



**MULTI-AGENCY PARTNERSHIPS FOR TECHNICAL
CHANGE IN WEST AFRICAN AGRICULTURE.**

**NATIONAL WORKSHOP ON RICE PRODUCTION IN
GHANA.**

Held at Ho, Upper East Region, Ghana.

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INVITED PAPERS PRESENTED AT GHANA NATIONAL WORKSHOP AT HO

Foreword

The workshop was held as part of the Multi-Agency Partnerships research project which is investigating technical change in West African agriculture through the study of rice production systems in Mali, Nigeria and Ghana. Rice surveys are currently being carried out in all three countries and will be used to analyse the comparative constraints to rice production systems throughout the region. The papers presented here formed the formal framework for discussion during the three day workshop. The workshop drew together rice farmers, researchers, students and officials from the ministry of agriculture to discuss both the ongoing research and lessons that could be learned from current practice. The interaction and participation by rice farmers, their community groups and representatives provided a particularly positive forum for raising the diverse elements of rice production in the various local and cultural contexts throughout Ghana. These papers will provide a useful overview of many of the key issues affecting rice production in Ghana today and illustrate the characteristics of indigenous rice production and a number of examples of technical change that are being implemented in practice through the development of both strong group co-ordination and strengthened links between relevant institutions.

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PAPER 1: SOME FEATURES OF RICE PRODUCTION IN GHANA -GORDANA KRANJAC-BERISAVLJEVIC', UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

1.0 INTRODUCTION

Rice is important to Ghana's economy and agriculture, accounting for nearly 15% of the Gross Domestic Product (GDP). The rice producing area totals about 45% of the total area planted to cereals. The rice sector is an important provider of rural employment.

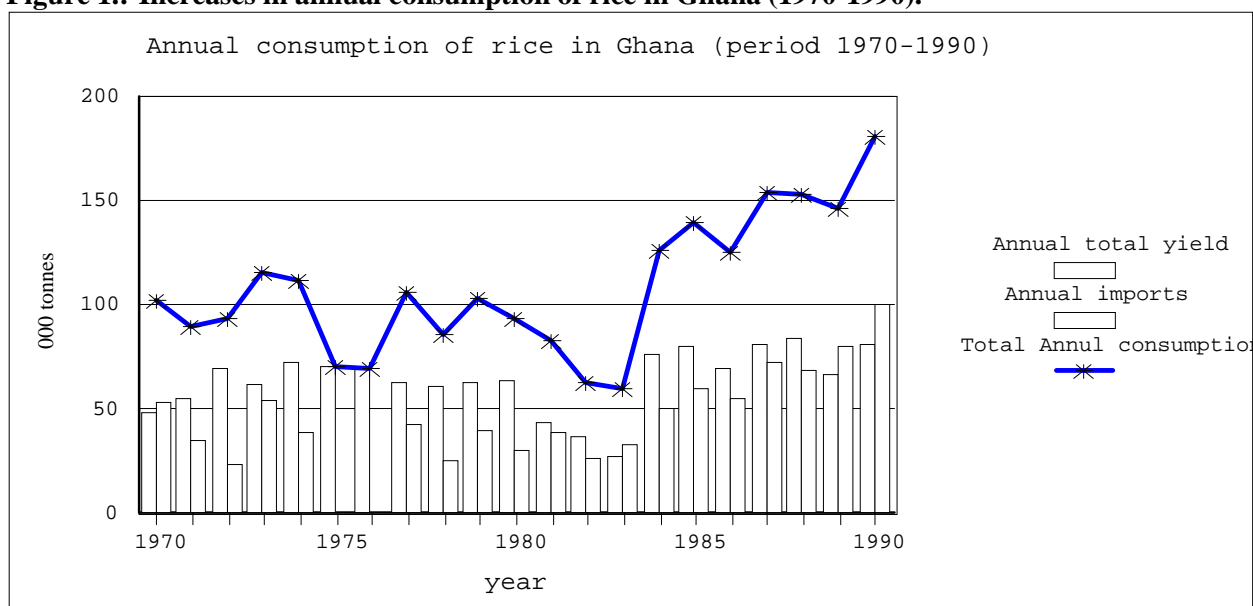
It was estimated that an annual average of 34 600 hectares of land area was under cultivation between 1960-64, with an annual average paddy production of 35,800 tonnes (Ibrahim, 1984).

Table 1: PRODUCTION ESTIMATES OF RICE IN GHANA VS. RICE IMPORTS (IN 000 METRIC TONNES)

YEAR	YIELD (1)	RICE IMPORTS (2)	TOTAL CONSUMPTION (1+2)
1970	49	53	102
1971	55	35	90
1972	70	24	94
1973	62	54	123
1974	73	39	112
1975	71	0	71
1976	70	0	70
1977	63	43	106
1978	61	25	86
1979	63	40	103
1780	64	30	94
1981	44	39	83
1982	37	26	63
1983	27	33	60
1984	76	50	126
1985	80	60	140
1986	70	55	125
1987	81	73	154
1988	84	69	153
1989	67	80	147
1990	81	100	181

Source: Statistical service: Quarterly Digest of Statistics (several issues), Ghana.

Figure 1.-Increases in annual consumption of rice in Ghana (1970-1990).



2.0 CHARACTERISTICS OF RICE CONSUMPTION IN GHANA

The perception that Ghana has low average annual rice consumption per capita, compared with most West-African countries, is a notion of the past. This could be said to have been the case when Ghana had consumption per capita of about 9kg, while the average for other countries in the same sub-region was 25kg. (Akanko, et al, 2000).

Imports of rice have been increasing steadily since 1980s, and are contributing more than 50% of all rice consumed in the country. The increase in demand can be attributed in a large part to rapid urbanization and ease of cooking and storage (Bimpong, 1998). Imported rice is also perceived to be of better quality than local rice and thereby reported to command higher prices.

Domestic production of rice in Ghana has been less than consumption needs, for a long period of time. Demand for rice began to outstrip supply due to population increase and improved standard of living. Unreliable production and marketing arrangements have also contributed to this situation. Consequently, government imports up to 200% of local production in order to compensate for the short fall in supply (Dogbe, 1996).

Rice is by every account an important crop in the Ghanaian staple diet and its availability throughout the year is of great importance, yet it will be very difficult for the country in present circumstances to achieve self-sufficiency in rice production. This could be achieved through area expansion or increased output per unit area. However, due to production constraints, such as land tenure problems, removal of subsidy on inputs, absence of water control systems which consequently leads to high-risk and non-intensive cropping practices. Other problems include low yields and low profitability, reduction of the productive capacity of the soil, coupled with over liberalization of rice trade in Ghana, locally cultivated rice is often unattractive to prospective buyers or consumers, and sometimes not available to them at all.

Table 2 below gives the average paddy rice production by region in Ghana for the period 1978-1980.

TABLE 2: PADDY RICE PRODUCTION REGION BY REGION IN GHANA FROM 1978-1980

REGION	QUANTITY (000 METRIC TONNES)	PERCENTAGE OF TOTAL PRODUCTION
Northern	170.0	61.0
Western	29.3	10.5
Eastern	22.3	8.0
Brong Ahafo	20.8	7.5
Volta	14.0	5.0
Upper East and West	14.0	5.0
Ashanti	4.2	1.5
Central	4.2	1.5
Totals	279.0	100.0

Source: Akanko, et al, 2000 (note that figures for Greater Accra Region are not available).

The bulk of rice comes from the Northern regions, as depicted by table 2 and 3 with the traditional mode of cultivation being lowland rainfed rice culture. (Ibrahim, 1981).

TABLE 3: PRODUCTION OF RICE IN NORTHERN REGION OF GHANA

DISTRICT	YEAR			
	1995	1996	1997	1998
Damango	2,922	2,636	1,950	8,600
Yendi	2,679	2,416	1,200	3,00
Bimbilla	609	521	200	200
Gusheigu/Karaga	7,652	11,550	4,400	4,000
Gambaga	1,013	813	280	100
Savelugu Nanton	5,264	7,905	5,040	1,000
Salaga	8,927	7,384	5,550	12,000
Tamale	19,137	4,000	2,800	4,000

Bole	2,435	2,088	1,650	22,000
Saboba/Chereponi	1,554	1,186	480	2,000
Tolon/Kumbungu	3,725	5,535	5,460	3,000
Walewale	2,679	2,235	960	2,000
Zabzugu/Tatale	1,299	1,120	550	800
Total	59,900	49,389	13,600	58,100

Source: Ministry of Food and Agriculture (MOFA) Policy Planning Monitoring and Evaluation Division-Northern Region, unpublished.

It has been recognised in Ghana that there is generally little incentive for farmers to take steps to improve the quality of their produce, as there is no price differentials based on quality. Despite the perceived inferior quality, farmers producing local rice seem to have little difficulty in selling their produce (NRI, 1997).

In a survey of rice preferences, the proportion of respondents reported that said they regularly purchase or consume local rice in the three (3) major cities, Tamale, Accra, Kumasi was 74%, 40% and 38% respectively (Bam et al, 1998). Nationally, there is a preference for imported rice (although in Northern Ghana the local parboiled rice is preferred). Local raw rice generally does not appear to compete well with imported rice, yet it is still preferred by many consumers for the preparation of local dishes. Locally produced rice from industrial mills associated with irrigation schemes is clean, white with a low percentage of broken grain (< 10%) and is on a par with some varieties of imported rice. Some of this rice is branded, graded and marketed competitively alongside imported rice in Accra markets (NRI, 1997).

3.0 REVIEW OF GOVERNMENT POLICIES ON AGRICULTURE

Agricultural production in Ghana has generally declined for several reasons. These include slow adoption rate of improved technologies, continuous use of traditional implements not suited to large scale production, advanced age of subsistence farmers, coupled with the youth migrating to the cities, lack of credit facilities, inadequate infrastructure development, marketing and inappropriate policy measures. General agricultural policies by governments since independence have focused on large scale production of food to meet public demand.

