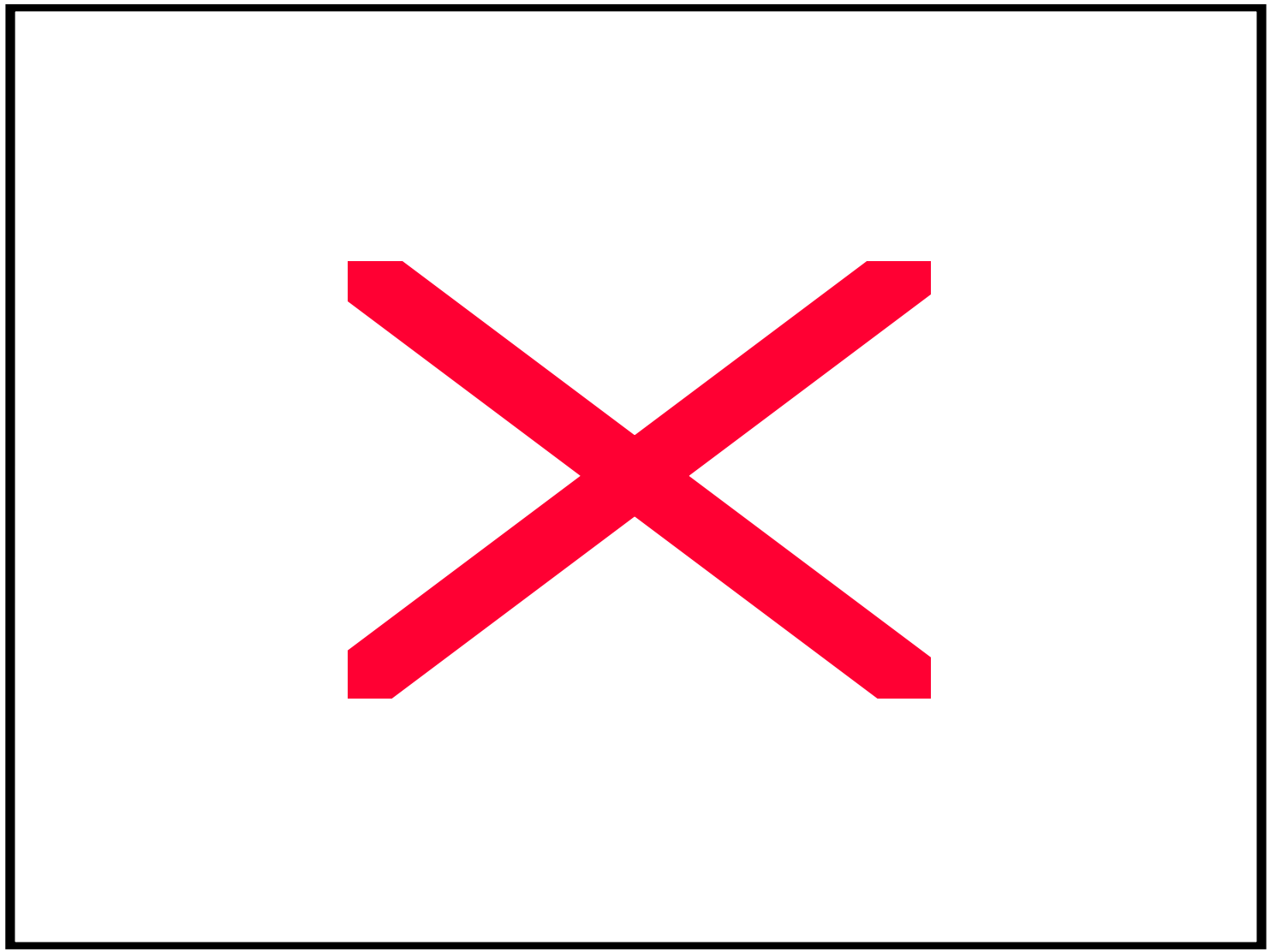
Model site



Baseline Survey

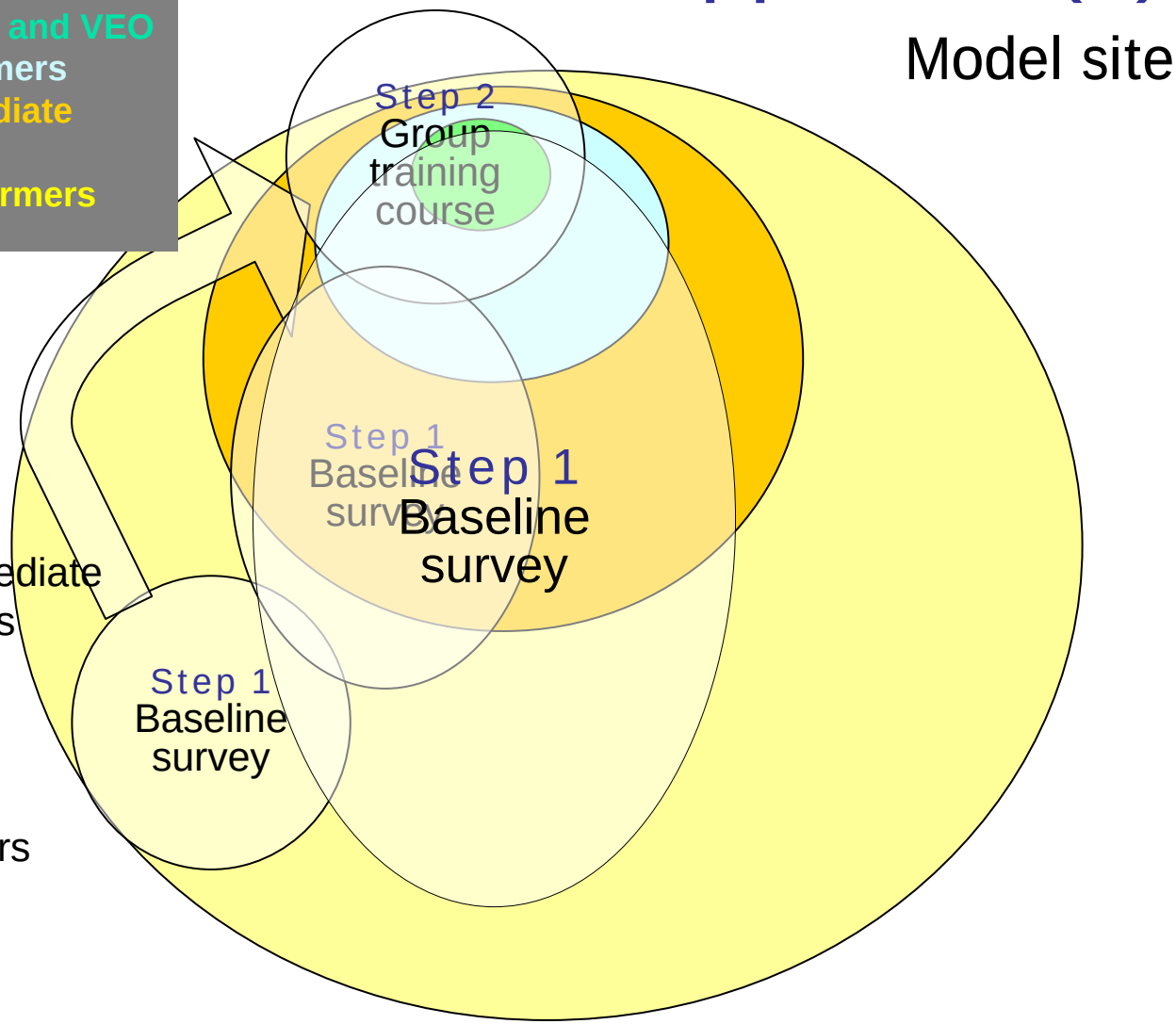
Participatory Learning and Action

Focus Group Interviews



KATC II Approach (2)

