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URBAN FOOD CONSUMPTION PATTERNS AND  
NATIONAL FOOD POLICY IN LIBERIA

Preliminary Report  
(Report 1)  
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## FOREWARD

This report is the initial report submitted to the Nutrition Economics Group (NEG), Technical Assistance Division (TAD), Office of International Cooperation and Development (OICD), under the project, "Urban Food Consumption Patterns and National Food Policy in Liberia." This project is being conducted under a Cooperative Agreement with Purdue University. The work is being conducted by the Restaurant, Hotel, and Institutional Management Department in the School of Consumer and Family Science.

The purpose of this report is threefold:

1. Provide a summary of the literature bearing on rice policy and food consumption in Liberia.
2. Report on the trip taken to Liberia on February 1-24 on invitational travel with USDA to do the first stages of this overall study.
3. Elaborate on the objectives and plan of work contained in the Cooperative Agreement and its Project Plan.

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## INTRODUCTION

### A. Location, Population

Liberia covers approximately 43,500 sq. miles, slightly larger than the State of Indiana, and is located on the west coast of Africa. It is bordered to the South by the Atlantic Ocean, to the East by Ivory Coast, to the North by Guinea, and to the West by Sierra Leone. The population is estimated at 2.2 million people in 1985, a projection of the 1974 census based on the estimated 3.3 percent annual growth rate. This population in 1982 was composed of 63 percent rural and 37 percent urban (Ministry of Planning and Economic Affairs, 1984). However, because the urban population increases at a faster rate than the rural population (6.4 percent per year for urban versus 1.7 percent for rural) due to rural to urban migrations, the urban share of the population is expected to be somewhat larger in 1985.

### B. General Economic Trends

Since 1980, real gross domestic product (GDP) has been on a decline. From a value of \$366 million in 1980 (at 1971 factor cost), real GDP dropped to \$322 million in 1983, a decline of 12 percent or an average of 4.1 percent per year. Per capita GDP decreased from \$570 in 1980 to \$497 in 1984, a decline of 13 percent (Stanley and Gallagher, 1985). These decreasing trends in the general economy seem to be related to the 1980 political events which led to important capital flight and a drop in Liberian exports (Ministry of Planning and Economic Affairs, 1984).

The agricultural sector accounts for 36 percent of GDP. This sector is dichotomized into a monetary subsector consisting of export crops (rubber, forestry products, coffee, cocoa, palm kernels) and a traditional subsector based on subsistence agriculture (rice, cassava, other roots and tubers, sugar cane, vegetables, plantains, groundnuts, other minor crops). Each subsector contributed 18 percent to GDP in 1980 (Stanley and Gallagher). However the contribution of the monetized sector declined to 14 percent in 1982 (USAID, 1984).

#### C. Subsistence Agriculture

Nearly 90 percent of rural households are involved in traditional agriculture which is dominated by rice production. Rice accounts for 42 percent of this subsector GDP. Rice production ensures 60 to 70 percent of domestic consumption needs depending on the year. The subsistence sector grew at an average rate of 2.9 percent over 1974-1978; however, more recent trends are not known. (World Bank, 1984)

#### D. Sources of Foreign Exchange

In order to finance its imports, Liberia relies on mining and the monetary agricultural sector as sources of foreign exchange. Total exports reached \$537 million in 1979, increased to \$600 million in 1980, and thereafter progressively declined to \$428 million in 1983 (table 1). The drop in export earnings is due in part to declines in the mining sector, which contributed 57 to 70 percent of total export earnings during this period. The decrease in the value of iron ore exports from 1982 to 1983 is attributed to both a drop in volume exported by 4.3

Table 1. Composition of Exports, 1979-83  
(Values in \$ Millions)

Sources	1979		1980		1981		1982		1983	
	Value	Pct								
<u>TOTAL EXPORTS</u>	<u>536.6</u>	<u>100.0</u>	<u>600.4</u>	<u>100.0</u>	<u>529.2</u>	<u>100.0</u>	<u>477.4</u>	<u>100.0</u>	<u>427.6</u>	<u>100.0</u>
<u>MINING</u>	<u>329.6</u>	<u>61.4</u>	<u>343.7</u>	<u>57.3</u>	<u>348.8</u>	<u>65.9</u>	<u>337.4</u>	<u>70.7</u>	<u>284.5</u>	<u>66.5</u>
Iron Ore	290.0	54.0	310.2	51.7	325.4	61.5	311.1	65.2	267.3	62.5
Diamonds	39.6	7.4	33.5	5.6	23.4	4.4	26.3	5.5	17.2	4.0
<u>MONETARY AGRICULTURE</u>	<u>189.5</u>	<u>35.3</u>	<u>223.1</u>	<u>37.2</u>	<u>160.4</u>	<u>30.3</u>	<u>121.7</u>	<u>25.5</u>	<u>129.0</u>	<u>30.2</u>
Rubber	87.8	16.4	102.2	17.0	86.7	16.4	53.4	11.1	73.1	17.1
Logs	50.1	9.3	65.3	10.9	32.5	6.1	29.2	6.1	22.2	5.2
Sawn Timber	8.5	1.6	7.2	1.2	4.3	.8	3.4	.7	1.3	.3
Coffee	27.1	5.1	33.0	5.5	19.4	3.7	22.8	4.8	18.2	4.3
Cocoa	11.0	2.0	10.5	1.7	13.8	2.6	8.8	2.0	11.5	2.7
Palm Products	5.0	.9	4.9	.8	3.7	.7	4.1	.8	2.7	.6
<u>OTHER*</u>	<u>17.5</u>	<u>3.3</u>	<u>33.6</u>	<u>5.7</u>	<u>20.0</u>	<u>3.8</u>	<u>18.3</u>	<u>3.8</u>	<u>14.1</u>	<u>3.3</u>