During the Second World War (1939-1945), efforts by the colonial government were mounted to increase food production in the north of the country, as well as elsewhere, in order to eliminate the growing need for food imports, principally in the south Ghana, which was becoming a food deficit area.

The investment in peasant farming was cut back after independence in 1957. During 1959-61, president of the first Republic, Kwame Nkrumah, focused on a socialist strategy of import-substitution, industrialisation, mechanised agriculture and direct public interventions in production and marketing by means of a plethora of large-scale state farms, marketing boards, public enterprises and other para-statal institutions. This policy led to a growing need for government revenues and foreign exchange in order to finance the ambitious investments and capital/input intensive imports and also resulted in a substantial investment programme to open up the shallow river valleys of the Northern regions for the commercial mechanised farming of rice to feed the southern markets.

After Nkrumah, the Military National Liberation Council (NLC, 1966-69) and its elected civilian successor, the Busia regime of the Progress Party (PP, 1969-72) tried to liberalize the economy. The number of state farms was reduced substantially and more room was created for the private sector to participate in the development process. (TI, 1993).

From 1972-83, succeeding military and civilian regimes between the early 1970's and mid - 1980's further encouraged the dualism in agricultural sectors as they all tended to favour large-scale and capital intensive modes of production over labour intensive farming by small-holders. Setting aside some minor differences in the agricultural policies of the period 1972 - 83, they can be summarised as follows (Dapaah, 1995, and others):

- **A high reliance on public sector.**
- **High direct and indirect taxation and under pricing of (industrial) cash crops for the benefit of urban interest.**
- **Steadily declining public expenditures with a relatively low share being allocated to rural development including agriculture.**
- **Increasing budget constraints - in combination with increasing foreign exchange related bottlenecks for subsidized agricultural inputs and services - resulted in growing scarcities of agricultural resources.**

In the mid - 1970's, the military regime tried to achieve food self-sufficiency by means of programmes such as Operation Feed Yourself, Operation Green Revolution and Operation Haul the Food to the Markets.

Although these programmes aimed at increasing smallholder food production by enlarging peasants' access to improved seeds, fertilizers and other inputs at subsidized prices, these scarce resources were mostly diverted to large commercial farms. Moreover, these programmes failed to achieve their ambitions due to reliance on exhortation and moral incentives (rather than economic ones), and bureaucratic military-style organisation, poor planning and implementation, low peasant participation and other factor.

In order to promote greater regional balance and equity, Regional Development Co-operations were set up to oversee local development projects particularly in the Northern Ghana, such as Upper Region Agricultural Development Project (URADEP), and the Northern Regional Integrated Programme (NORRIP). These projects became important policy instruments for channelling subsidies on inputs, credits and mechanization to particular groups of farmers.

Although regimes operating in the period of 1972-83 tried to control food prices and distribution for the benefit of the population, they were predominantly determined by private market forces and hence prices increased rapidly due to growing scarcities and rising marketing cost. From 1983-1990, Ghana's agricultural policies and institutions became a major part of the economic recovery and structural adjustment programmes. (TI, 1994).

The Structural Adjustment Programme involved the progressive liberalization of both internal and external commerce, a partial abolition of controlled prices, the privatisation of certain state monopolies and the progressive withdrawal of subsidies. The profits accruing to commercial farmers dropped and this led to the progressive disengagement on their part (Bozza, 1994).

In 1991, the government implemented a Medium Term Agric Development Programme (1991-2000), which aimed to achieve complete self-sufficiency in food by the year 2000. The programme included proposals to diversify staple crops and improve livestock production; farmers were to receive subsidized loans from local banks to purchase high yield seeds and fertilizers (Africa South of Sahara, 1999).

4.0 THE PRESENT AGRICULTURAL POLICY AND THE VISION 2020

In line with Ghana's objective of becoming a middle-income country by the year 2020, the overall GDP is to grow at an annual economic rate of 8% compared with the Structural Adjustment period. Under the vision 2020 programme, the agricultural sector is targeted to grow at annual growth rate of 5-6% in order to ensure food security and adequate nutrition for all Ghanaians, to supply raw materials and other inputs to other sectors of the economy, to contribute to an improvement in balance of payment and to provide producers with incomes comparable to earnings outside agriculture.

The Ministry of Food and Agriculture, in line with the objective of vision 2020 has launched an Accelerated Agricultural Growth and Development Strategy (AAGDS) which has been designed to generate sectoral growth of about 5-6% from the current 2-3% and thereby fuel an increase in Ghana's annual GDP growth rate to 8% (Ofori, 2000).

The policies and programmes designed to achieve the objectives of the strategy are based on five elements.

- **Improve access to market for the promotion of production and export of selected commodities.**
- **Facilitate access to agricultural technology for sustainable natural resource management.**
- **Improve access to rural finance.**
- **Improve rural infrastructure and utilities.**
- **Build institutional capacity.**

The strategy is consistent with two basic orientations of the Government of Ghana namely;

- a. **Privatisation - reliance on private sector to lead investment, and**
- b. **Decentralization - devolution of significant responsibilities from central Government to District Assemblies (Ofori, 2000).**

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PAPER 2: CHARACTERISTICS OF COMMERCIAL RICE PRODUCTION IN NORTHERN GHANA. A COMPARATIVE ANALYSIS OF PROFITABILITY OF INDIGENOUS AND IMPROVED RICE VARIETIES - ISAAC KWADWO ASARE, UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE.

1.0 INTRODUCTION

The study examined the characteristics of commercial rice production in Northern Ghana and carried out a comparative analysis of profitability of indigenous and improved rice varieties. In summary, it was discovered that 71% of the farmers interviewed cultivated improved rice varieties, while 29% cultivated indigenous rice varieties. It was also discovered that 78% of the farmers who cultivated improved rice varieties made profit as against 22% who incurred losses. By contrast only 46% of the farmers who cultivated indigenous rice varieties made a profit while 54% incurred losses. Although farmers prefer the taste of indigenous varieties, the high yield of the improved varieties has outweighed the preference of the eating qualities of the indigenous rice varieties.

Economically, rice cultivation in general is becoming less profitable because of increases in input costs, especially fertilizer coupled with a poor marketing system. Comparatively, improved rice varieties were found to more profitable than the indigenous rice varieties in the areas studied.

1.1 Rice in the Ghanaian Economy

Self-Sufficiency in food production is an important component in the economy of every country. In Ghana, the policy of food self-sufficiency especially in rice, was first implemented by the government in 1970's. The policy was successful up to 1982, with an average rice self-sufficiency rate of 63.3% with the highest rate of 99.2% in 1976 (Bozza, 1994). 1983 marked a major change in the economic policy of the country. The government accepted International Monetary Fund's (IMF) and World Bank's credit conditions and adopted Structural Adjustment Programme. This action involved the gradual withdrawal of subsidies. The profits accruing to the commercial farmers dropped and this led to progressive disengagement on their part (Bozza, 1994).

Local rice production hardly meets the annual rice demand in Ghana. Rice imports have been increasing steadily since 1980s and now contribute more than 50% of all rice consumed in the country (Bam et al., 1998). It is also important to note that rice is central to Ghana's economy and agriculture, accounting for nearly 15% of Gross Domestic Product (GDP)

1.2 Short history of rice production in Ghana.

In the 17th and 18th centuries, rice was already one of the major commercial food crops in the sub-region. However it was not until 1960, that rice became an important crop in Ghana (Bozza, 1994). Since the 1960s, the bulk of Ghana's rice has come from the Northern Sector of the country. From 1978-1980, the Northern Region produced 170,000 metric tones of paddy rice. This formed 61% of the total rice production in Ghana during the period (Akanko et al., 2000). It is therefore possible to conclude that promoting paddy yield of rice in the Northern Ghana could help the country achieve its food policy objective of attaining self-sufficiency in rice production.

1.3 Comparative advantages and profitability of rice production in Ghana.

According to Asuming-Brempong (1998), Ghana has comparative advantage in the production of paddy rice over the other countries in the sub-region. However, it has a disadvantage in the processing and distribution of rice, due to the high cost of processing and poor transportation systems and is therefore uncompetitive on the market when compared with imported rice.

Analysis of the competitiveness of domestic rice production since the mid-1980s, suggest that the

liberalization policies under the Structural Adjustment Programme have affected the competitiveness of rice in Ghana (Asuming-Brempong, 1998).

The erosion of rice profitability in the mid-to late 1980s is demonstrated by the rice-fertilizer price ratio. From 1989, when the liberalization policy was effected, the nominal price of fertilizer increased much faster than the increase in the price of rice. In effect, the liberalization policy negatively affected farmers incentives to produce rice in Ghana (Asuming-Brempong, 1998).

1.4 Production and Consumption Trends

Domestic production of rice in Ghana has been consistently less than consumption needs. Demand for rice has outstripped supply due to population increase and improved standard of living, as well as poor production and marketing arrangements on the supply side. Consequently, government imports up to 200% of local rice production to compensate for the short fall in supply with the consequence of draining the country's scarce foreign exchange (Dogbe, 1996).

The intensification of rice production would play an important role in the provision of food and cash security to farmers who cannot afford the use of irrigation technology. This will help make the vision 2020 meaningful in the lives of farmers.