Leaders and VEO
Key farmers
Intermediate farmers
Other farmers

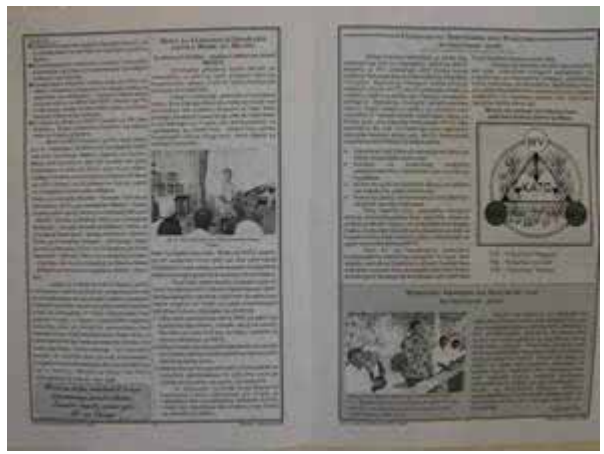


Residential training at KATC for key farmers

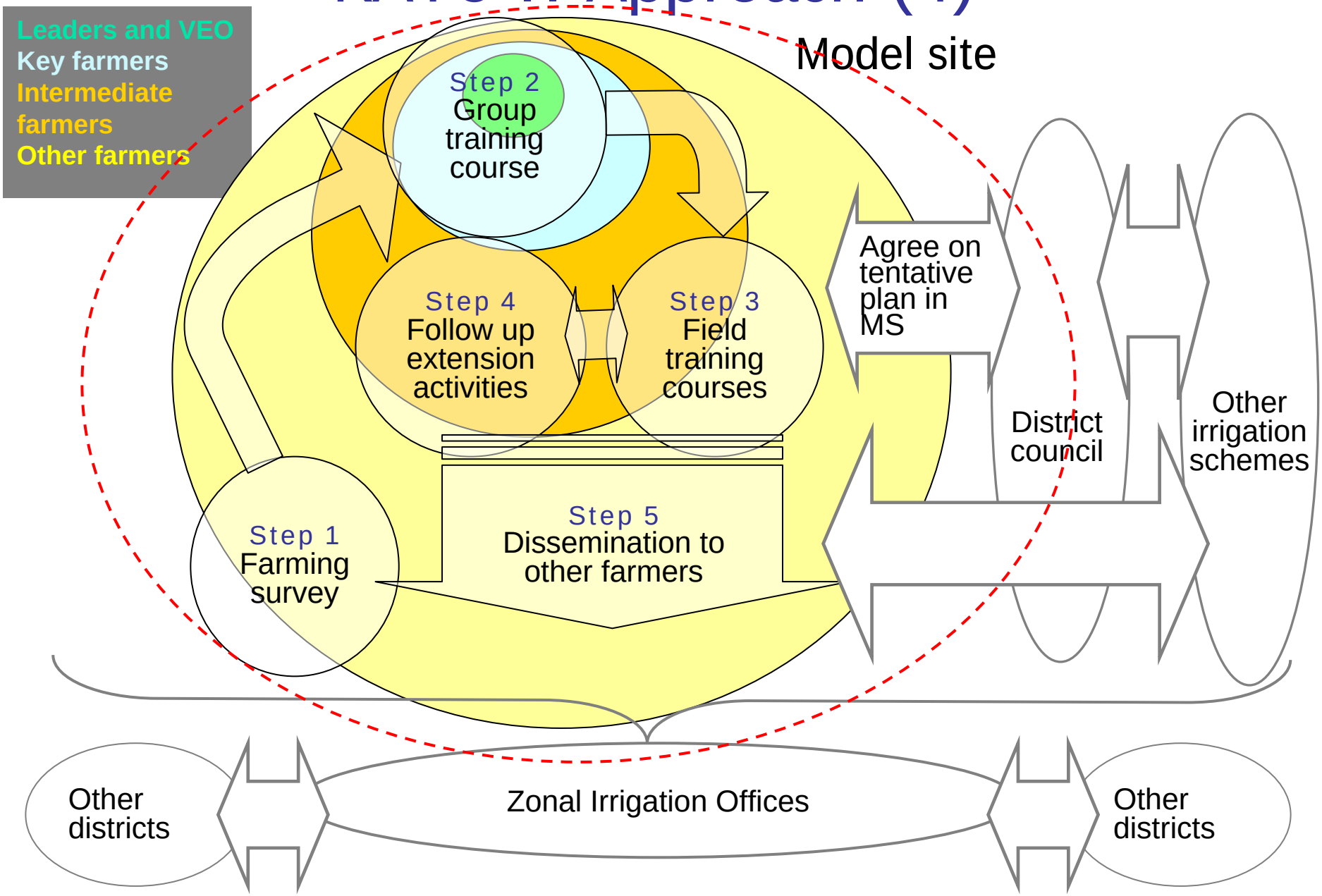
Information Dissemination

Disseminate Information to other farmers through;