Includes other domestic products and re-exports.

Source: Republic of Liberia, Ministry of Planning and Economic Affairs, 1984, Table 3.

percent and a 10.3 percent fall in world prices (Ministry of Planning and Economic Affairs, 1984).

The monetary agricultural sector which contributes about 30 percent to foreign exchange has also been in steady decline since 1980. The fall from \$223 million exports in 1980 to \$129 million in 1983 was due to declines in all major crops except cocoa. Rubber, the major agricultural export commodity, dropped from \$102 million to \$73 million, due to a fall in world market prices for rubber which started in 1981. Although prices improved in 1983, they started falling in the early months of 1985, suggesting a bleak outlook for rubber in the near term (Stanley and Gallapher, 1985).

The forestry sector also has experienced difficulties since 1980. Total exports of logs dropped from \$65 million in 1980 to \$22 million in 1983, due to a fall in world prices and resulting fall in volume exported. However, forestry has a significant potential for expansion, and the outlook for world markets seems favorable in the medium term (World Bank, 1984).

Up to 1983, Liberian export earnings have been able to cover imports, resulting in surpluses in the trade balance. Surpluses reached \$30 million in 1979, increased to \$66 million in 1980, and gradually declined to a level of \$16 million in 1983 (Ministry of Planning and Economic Affairs, 1984). In 1980 raw materials constituted the bulk of Liberian imports with 58 percent of import value, of which crude oil accounted for one half. Also in 1980, food imports constituted 14 percent of total imports, and steadily increased to 18 percent in 1983. Rice is the

major imported food item, accounting for 47 percent of food imports in 1983 (ibid, p. 23).

Currently, there is a dire shortage of foreign exchange which could result in going off the 1-to-1 convertibility of Liberian and U.S. dollars. U.S. dollars in large bills can be exchanged in local markets for about \$1.20 Liberian.

The World Bank on February 15, 1986, froze \$55 million in authorized loans to Liberia. This action further tightened the financial noose which began when the International Monetary Fund last fall stopped loaning them funds.

The remainder of the present survey of the Liberian economy will cover the production sector, its potential and constraints, and the state of nutrition. Then, the specific issue of rice as a major food staple is addressed, including a review of rice policies and potential for self-sufficiency.

## II. CHARACTERISTICS OF FOOD PRODUCTION

### A. Rice

Rice constitutes the principal crop produced by the subsistence agriculture sector. Upland rice accounts for 90 percent of the rice activity and swamp rice the remaining 10 percent.

1. Upland Rice is cultivated under rainfed conditions in a shifting rotation system. Upland cropping is traditionally a men's activity in the bush clearing phase. Women normally are responsible for the planting, weeding, and most of the harvesting and threshing. Upland cultivation is characterized by two types of farming systems.

The traditional farming yields are generally low, averaging 1,270 kg/ha in 1984 (Ministry of Agriculture, July 1985). In previous years, yields averaged 1,230 kg/ha in 1983, and 1,267 kg/ha in 1982 (MOA, 1985, table 1-1).

In improved farming systems upland yields can be increased to 1,500 kg/ha by the adoption of a new seed variety, LAC-23. With an appropriate application of fertilizer, The West Africa Rice Development Association (WARDA) showed that upland rice can yield up to 2,400 kg/ha.

The area under upland cultivation averaged 579,000 acres in 1984, with a total production of 656 million pounds (MOA, 1985). The potential yield increase is not enough to significantly increase production because there are limits to expanding the area cultivated due to ecological reasons (see below).

2. Swamp Rice is also cultivated under traditional or improved management. Because of richer soil types, the necessary fallow period to reconstitute fertility is reduced to 4 or 5 years, and in some cases eliminated, as opposed to 10 or 12 years for upland cultivation.

In traditional farming, average yields vary between 1 and 6 metric tons (mt). Some swamps have a potential for double cropping, but the yield of the second crop is generally low, averaging 1,950 kg/ha. With proper management, swamp rice, as a single crop, produces 3.2-3.5 mt/ha.