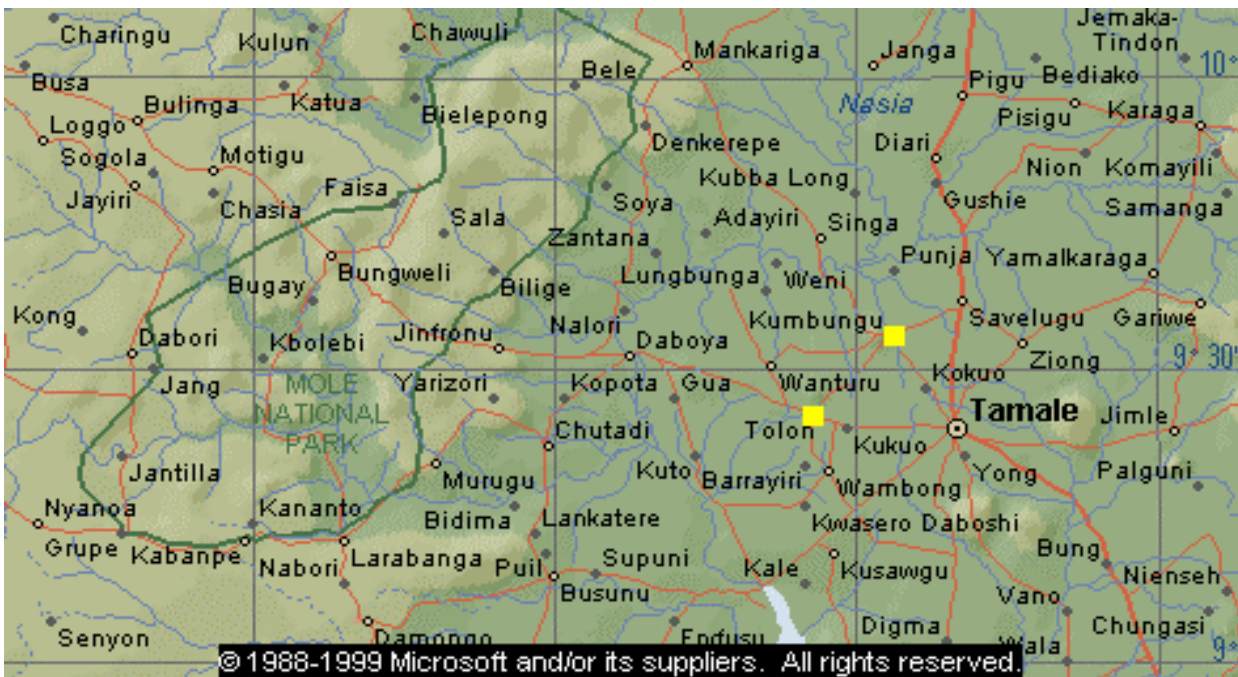
2.0 Objectives of the Study

- To examine the socio-economic parameters involved in the production of improved rice and the production of indigenous rice varieties.
- To find out the cost involved in the production of indigenous and improved rice varieties.
- To find out the economic returns of indigenous and improved rice varieties production.
- To identify the reasons for the differences in the profit margins (if any).

3.0 METHODOLOGY AND STUDY AREA

The study was conducted in the Tolon/Kumbungu District of the Northern Region of Ghana. The district has an area of 2,631 square kilometres and lies at longitudes 10° 0' and latitudes 9°25'N and 10°0' 1W. The population of the district is about 130,000 people (MOFA, 1997). The study comprised the following communities; Dugu, Tolon, Jajirigu, Zanjbalig-bibu, Ginganni-villi. A sample of 45 farmers was interviewed using a structured questionnaire.

FIGURE 2.:- MAP OF TOLON/KUMBUNGU DISTRICT, NORTHERN REGION OF GHANA.



4.0 RESULTS: SOCIO-ECONOMIC CHARACTERISTICS OF FARMERS

4.1. Size of Farm Holdings

The traditional land tenure system has an impact on the size of the land allocated to individuals and their families. The land size of the farmers interviewed ranges from 0.4-2.4 hectares. From the analysis, 44% of the farmers interviewed had size holdings between 0.4-0.8 hectares; 47% and 2% were in the range of 0.8-1.2 hectares, and 2-2.4 hectares, respectively. Farmers who cultivated improved rice varieties had a relatively large land size holdings, compared to the farmers who cultivated indigenous rice varieties.

4.2. Method of Land Acquisition

From the analysis, 93% and 7% of the land respectively, was acquired through inheritance and gift. This can lead to fragmentation of the cultivated land, since every parent has to share the land among the children. No farmer interviewed purchased or rented land. Most farmers wanted to increase size holding. However, they were generally hindered by the existing land tenure arrangements. Therefore, there is a need for transformational changes at all levels of land tenure arrangements in order to increase production.

4.3. Sources of Inputs (seeds and fertilizer)

Most farmers (62%) processed their own seeds from the previous year's harvest while a few (10%) purchased seeds from market and extension agents. The rest of the farmers (28%) got their seeds from other sources namely; irrigation schemes and nearby countries. Also, most who applied fertilizer purchased it from the market; a few purchased fertilizer from friends, especially cotton farmers in the area. Farmers complained of high cost of transportation and unavailability of fertilizer during market days in the area. There is a need to provide centres where farmers can get direct access to these inputs in order to lessen their burdens in search for fertilizer and other inputs.

4.4. Type of labour for farm operations

From the data analysis, 56% of the farmers interviewed used family labour; 24% and 20% used communal and hired labour, respectively. Family labour is used in operations such as planting, weeding, harvesting and

sometimes processing. Hired labour is mostly used in land preparation while communal labour is used in carting harvested rice from field to the storehouse.

4.5. Type of Rice Varieties Cultivated

From the data analysis, farmers who cultivated improved rice varieties formed 71% as against 29% who cultivated indigenous varieties. Major exotic varieties cultivated by the farmers are GR 18 and Farro. Each forms 22% of the total rice production while Kpukpula, which is local variety forms about 13%. Table 1 shows the frequency of the major rice varieties cultivated by the farmers.

Table 1: Frequency distribution of Major Varieties Cultivated by the Farmers.

Major rice varieties grown in the area:	Frequency (n=45)	%
<u>Indigenous:</u>		
Kpukpula	6	13
Anyofula	3	7
Others	4	9
<u>Exotic:</u>		
Mandi	2	4
GR 18 (Afife)	10	22
Farro 15	10	22
Tox varieties	3	7
Others	7	16

Source: Field Survey Data Analysis 2000.

4.6. Reasons For Cultivating the Type of Rice Varieties

The study revealed that most people preferred the taste of the local varieties when it comes to preparation of traditional dishes. Other reasons why farmers cultivated the type of rice varieties were also examined. The majority of farmers (71%) in the study area cultivated improved rice varieties because of the high yield characteristics and other qualities such as land suitability, disease resistance and recommendation by extension officers, while 29% of farmers who cultivated indigenous rice varieties mostly gave reasons such as availability of seed rice, land suitability, disease resistance and drought resistance. Although farmers prefer the indigenous varieties because of its eating qualities, the high yield of exotic varieties has, in many case, outweighed the particular preference for indigenous rice varieties.

4.7. Sources of Credit

Agricultural finance is important component in increasing the total output. However, the analysis confirmed that farmers in the study area do not have access to credit facilities. For Vision 2020 to become a reality, credit facilities should be made available to farmers through the Poverty Alleviation Fund and District Common Fund and other sources in credit, such as rural Banks.

4.8. Sources of Technical Assistance

Technical assistance is important to increase the overall rice production. From the analysis, 16% received assistance from friends, 51% received assistance from extension agents and 33% received no assistance. Lack of technical know-how could affect technical and economic efficiency in production. Most of the farmers who cultivated improved rice varieties received assistance from extension agents, while only a few farmers who cultivated indigenous varieties received assistance from extension agents.

4.9. Reasons for Rice Cultivation

The motive behind rice production is mainly for cash and food security, which forms 89% while growing for cash security alone forms 11%.

4.10. Marketing of Produce

From the data analysis, most farmers (89%) market their produce through private traders who either come to farms or market centres. The government should provide an enabling environment for the private sector to invest in purchasing of farmers' produce after harvest.

4.11. Determination of Price of Produce

From the data analysis, 51% of the farmers interviewed determine price of their produce by bargaining, while 13% and 26% of the farmers' produce price are determined by sellers and buyers, respectively. The government is not directly involved in the price determination.

4.12. The Role of Women in Rainfed Lowland Rice Production

Women play a major role in rice production. Their involvement is important in all aspects of agriculture: sowing, weeding, harvesting, processing and marketing. Although women can have their own farms the traditional land tenure system does not favour their total ownership of the land. Out of the 45 farmers interviewed only one was a female farmer cultivating rice.

4.13. Problems Facing Farmers

The major problems farmers encounter are high cost of inputs such as fertilizer, tractor services during ploughing and unfavourable market. Other problems include; poor distribution of rain, infestation of weeds, poor soil fertility, lack of extension services, lack of credit facilities as well as lack of improved varieties.

4.2 Analysis of profitability

From the analysis, 46% of farmers who cultivated indigenous rice varieties made profit while 54% incurred loss. Their profits ranged from 364,500 to 9,000 Cedis while the losses ranged between 343,000 to 63,500 Cedis. The high percentage of loss was due to the weather conditions as high level of water on some farmers' fields caused the rice plant to lodge. Again, 78% of farmers who cultivated improved rice varieties made profit as against 22% who incurred loss. Their profits ranged from 1,888,000 to 6,500 Cedis, while the loss ranged from 4,000 to 587,600 Cedis. Farmers who cultivated improved varieties tend to manage their crops well because of relatively high investment made as compared to farmers who cultivated indigenous rice varieties. However, for those (22%) who incurred a loss the reasons were mainly improper management, poor soil type and lack of technical assistance. The average cost per hectare was 612,000 and 280,400 Cedis for improved and indigenous varieties respectively per growing season.

The average yield per hectare was about twenty (20) bags and ten (10) bags of improved and indigenous rice varieties respectively. There is no price differential in the both type of rice varieties. The average price per bag was 40,000 Cedis. The average returns and net income of improved varieties were about 800,000 and 187,500 Cedis respectively. The average returns and net income of indigenous varieties were about 360,000 and 79,600 Cedis respectively.