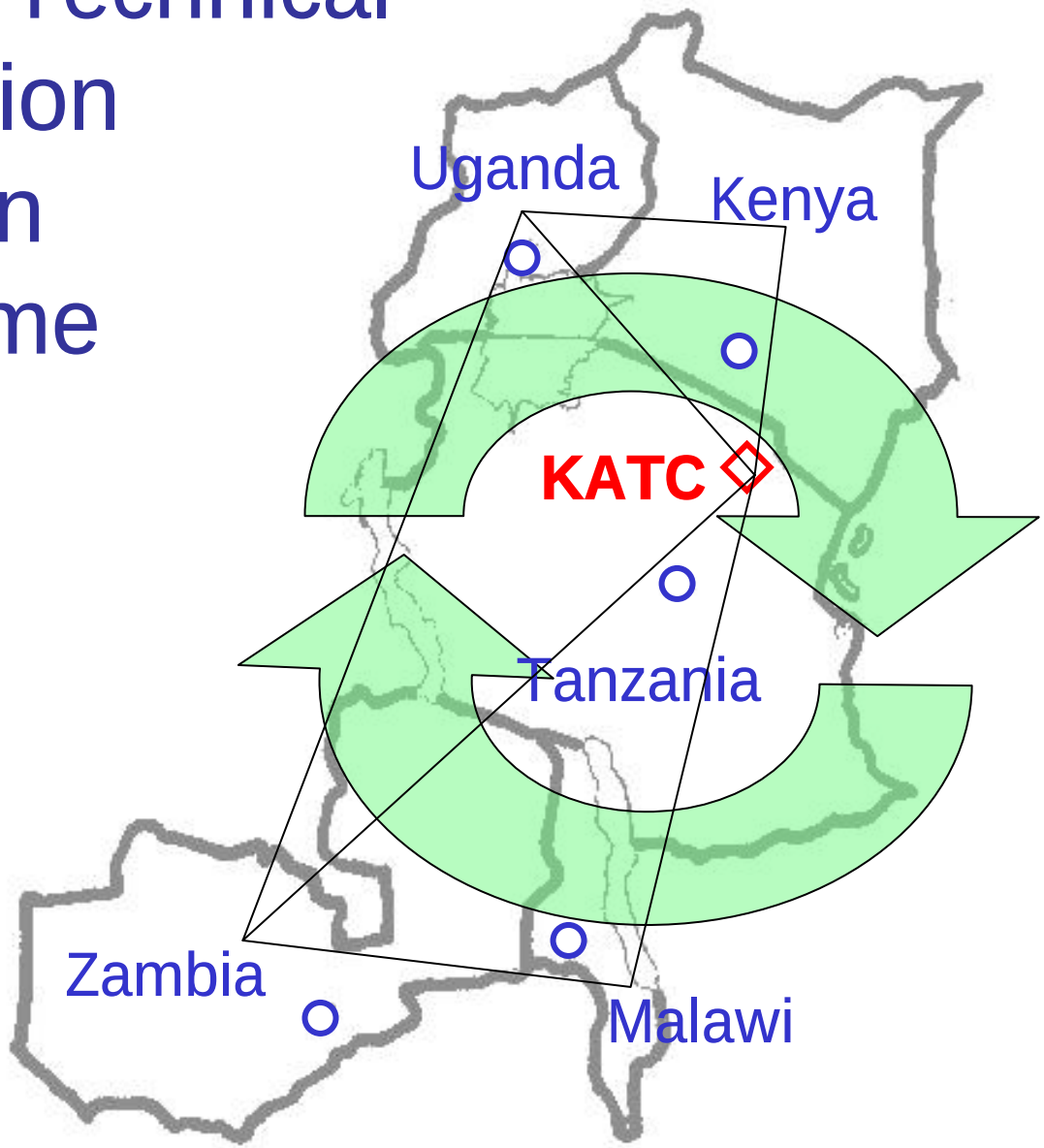
- Leaflets
- Flyers
- Newsletters
- Displays of demo. Plots
- Field Days and Farmers' Days
- Information boards, etc.



KATC II Approach (4)



Regional Technical Cooperation Promotion Programme



Key Farmers' Course for Zambia & Malawi