Comparatively, from the analysis of cost and returns, exotic rice cultivation is more profitable as a higher percentage (78%) of farmers made profit. Indigenous rice varieties were considered to be relatively less profitable, showing 54% loss and 46% profit.

5.0 SUMMARY

Rice cultivation serves to meet the financial needs of the household. It also serves to sustain the food

security during the lean season. Farmers mostly employed family labour. Women play a key role in the rice production.

Most (71%) of the farmers interviewed cultivated exotic rice varieties, while 29% cultivated indigenous rice varieties. This can be attributed to the activities of the extension agents and the high yield qualities of the exotic rice varieties. Land size holding ranged between 0.4 -2.4 hectares. Farmers who cultivated exotic rice varieties had larger sizes compared to those also cultivated indigenous rice varieties. From data analysis, 78% of farmers who cultivated exotic rice varieties made profit. About 46% of those who cultivated indigenous rice varieties made profit.

Although indigenous varieties are not very profitable, the cultivation has been an activity that farmers use to cushion themselves against cash and food insecurity during the lean season. There are no official marketing channels for rice in the study area. Forces of demand and supply determine the prices. Government policy in rice production has generally disincentivised rice growing in terms of costs of inputs and marketing of rice in Ghana.

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PAPER 3 : CHARACTERISTICS OF TRADITIONAL RICE PRODUCTION IN GHANA - DANIEL DONYA , UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

ABSTRACT

The survey focused on traditional farmers' role in Upland Hill and Inland valley rice cultivation in Volta Region. It is the only region in Ghana in which upland hill rice of Glaberrima origin can still be found. The inland valleys, which are abundant in the area also have specific hydrological conditions which are appropriate for wet land rice cultivation.

The traditional upland hill rice varieties are of great importance to the people eg. For staple food, rituals, food at festivals etc. Unfortunately, sufficient records on the nature and extend of constraints as well as potentials for sustainable use of the rice ecologies in Volta Region are generally lacking. Even the names of rice varieties of Glaberrima origin are becoming extinct because of lack of records. The only records that can be found are those on female farmers' farms in the valley bottoms. The paper therefore examines the strengthes and weakness in terms of rice cultivation in the Volta Region.

1.0 TRADITIONAL PRODUCTION OF RICE IN GHANA

Rice has been in cultivation in Ghana for a very long time. In the 17th and 18th centuries, rice was already one of the major commercial food crops (Mobil J. et al., 1985). Presently, rice is one of the major cereals in Ghana. The Ghanaian rice self-sufficiency rate is about 41% (WARDA, 1986), resulting in high annual imports costing around seven (7) million dollars to meet the growing demand (Andriesse and Fresco, 1991).

In the 1920s, most of the rice in Ghana was produced in Volta and Western Regions, by traditional rice farmers (MOFA, 1999). In Volta Region, rice cultivation is carried out mainly by women, while males focus on the cultivation of tree crops like cocoa and coffee. Rice varieties of *Glaberrima* origin are grown on the mountains as upland hill rice. In the inland valleys, mixtures of *Glaberrima* and improved types, mostly *Sativa* origin are grown in water flooded fields. Years of selection under different climatic, soil and cultural conditions have produced marked variability in rice grown in the valley ecologies. Traditional rice varieties are of great importance to the people in Volta Region.

However, records on rice production are lacking and yields are generally low. There is therefore the need to find out the strengths and weaknesses in rice production in Volta Region.

1.1 Specific Objectives of the Study

- To identify local rice varieties in Volta Region that farmers still grow and to find out reason(s) why they still grow these varieties.
- To identify constraints/potentials of traditional rice production.
- To identify elements in Government Policy that encourage/inhibit rice production in the Region.

2.0 JUSTIFICATION:

Volta Region is the only region in Ghana in which upland hill rice of the *Glaberrima* origin can still be found. The inland valleys, which are abundant in the area also have specific hydrological conditions which are appropriate for wetland rice cultivation.

In Volta Region, the traditional hill rice varieties are of great importance to people, e.g., for rituals, staple food, food at festivals etc. Unfortunately, sufficient records on the nature and extent of constraints as well as potentials for sustainable use of the rice ecologies are generally lacking.

Even the names of rice varieties of *Glaberrima* origin are becoming extinct because of lack of records. The

only record that can be found is that on female farmers farms in the valley bottoms.

However, yields of rice are generally low, 0.5 - 2 tons/ha (Otto E. et al, 1996). The outcome of this study will therefore serve as a document indicating the strength and weaknesses in terms of rice cultivation in the Volta Region. Gathering of information on local varieties will also help preserve the threatened rice biodiversity in the region and serve as a useful resource for any future work.

3.0 METHODOLOGY

3.1 Study Area:

The study was undertaken in Volta Region of Ghana, specifically in Ho and Hohoe Districts. Two hundred (200) rice farmers interviewed using questionnaire in ten (10) villages within two (2) rice growing ecologies selected at random. The ecologies were:

- Upland (Hill) rice and
- Inland Valley.

The area under study was roughly rectangular in shape, stretching from Avatime in the south ($6^{\circ}49'N$) to Akpafu ($7^{\circ}16'N$), along the Greenwich Meridian. (Map 1).

FIGURE 3:MAP OF STUDY AREA IN VOLTA REGION, INDICATING SOME OF THE VILLAGES VISITED DURING FIELD SURVEY (YELLOW DOTS).

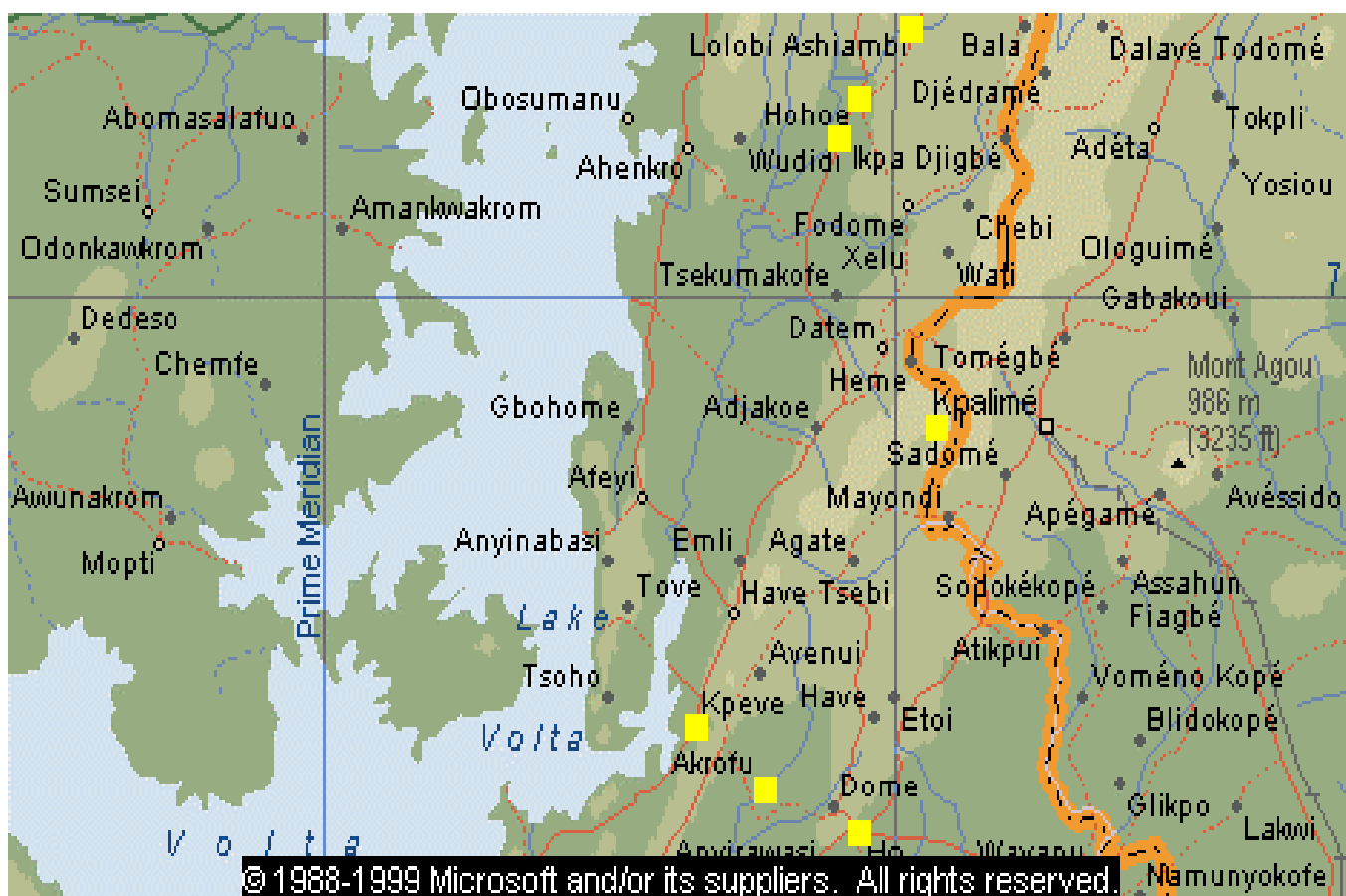


Table 1.-Villages visited, their locations and altitudes.

Date	Village	Location	Altitude
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10.05.2000	Avatime Vane	N: 6° 49' 44'' E: 0° 25' 51''	501 m a.s.l. ¹
11.05	Avatime Tsadome	N: 6° 49' 29'' E: 0° 25' 49''	502 m a.s.l.
12.05	Likpe Bakwa	N: 7° 09' 18'' E: 0° 35' 35''	329 m a.s.l.
13.05	Likpe Bala	N: 7° 12' 21'' E: 0° 36' 51''	370 m a.s.l.
14.05	Lolobi Kumasi	N: 7° 12' 06'' E: 0° 31' 59''	238 m a.s.l.
15.05	Lolobi Ashanti	N: 7° 12' 08'' E: 0° 31' 14''	228 m a.s.l.
16.05	Gbi-godenu	N: 7° 06' 07'' E: 0° 27' 33''	194 m a.s.l.
17.05	Akpafu Mempeasam	N: 7° 14' 17'' E: 0° 28' 09''	279 m a.s.l.
18.05	Akpafu Odomi	N: 7° 16' 53'' E: 0° 28' 49''	273 m a.s.l.
19.05	Santkrofi Bume	N: 7° 13' 08'' E: 0° 28' 41''	273 m a.s.l.

Source: Field Survey, May 2000.

4.0 RESULTS

4.1 Farmers' Profile

Table 2: Distribution and Characteristics of the sample.

Farmer Group	Number of Farmers	Characteristics
Avatime Vane Farmers	20	Mostly females (73%), no extension advice, information about rice cultivation on Radio/TV/leaflet is limited (20%), have attended farmers day
Avatime Tsadome Farmers	20	Mostly females (75%), no extension advice, information about rice cultivation on Radio/TV/leaflet is limited (15%), have attended farmers day
Likpe Bawa Farmers	20	Mostly females (75%), no extension advice, information about rice cultivation- NIL, attended Farmers' Day, and formed co-operative (under 31 st December Women Association)
Likpe Bala Farmers	20	Mostly females (71%), no extension advice, information about rice cultivation-NIL, attended Farmers' Day, and formed co-operative (under 31 st December Women Association)
Lolobi Kumasi Farmers	20	Mostly females (72%), no extension advice, information about rice cultivation- NIL, attended Farmers' Day, and formed co-operative (under 31 st December Women Association)
Lolobi Ashanti Farmers	20	Mostly females (77%), no extension advice, information about rice cultivation- NIL, attended Farmers' Day, and formed co-operative (under 31 st December Women Association)

¹ a.s.l.- above sea level

Gbi-Godenu Farmers	20	Association) Mostly females (90%), have more extension advice, well informed about rice cultivation through media, attended Farmers' Day, and formed co-operative (under 31 st December Women Association)
Akpafu Mempeasem and Akpafu Odomi Farmers	40	Both male and female farmers (50% each), limited extension advice, formed co-operative (under 31 st December Women Association)
Santkrofi Bume Farmers	20	Mostly females (75%), limited extension advice, information about rice cultivation- through media - NIL, attended Farmers' Day, and formed co-operative (under 31 st December Women Association)

Source: Filed Survey, May 2000

4.2 Gender Issues

There is a sexual division of labour between crops. Women are primarily responsible for field crops (rice, cassava and legumes) while men take care of the tree crops (cocoa, coffee, kola and fruit trees). In Akpafu area, however men and women have complementary labour roles for crops. Before the arrival of missionaries in Volta Region, traditionally, men were primarily engaged in hunting, fishing and warfare, while women were responsible for gathering wild leaves and fruits for food. The years of 1828 and 1947 saw the arrival of Basel and Bremen Missionaries in Volta Region and the subsequent introduction of coffee and cocoa plantations, which were soon copied by the traditional men. From then onwards, men controlled these cash crops, giving the women a small share of the income for their work in coffee harvesting, transportation of cocoa pods to the compound and for preparing food for wage or reciprocal labour groups.

Men also determine the size of the area to be cultivated in hill rice, since they clear and burn the land and make fences needed to keep out rice-eating animals, such as grasscutters. Women also specialize in certain operations such as broadcasting, weeding, winnowing and selection of seeds. Both men and women are involved in other operations such as harvesting and threshing.

The question about the control of sale of the hill rice is ambiguous. The rice may be stored in mud silos at the husband's compound. The house head either establishes a regular routine of giving the rice out to women to cook or leaves it in unlocked stores for women to take when needed. In some cases, men sell some of the rice to meet the school fees that fall due at the time of the rice harvest, and before their cocoa and coffee cash crop harvest. However, women also may sell some of the rice in small quantities at a time and control the revenue for their needs. For inland valley, rice cultivation is mostly women responsibility. This is because during the major farming season, the men will attend to their tree crop farms such as cocoa and coffee, while the women will migrate from areas like Lolobi, Likpe, Nkonya, Alavanyo, Akpafu and Santrokofi to the inland valley at Gbi-Godenu to cultivate rice. The women farmers control the sale of the inland rice and use the proceeds from their rice farms to buy for household needs.

4.3 Tenure arrangements

Upland (Hill) ecology- Family Lands (95%)
Share Cropping (5%)

Inland Valley ecology- Hired Land for Seasonal Cultivation (100%)

4.4 Cropping Systems

Upland (Hill) ecology- mixed cropping with crop like cocoa, rubber coffee, etc.;

Inland Valley ecology- mostly rice as sole crop

4.5 Farm Size

Upland (Hill) ecology- 1.5-2.0 ha

Inland Valley ecology- 2.5-4.0 ha

4.6 Planting Calendar

As shown in Table 3, 58% of farmers plant rice in June-July, after the rains have established (especially those in the inland valleys). Another (35%) of farmers, plant rice between March and April, at the onset of the major rains (this is related to upland hill rice ecology). While inland valley rice takes 3-4 months, to harvest, upland hill rice takes about 4-5 months. This is due to the variety used.

Table 3. Cropping Calendar.

Month when most of the rice is planted	% of respondents	Month when most of the rice is harvested	% of respondents
January		January	
February		February	
March	15	March	
April	20	April	
May	7	May	
June	40	June	
July	18	July	15
August		August	58
September		September	25
October		October	2
November		November	
December		December	

Source: Field Survey, May 2000.

Table 4.-Five basic land preparation methods practiced in the study area.

Method	No. of farmers	%	Ecology
Slash and Burn	75	37.5	Upland
Slash no Burn	25	12.5	-“-
Power Tiller cultivation	15	7.5	Inland Valley
Tractor Ploughing	20	10.0	-“-
Slash, no Burn, cultivation with Hand Hoe	60	30.0	-“-
Herbicides application	5	2.5	-“-
TOTAL	200	100	

Source: Field Survey, May 2000.

4.7 Rice Varieties

Farmers on the hills are natives who have been planting only local rice varieties as indicated in Table 5. These varieties are either white or slightly red in grain colour. They are of *Glaberrima* origin and have undergone no form of improvement. They mature within 4-5 months. These varieties were introduced into the area by farmer's ancestors.

The majority of farmers in the inland valley ecology are settlers. These are their own local varieties, which they have grown over the years. In addition to these varieties they also use other improved rice varieties obtained from Ministry of Food and Agriculture (MoFA) extension services.

Table 5: Rice Varieties.

No	Location	Local Name(s)	Language	Remarks
1	Avatime Vane	Kimimi or Amum	Avatime	Ewes call it 'Molu'. It is used for rituals and festivals. Not improved. Normally not sold. Red in colour (grain). Husk adulterated with black colour.
2	Akpafu	Kamo	Siwu	The same rice is found at Akpafu. It might have been introduced from Avatime. Used as food for festivals and ceremonies.
3	Avatime Vane	Amu	Avatime	Similar type, but grows faster. Used for festivals and ceremonies. Husk not adulterated.
4	Avatime Tsadome	Wosowoso	Avatime	Used as a staple food resistant to birds because of long awn.
5	Avatime	Emuke	Avatime	Staple food. Sold, double husk, therefore better for storage than other types, not improved.
6	Akpafu	Kawumo	Siwu	Staple food, also sold. Heavy grains.
7	Likpe	Sinyadu	Sekwa	Staple food, and sold at market. Good taste.
8	Santkrofi	Akwablu	Buem	Staple food and sold at market. Not common. Being almost extinct. Attacked strongly by birds.
9	Likpe	Mabusui	Sekwa	Staple food, and sold at market. Not improved. Sticky in structure when cooked
10	Avatime	Klu I	Avatime	Staple food, and sold at market. Not improved. Originating from Liberia. High yield.
11	Avatime	Kuru	Avatime	Staple food and sold at market. Being almost extinct. Attacked strongly by birds.
12	Avatime	Klu II	Avatime	Staple food, and sold at market. Not improved. Originating from Liberia.
13	Gbi-Godenu	Viwono	Ewe	Cultivated mainly in inland valleys. Leading variety in its ecology, due to good taste and high yield.
14	Gbi-Godenu	Adaisi	Ewe	Brought in by the wife of Adai. High yielding and good taste.
15	Avatime	Mighty	English	Branching vigorously. Preserved by the man named Mighty.
16	Gbi-Godenu	Akpese or Kado	Ewe	Good variety for transplanting.
17	Likpe	Matter	Sekwa	Preserved by the woman called Matter. Good taste.

18	Lolobi	Local white	English	Have itching effects when harvested. High yielding.
19	Gbi-Godenu	Khaki	Ewe	Called 'Khaki' because of its grain colour.
20	Akpafu	Madid	Siwu	High yielding, brought by the man called Madid.
21	Santkrofi	Anango	Buem	Weed resistant, due to its height.
22	Gbi-Godenu	Mattin	Ewe	Preserved by a man called Mattin. Good taste.
23	Lolobi	Toss	Lolobi	Preserved by the man named Toss. High yield.
24	Likpe	Kabore	Sekwa	Brought by Kabore. High yield.
25	Gbi-Godenu	Kawawa	Ewe	Preserved by Kawawa. Drought resistant
26	Gbi-Godenu	Nigeria	English	Form Nigeria. Resistant to lodging.
27	Gbi-Godenu	Long grain ('perfumed')	English	Fine scent when cooked. Grains are long

Source: Field Survey May, 2000.

4.8 Reasons for planting local varieties

The ultimate aims for growing local varieties in the study area are for food (Upland ecology) food and cash (Inland valley). Other reasons given for growing local varieties are:

- For rituals and special festivals;
- For staple food;
- Resistance to birds;
- Convenient for long-term storage, etc.

4.9 Management of Ratoon Crop.

Rice belongs to the Family *Graminea* and thus possesses the ability to regenerate itself upon harvesting through a process called **ratooning**, which involves development of the new tillers. According to Chauhan et al., 1985, rice ratooning has many advantages;

- Lower production cost,
- shorter crop duration, etc.

It was only at Gbi-Godenu where research work as carried out on ratoon crop (Kranjiac-Berisavljevic', 1993) that about 40% of the farmers left their field to ratoon. Further, farmers also claimed that seed from the ratoon crop is the best for planting, since it is free from disease and pests, and in most cases well dried. It is therefore necessary to look into the management of rice ratooning and educate farmers accordingly.

4.10 Pest and Diseases

Table 6:Major Pests and Diseases.

		Local Name	Language
<u>Weeds:</u>	<u>Scientific Name</u>		
1	<i>Panicum maximum</i>	Esii	Ewe
2	<i>Imperata cylindrical</i>	Ebe	
3	<i>Euphorbia spp.</i>	Miliki gbe	
4	<i>Chromolaena odorata</i>	Acahmpong gbe	
5	<i>Commelina esculentum</i>	Abgenokunoku	

<u>Diseases:</u>	<u>English Name</u>		
1	Brown leaf spot	NA	-
2	Blast		
3	Yellow mottle		
<u>Field pests:</u>			
1	Grasscutter (Rodent)	Nukpui (Exor)	Ewe
2	<i>Quilla quilla</i> (Bird)	Xevi	
<u>Storage pests:</u>			
1	Rat	Botoe/Kisii	Ewe
2	Mouse	Afii	

Source: Field Survey May, 2000.

Table 7.-:Storage methods of harvested rice.

Method	No of Farmers	%
Keep the panicle heads in barns/cribs at home	50	25
Keep the panicle heads on raised platforms at home	9	4.
Keep the panicle heads in silos	14	26
Threshed and stored in silos	65	32.5
Threshed but spread on floor in the room	10	5
Threshed and stored in sacks (jute, cement paper)	52	26
TOTAL	200	100

Source: Field Survey May, 2000.

4.11 Marketing and Processing

Marketing of paddy rice poses no special problem. Marketing outlets for rice in the study area are numerous. Farmers sell to other farmers, local assemblies, itinerant middlemen. The principal marketing problem the farmers faced was the fact that traders dictate prices and at times buy on credit. Other minor problems were poor quality, (poor visual appearance) high level of foreign materials. The type of processing identified in the study area is small-scale mainly for local consumption. It involves hand pounding of paddy using wooden pestle and mortar. Parboiling is not practised in the study area, since there is no high level of broken grain with these methods of processing.

5.0 SUMMARY

Volta Region, the only region in Ghana in which upland hill rice of *Glaberrima* origin can still be found, may provide an environmentally sustainable and economically sound base for increased rice production in Ghana.

The study showed that rice farmers in the study area are mostly women (above 75%). Men see to the cultivation of cash crops such as cocoa, coffee and kola. Almost all (95%) of the farmers within the hill rice ecology are natives, with the remaining 5% being settler farmers. In the inland valley ecology, however, migrant farmers from Hohoe, Ho and Kpandu districts, who are traditional rice farmers form the bulk of the farmers. Tenure arrangement on the hill ecology is by family land while in the inland valleys land is hired for rice cultivation seasonally. Rice yields are generally low (0.5-2ton/ha). Factors such as skills in rice cultivation, access to land, access to labour and availability of traditional rice varieties contribute to type of rice cultivation.

The farmers identified about ten (10) different constraints. The most important of these is weed infestation

(65.5%). This was followed by lack of formal credit to farmers (50%), health constraints (47%), lack of improved seeds (30%), and high input cost (25%).

Government Policy in traditional rice production has not been favourable. Cost of inputs is generally high and marketing of indigenous rice varieties is considered to be relatively poor.

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PAPER 4: PARTICIPATORY RICE VARIETAL RESEARCH IN GHANA: PROBLEMS AND CHALLENGES - Dr. Kofi Dartey, on behalf of the Rice Project Team, Crops Research Institute, Kumasi.

SUMMARY

Rice in Ghana is characterised by increasing national demand (e.g. per capita of 7.0kg in 1988/89 rose to 16.3kg per annum in 1994/95): low domestic rice production resulting in high rice imports (67% of rice consumed in 1996 was imported and \$100m was used to import rice in 1999); a low rice production per unit area (estimated 1.2, 1.8 and 4.5 t/ha for upland, rainfed and irrigated lowland ecologies are far below their potentials); and the failure of conventional testing procedures to deliver improved varieties to farmers.

Conventional varietal screening has involved their systematic testing in preliminary screening sets, observational yield trails, initial replicated yield trials, advanced yield trails and on-farm trails. Released varieties should correct at least one deficiency in previously released ones. The failure of the conventional system is largely due to lack of logistics for stability tests in time and space.

Under such situations, participatory research would be likely to deliver varieties faster and cheaper to farmers. This involves setting up a researcher-led seed garden in the first year on farmers fields and the supply of some farmer-preferred varieties to each farmer in the following year. Organoleptic and market acceptability tests are determined concurrently for the selected varieties. Non-acceptance of finished products (varieties) by end users (farmers, traders & consumers) is minimal because they would have been part of the varietal selection process.

The case of participatory research in Ghana (Hohoe and Aframsso) from 1997 to 1999 is presented. Apart from some introduced varieties being higher yielding, they were found to be more acceptable to both farmers, traders and consumers when compared with local checks.

Although the tendency for varieties to remain on-station due to limited funding will be reduced, problems that would have to be overcome in order to further refine the participatory process are enumerated with emphasis on those observed during farm walks on farmers fields.

1.0 INTRODUCTION

Participatory rice varietal selection in Ghana is justified because of increasing national demand for rice (e.g., per capita of 7.0kg in 1988/89 rose to 16.3kg per annum in 1994/95); low domestic rice production resulting in high rice imports (67% of rice consumed in 1996 was imported whilst \$48m was used to import 200,000t of rice in 1995); a low rice production per unit area (estimated 1.2, 1.8 and 4.5 t/ha for upland, rainfed and irrigated lowland ecologies are far below their potentials); and the failure of conventional testing procedures to deliver improved varieties to farmers.

Conventional varietal screening has involved their systematic testing in preliminary screening sets, observational yield trials, initial replicated yield trails, advanced yield trails and on-farm trails. Released varieties should correct at least one deficiency in previously released ones.

The problem with the conventional system of testing in Ghana has not been non-acceptance of released varieties by farmers. Rather rice varieties have not been delivered to farmers because of the following:

- **Lack of funds:** for example, West Africa Rice Development Association (WARDA) Task Force small grants were used to evaluate upland and lowland rice varieties in 1994 & 95. Varieties were also evaluated in the regional yield stability trails in 1997 & 98. There has been no sustained funding to advance selections from these for wide-scale testing.
- **Late delivery of funds:** This has reduced the usefulness of some results as varieties have

succumbed to mid-duration and/or terminal drought due to late seeding in Southern Ghana. This is particularly true of drought-testing trails carried out in 1998 and 1999.

- **Lack of logistics for rice project team:** For example, there are no serviceable vehicles as at present.

The net result is the confinement of existing varieties or new introductions to research station e.g., varieties requested from WARDA in 1998 could not be evaluated in 1999.

2.0 PARTICIPATORY VARIETAL SELECTION IN GHANA

This method should accelerate the delivery of existing varieties or new introductions to farmers when funding cannot be sustained. Added advantages of selected varieties being readily accepted by farmers, etc. are obvious.

This presentation summarises the process adopted in Ghana and focuses on the problems faced so as to facilitate the conduct of subsequent participatory trails.

2.1 The Process in Ghana

One hundred and two (102) rice varieties comprising of traditional or improved *Sativa/Indica/Japonica*, *Glaberrima*, and *Nerica* (*Glaberrima x Sativa* interspecific hybrids) were evaluated under upland conditions in Hohoe in 1997 with DFID funding through the University of Reading. Varietal categories were also considered in the selection of 60 of these varieties for testing at Hohoe and Aframso in 1998.

Sixty (60) varieties were evaluated in 1998 at Nyankpala with WARDA funding. There were three (3) evaluations at the vegetative, reproductive and post-harvest stages in 1998. Each of fifty six (56) farmers at Aframso and ninety four (94) farmers at Hohoe was supplied with two (2) varieties each weighing one (1) kg in 1999. A total of twenty eight (28) varieties were distributed in different proportions. An essential component of a PVS study is the off-season multiplication of preferred varieties for supply to farmers during the subsequent rainy season.

There were three (3) farm visits in 1999, followed by a general meeting to evaluate varieties. Another PVS is currently being conducted at Abofrem near Bibiani, with funding from WARDA.

2.1.1 Post-harvest evaluation by traders.

Nine (9) milled varieties were evaluated by ten (10) traders at Asawase and Ashiaman markets. Four (4) of the varieties were common to each site with remaining five (5) being specific to the locality. Traders evaluated the following traits:

1. Long grain,
2. bold grain,
3. white grain,
4. red grain,
5. brownish grain,
6. high milling recovery and
7. high market value.

They selected their five (5) best varieties.

2.1.2 Cooking quality assessment

Nine (9) varieties (7 improved and 2 local) were cooked by consumers (10 male and 10 female farmers) at Aframso and Hohoe. Varieties were evaluated on a score of 4 (with 4 as excellent and 1 very bad). Traits

evaluated were:

- aroma,
- taste,
- stickiness,
- hardness and
- ability to expand.

2.1.3 Trader Preferences

Traders preferred white, long, slender or bold grains. All introduced varieties were accepted in higher frequency than the three (3) local varieties. All but one of the introduced varieties were judged to have higher market value. It should be noted that introduced varieties compete also with imported rice and not only local checks. Varieties for future work should therefore mostly have brown pericarp and be long and slender.

2.1.4 Consumer Preferences

Some introduced varieties were as preferred as local checks e.g. TOX3377-34-3-3-2 and IDSA10 (IRAT262) for Aframso as well as TOX3377-3-3-2, WAB126-18-H-HB and KLEMINSIN for Hohoe. The most preferred variety by farmers at harvest and traders after milling (IDSA85) had a low cooking quality at both locations. This might have prevented its intended release, but farmers at Akpafu Todji who grew this particular variety were of a different opinion and rated it above their local varieties.

2.1.5 Observations from Farm Walks

Land preparation by farmers was manual. Slashing of field was followed by burning or collection of trash. Seeds were broadcast into re-growth and incorporated into the soil by weeding re-growth. For those who planted lowland, seeds were sometimes broadcast directly onto mechanically cultivated land. Broadcast density was up to 120 seedling/m² which should normally give uniform establishment.

No fertiliser was applied on upland farms visited: only one farm at Akpafu Mempeasem applied fertiliser. Soils were generally poor and tillering was absent on most farms.

Weed control upland was manual: there was one instance of a female farmer spraying a combination of sulphate of ammonia and salt as a herbicide in Akpafu Todji.

There were only two instances of susceptibility to disease: A local variety Addesi planted upland was susceptible to leaf spot with an IRRI score of 7. It was the only variety out of four on the farm that was diseased. Another local variety, Kpuglu. (an improved *Sativa indica*) was blasted with an IRRI score of 3 at time of visit (vegetative stage).

The best variety selected from farm walks at Todji was WAB209-5-H-HB. It was reported to have difficult panicle threshability, poor milling quality (rice in Todji is milled by pounding), and poor cooking quality (it turned watery on storage) and was consequently rejected by most farmers. There was an overwhelming preference for IDSA85: All farmers who had IDSA85 and another variety preferred IDSA85.

Farmers who did not seed IDSA85 but saw it on other's farms preferred it to their supplied varieties. Although IDSA85 was highly preferred, the distribution of seed in the study and the results apply only to the nine (9) varieties supplied to Akpafu Todji farmers.

2.1.6 Problems & Challenges.

These, as well as other observations, are best presented in lessons to be learnt which are presented below:

Lessons to be learnt from the PVS studies:

- **Varietal composition:** Large numbers of *Glaberrima* and lowland *Sativa-indica* varieties were included in the upland trail: This PVS began as an academic study and not with varietal release as its main objective.
- **Future studies** should use varieties for a particular ecology. PVS plot in Hohoe was sited away from the community and farmers could not have access at all times. Need for replication: Land non-uniformity resulted in a wide yield range for the check varieties and one should expect the same for test varieties if they were replicated. In 1998, yields for IDSA85 ranged from 0.5 to 2.4t/ha.
- **Discarding varieties after only one year** of evaluation in unreplicated plots affects stability of results over time. WAB36-54 performed best in PVS at Nyankpala in 1998, but was blasted at Kwadaso in 1996. TGR75 gave the highest yield of 5.3t/ha in Hohoe in 1997 when it was not blasted. On the same field, blast reduced its yield in some plots to 0.6 t/ha.
- **Timing of PVS visits:** The second visit around 98DAS was inappropriate for 120-day maturity varieties.
- **Timing of seed supply:** Seeds were supplied after the rains had begun in Aframsso and after farmers had seeded their fields.
- **Maturity period and length of rainy season:** Long duration varieties were supplied at Aframsso which has a short rainy season e.g., FKR14.
- **Quantity of seed supplied:** The one (1) kg seed supplied was small, especially against the background of the need to scare by new upland rice growers.
- **Distribution of seed** across villages: In some cases separate varieties were given to different villages when more information could have been obtained by distributing same varieties to different villages: all 13 lots of WAB450-I-B^oP-129-HB were given to farmers at Aframsso; all 16 lots of MOROBEREKAN were given to farmers at Akpafu Odomi.
- **Village politics and distribution of seed:** Some people not involved in original PVS study scrambled for seeds supplied and so some of those involved refused to participate. There were reports of varieties being supplied to favourites at Akpafu Odomi.
- **Dishonest farmers:** There was a report that a few farmers at Aframsso milled seeds supplied to them for food.
- **Germination tests:** Seeds obtained from WARDA were not tested for germination ability before supplying to farmers. The cause of poor germination could therefore not be determined.
- **Supply of long and short duration varieties to the same farmer:** This made farm walks and scarring tedious e.g., FKR48 and WAB209-5-H-HB to the same farmer. Apart from supplying similar duration varieties, farmers should be informed of varietal duration so that seeding is either delayed or done earlier for introduced varieties to flower synchronously with local checks.
- **Distance of farmers' fields:** One could walk for about 4 hours just to visit a few farms.
- **Location of farmers' fields:** Some planted upland varieties in heavy lowland soils and under inundation e.g., IDSA10 and IDSA85 lowland.
- **Location of farmers' fields:** One variety was planted on one field and another only a short distance away.

- **Planting on a slope:** The same variety was planted at different times and different varieties at different times, making farm walks and varietal comparisons difficult.
- **Planting on a slope:** One variety was planted on the upper slope and another on the lower slope with different soil types.
- **Planting density:** The same variety was broadcast at different densities and different varieties at different densities.
- **Labelling varieties:** Labels got missing and varieties were referred to as long, short, bold etc., and where seed shape and colour were similar, they could not be separated.
- **Weeding:** As with planting, this was non-uniform with part of one variety weeded or one variety weedy whilst the other was weeded.
- **Farmer prejudice:** Some farmers at Hohoe preferred IDSA85 at the vegetative stage even when its stand was much poorer than the other varieties being compared.
- **Post-harvest evaluation:** A farmer at Aframsso had WAB209-5-H-HB yielding 1.5xIDSA85 but said it had difficult panicle threshability and was not suitable for a man of his age. Both farmers and traders preferred IDSA85 until after it was cooked.
- **Varietal preference:** Farmers in Nyankpala PVS preferred big grains, because seeds are marketed by volume. Most rice consumers in Ghana would prefer long slender grains. Commercial production of farmer-preferred varieties in Nyankpala PVS would not be viable in Ghana.
- **Cooking quality assessment:** Imported rice should have been added to the test and check varieties.
- **Multiplication of seeds:** Some upland varieties do not yield well in lowland and consequently the best time for multiplication is in the wet season under upland conditions. There was complete loss of IDSA85 in the dry season due to production of white heads.
- **Multiplication and supply of varietal selections** to farmers before sensory tests. This could not be avoided in the present study because of time constraints.
- **Three PVS in one rice ecology** (upland) nation-wide will not overcome the problem of supply of seeds. More are needed for each ecology.
- **Correlating scientific data with socio-economic ones :** more information could have been obtained if brown rice, head rice, etc., were reported after the milling tests.
- **Logistics for Rice Group.** For example, with no vehicles for monitoring, the present study was done under very difficult circumstances.

2.1.7 Success of PVS

Farmers at Akpafu Todji storing introduced varieties for seeding in Y2K. Unwillingness of farmers to sell harvested seeds to the Crops Research Institute. Willingness of farmers to set up community seed multiplication system in Y2K.

3.0 FUTURE WORK

Preliminary screening trials should be conducted on-station. Seeds from these should be evaluated for phenotypic acceptability with farmers and traders before observational yield trails in a PVS. There should be more than one PVS per ecology in order for selection of varieties to be less severe. For example, the

complete loss of IDSA85 in the dry season multiplication could have occurred on farmers fields.

Subsequent PVS trials should rely on smaller numbers of varieties (most selected varieties from previous PVS's) which could be replicated at each location in order to obtain indices of stability.

Support for PVS studies must include logistics for conventional research, e.g. for the determination of the cause of white heads in IDSA85 during the multiplication.

**PAPER 5: THE LOWLAND RICE DEVELOPMENT PROJECT - HECTOR MERCER-
QUARSHIE, LOWLAND RICE DEVELOPMENT PROJECT, TAMALE**

1.0 INTRODUCTION

The bulk of the national grain supply comes from Northern Ghana comprising Northern Region, Upper East Region and Upper West Region. While maize, millet, sorghum is cultivated mainly for home consumption; rice groundnut and cowpea are cash crops.

Rice has become an important component of the diet of Ghanaians. Whereas in the 1980s, the average rice consumption per head per annum was about 12kg, currently is estimated at about 17kg, which corresponds to a national consumption per annum of 316,000t tons. The rate of growth of demand for rice has outstripped supply due to an increasing urban population, improved standard of living, the ease of rice preparation, the development of trade as a result of economic liberalization and poor production and marketing arrangements on the local front.

1.1 Domestic Production.

By a policy of state intervention in all aspects of the rice industry including the establishment of state farms, supply of subsidized inputs, marketing of rice by state agencies and control pricing, the national paddy production between 1970-1980 stood at an average of 79,000 tons per annum. It then decreased to 26,000 tons per annum in 1983. Following the liberalization of the economy, over the 10-year period(1984-1994) the area cultivated to rice rose again and reached 150,000 tons in 1994. Fifty five percent (55%)of this production was from northern Ghana (PPMED, 1995). It is estimated that 30,400 ha of rice has been cultivated in the Northern Region in 2000 from which a yield of 72,960 tons is expected. Ninety percent of the production is in the hands of small-scale farmers.

1.2 Types of Rice Culture

Among types of rice cultures in northern Ghana are:

1. **Upland rice culture** in which rice is grown in rain fed, naturally well drained soils without surface water accumulation. It includes upland portions of hydromorphic soils where there is no water table in the root zone.
2. **Rain fed lowland culture** in which lands are flooded for 2-3 months during the growing season. This also includes hydromorphic lands at lower slopes with water table in their root zones during a significant part of the growing season. Rain fed lowlands have a great diversity of growing conditions that vary by amount and duration of rainfall, depth and duration of standing water, time of flooding, soil type and topography.
3. **Irrigated rice culture**, which requires expensive layouts to ensure that the growers have total control over water allowed on the plot under cultivation.

There are currently about 3,000ha of land under irrigation in Northern Ghana.

Research work done by the Savanna Agricultural Research Institute with support of France proved that with an appropriate technical package the potential yield from lowland rice culture can be very good. The main elements in the package are

1. **construction** of field bunds along contours to retain water
2. **use of improved seed** and
3. **the use of fertilizers.**

1.0 CONSTRAINTS OF RICE PRODUCTION IN NORTHERN GHANA.

The potential land for the development of lowland rice exceeds 400,000ha. Only a small proportion of this is currently under cultivation. There are a number of constraints to be overcome for full utilization of the available land.

Among them are:

- The high climatic risks due to inadequate water control measures and consequently non-intensive cropping practices and therefore low yields and low profitability.
- The agronomic practices employed which essentially include ploughing broadcasting of seed, harrowing and harvesting of the crop under these practices land preparation is inadequate, little or no fertilizer is applied and little weed control is done thus promoting the rapid build up of noxious weeds which soon make the land unusable after a few years of cultivation.
- The use of mixed and unimproved varieties possessing different colours and shapes which when milled give poor quality grain spurned by most consumers who then turn to imported rice.
- Inadequate extension on rice production and processing.
- Poor processing techniques and the use of unimproved milling machines such as the Englebert type rice huller, which compounds the poor outturn in the milling process.
- The lack of credit to farmers to enable them purchase inputs for farming is another bottleneck for increased production of rice. Allied to this is the current high interest rate and other lending requirements, which are disincentive for farmers in their acquisition of loans.
- There is a lack of a well organised farmers organisation such as rice growers or rice processors associations which can play an advocacy role or serve as pressure groups to ensure that rice growers and processors interests are taken account of in the formulation of policies on rice.

3.0 LOWLAND RICE DEVELOPMENT PROJECT.

To overcome the afore mentioned constraints the Lowland Rice Development Project was established to demonstrate the viability and profitability of rice production on a total of 1000 ha by small-scale farmers in three valleys: Kulda-Yarong (Damongo District) the Zuwari (Woriwori) (Tamale District) and the Sillum (Tolon-Kumbungu District).

The project is a collaborative project between the Ministry of Food and Agriculture (MoFA) and The Agency Francaise de Development (AFS) with a total investment of 17.4 million FF.

3.1 Objectives of the Project

The immediate objective is to alleviate through an integrated approach, the main constraints to the development of inland valley rice and to promote an improved and more intensive but sustainable production system, which will be economically attractive to farmers. Once demonstrated by the project, the proposed approach could be replicated in other valleys using the tested technical package, provided a basic financial support can be made available to farmers through their organizations.

3.2 Project Strategies

In the implementation of an economically viable rice production system a number of coordinated activities

are being supported by the project. These include:

- The implementation of water management systems in valleys. The systems will embody the construction of water harvesting structures, which will consist of cross dams in the lower part of the valleys where slopes are below 0.1% and 0.3%.
- The introduction of improved technical packages. This includes improved cropping practices such improved land preparation, adequate fertilization, use of improved seeds and methods of weed, insect pests and disease control.
- The intensification and improvement of the rice extension system by establishing a much closer relationship between Agricultural Extension Agents and farmers in the valleys. In 2000 there are six AEAs working with 550 farmers. In 2003 which will be the fifth year of the project each of the six AEAs will be in contact with about 250 farmers.
- The enhancement of harvesting, post-harvesting and processing techniques in order to improve the quality of rice. The improvement of quality will come about through use of pure varieties. Improved threshing with the employment of pedal-operated threshers, improved parboiling and also improved processing with the use of rubber roller de-huskers instead of the traditional Englebert type rice hullers.
- The establishment of a farmers organisation in the valleys through which credit to, and repayment by, farmers are channelled and farmers mobilized to maintain the water management infrastructure. Under this, farmer groups each composed of about 10 members have been established. Currently there are about 50 groups established.

Additionally, processing and marketing groups have also been established. Two (2) NGOs (one for two valleys, and one for one valley) have been contracted to undertake animation, training and management support and advisory service for farmers.

The establishment of a credit system with the assistance of the Agricultural Development Bank. Under this, four types of credit are in operation. These is a seasonal credit for agricultural inputs, a marketing credit for women groups involved in rice processing, an equipment credit for the acquisition of bullock implements and pedal threshers, and credit for milling machines.

There are also opportunities for training in animal traction and functional literacy for farmers and cooperation organizations, and in credit management for relevant NGOs and bank credit officers.

3.3 Research Component

Over the years, research organizations such as the Savanna Agricultural Research Institute, (SARI) and the Soil Research Institute (SRI), have accumulated a large body of knowledge through their research activities. However, the extent to which the developed technologies fit exactly the conditions prevailing in the project valleys is not known. The Lowland Rice Development Project has therefore contracted the SARI and SRI to fine-tune their recommendations to fit the project's operational valleys. They are also to support the project to find solutions to any emerging field problems.

The SARI is currently engaged in on-farm variety, fertilizer and tillage trials and also pest and disease monitoring. The SRI is conducting soil suitability mapping of the valleys. The University for Development Studies has also been contracted to identify the different water resources in the valleys particularly their distribution in time and space for a good understanding of the hydrological characteristics of the valleys.

3.4 Coordination of the Project.

The Project plans call for the production of 300 ha of rice in 2000. In order to ensure that good seed would

be available for the 2000 season, the Project supported 50 farmers to produce 20 ha (50 acres) of seed of GR18 and TOX3107 in 1999. Yields were quite high. Of the 30 farmers who planted TOX3107, a yield range of 2.37-6.1t/ha with an average of 4.45t/ha was 4.55t/ha was obtained. Among the 20 farmers who cultivated GR18 a yield range of 1.84-3.5/ha with an average of 3.32t/ha was obtained. It should be stated that the seed used in planting the GR18 and the TOX3107 had mixtures of 10% and 2%, respectively. These yields were obtained in spite of the rouging which was carried out so that by the time of harvest the purity of the seed as tested, in the laboratory stood at 96:4 and 99.7% for GR 18 and TOX3107, respectively.

It has to be stated that for the 1999 season the only farmers who met the rice seed certification standard in the Northern Region were the project farmers.

The total cost of inputs excluding labour for the 20ha (50acres) was twenty million, ninety thousand seven hundred and eight three cedis (20,091,783 cedis), making the average cost per hectare of one million, four thousand five hundred and ninety cedis (1,004,590 cedis) The highest margin made by a farmer was 1,548,690 cedis and the average margin was 909,026 cedis per acre.

3.5 Current Activities

In 2000, a total of 29ha of land was surveyed and banded. Two hundred and fifty hectares was prepared and planted by 548 farmers. While 109ha was planted to GR 18 in the Sillum valley, 142ha was planted to TOX3107 in the Zuwari and Kulda-Yarong valleys. Harvesting is in progress in all valleys. An average yield of at least 3t/ha is expected. Credits worth 875,000 cedis per hectare have been extended to farmers.

In rice processing, 150 women have been organised into groups and trained in improved processing techniques as well as in credit management. Some of these women have already started producing rice of a very high quality.

Entrepreneurs to own and manage three improved rice mills have been identified in the three valleys. Hopefully the mills will start operating within the next few weeks. Research activities by SARI, SRI and UDS are proceeding on various topics.

3.6 Implementation Problems in 2000

Farmers did not fully anticipate the workload involved in the intensive operations in comparison with their method in which only ploughing, broadcasting of seed, harrowing and harvesting were required. Again they considered the cultivation of their food crops (maize, sorghum) as a priority activity and relegated rice, the cash crop, to second place. They concentrated available labour on the food crop and turned to rice only after they had secured the food crop.

The attitude of some farmers particularly in the valleys of Zuwari and Kulda-Yarong where the project is in its first year of operation has been very poor. The behaviour and utterances of the farmers made it clear that they have not been adequately animated and therefore do not understand their roles in the project. Further training of farmers is required. The difficulties experienced in the new villages in getting farmers to respond to calls for certain activities to be undertaken is a good lesson to the Project in initiating activities in new villages. The lesson is that the Project should start with a small number of committed farmers and only involve a large number after the potential benefits have been amply demonstrated to all.

The plan was to start land preparation in the middle of April. However, as a result of delays in bund construction and a combination of other factors including delays in the green light to start field operations and also difficulties in the acquisition of dependable tractors, most of the subsequent activities fell behind schedule.

The winner of the tender to supply inputs could only deliver part of the required inputs and then requested for increases in prices giving depreciation of the cedi as a reason. In the event other sources of supply were used.

Rainfall in 2000 was much lower than expected with July and August giving only 60% and 80% respectively, of the average. The dry conditions in July delayed basal fertilizer application and also promoted excessive weed growth, which reduced the effectiveness of the herbicide applied. However the bunds in the field retained sufficient water to see the crop through to maturity. Estimated yields will be about 3t/ha.

4.0 CONCLUSION

The LRDP is in its second year of operation but in its first year of major activity. The indications so far are very promising. The LRDP's intensive cropping system of helping farmers to obtain high yields from a plot of land, generally not more than one hectare, will enable farmers to sustain production. It is a system, which relies less on machinery but more on the labour of the farmer. Whereas in the initial stages farmers may entertain doubts about the profitability of the system and therefore show a lukewarm attitude, they will embrace it whole-heartedly once its superiority to other farm enterprises has been demonstrated as has happened in the Sillum Valley. The critical issues, on which the system may succeed or fail, are water management, profitability of rice production and appropriate mechanisms to ensure loan repayment by farmers.