3. Constraints to Increasing Rice Production. Many constraints, physical, technological, cultural and economical, limit the possibility of significantly expanding rice production.

Physical constraints include the nature of Liberian soils, which are typically light and characterized by poor mineral content, iron toxicity, and high vertical drainage (Republic of Liberia, Interministerial Technical Committee on Food and Nutrition Planning, July 1982.) Therefore, yields tend to be low, and in the present condition, it is not feasible to increase upland yields beyond 30 or 40 percent of their current levels. Increasing acreage of upland rice to compensate for yields is not recommended because of the accompanying destruction of forest and its unfavorable ecological effects.

Labor constitutes the principal constraint to increasing rice production in the present system, and land is relatively abundant. Increasing rice production will necessarily imply displacing labor from other sectors, including cash cropping, which economically would entail both private and social costs because of the apparent comparative advantage of producing tree crops (World Bank, 1984; Twetten and Rogers, 1984). The labor constraint manifests itself particularly in slow adoption of swamp cultivation where labor requirements initially are very high (World Bank, 1984). Rice production constraints in Liberia are reversed from those in Asia, where labor is relatively abundant and land is scarce.

To relax the binding labor constraint, mechanization has been attempted in the past, but it has met with little success because of failures to fit into the existing systems. Use of simpler techniques such as animal traction is impeded by animal diseases such as trypanosomiasis or African Sleeping Sickness

(Tweeten and Schreimer, 1984). Other techniques including the replacement of the knife with the sickle in harvesting rice also failed. The use of herbicides is also a possibility but further research is still needed to evaluate the success of a zero - tillage regime under Liberian conditions. Availability of foreign exchange for purchasing such inputs would be a problem currently.

Other constraints to increasing production may include an inadequate supply of improved seeds such as LAC-23. In this respect, an International Fund for Agricultural Development (IFAD) - financed project has been designed to supply 40 percent of upland rice area by its tenth year of operation.

#### B. Cassava

Cassava is the second most important food crop and substitutes for rice particularly during the "hungry season". Cassava may be grown in a pure stand, although often it is intercropped with upland rice.

Yields in 1984 on traditional farms reached 5 mt/ha (MOA, 1985). However, there exists a potential for increasing cassava yields to 20-30 mt/ha by the adoption of high yielding mosaic varieties developed by the Central Agricultural Research Institute (CARI).

Despite the high production potentials, promoting cassava is risky because of two limitations. First, once harvested, it is a highly perishable crop, which makes it difficult and costly to transport long distances and store for long periods. Second, substituting cassava for rice may bear negative nutritional

consequences because of its low content of most minerals and vitamins.

### III. RICE POLICY ISSUES

#### A. Introduction: Evolution of Rice Imports

Food self-sufficiency has been a constant theme in Liberia's food and agricultural policies. Because rice constitutes the focal point of the food economy, food policy is often equated with rice policy. Although in the past Liberia at times has been able to produce enough rice for domestic consumption, such is not the case over recent periods due to a growing population and perhaps to sub optimal production conditions.

Prior to 1945 when Monrovia had a population of only 15,000, imports in certain years were nil. However, rice imports jumped to 33,000 mt two decades later, in 1965, and leveled off at 48,000 mt over the years 1970-1973 (table 2). Following a sharp increase in world prices in 1973/74, imports declined sharply in 1974-1976, averaging 34,000 mt.

Starting with 1977, rice imports increased from 58,000 mt to over 100,000 mt in 1984. Beginning 1980, a large share of imports has been financed by the P.L. 480, Title I program, from 25 percent of total imports in 1980 to 44 percent in 1984. These concessional sales contributed significantly to alleviating the government's budgetary burden.

The increasing imports denote the increasing dependence of Liberia on world markets (in particular U.S. market) for its rice supply. Self-sufficiency decreased from 70 percent in 1978 to 65

Table 2. Annual Rice Imports in Liberia, 1965-1985  
(Calendar Years)

Year	TOTAL IMPORTS		PL 480 IMPORTS	
	Quantity (000 mt)	Value (\$000)	Quantity (000 mt)	Value (\$000)
1965	33.0	---	---	---
1970-73 Ave.	47.7	9,959	---	---
1974-76 Ave.	34.2	14,117	---	---
1977-78 Ave.	58.4	21,381	---	---
1979	73.6	25,961	---	---
1980	86.5	34,427	22.0	10,000
1981	95.0	40,526	21.5	10,000
1982	86.0	44,271	43.4	15,000
1983	86.2	44,271	45.6	15,000
1984	101.0	49,766	44.2	15,000
1985	71.7	35,834	18.6	6,000

Sources: Data on total imports from 1970 to 1984 are taken from MOA Production Estimates, 1985, table 3.3 after converting from pounds to kg.

Import data for 1965 taken from World Bank Report, Vol. II, 1984.

Data on PL 480 were obtained in personal communication with Ed Costello, PL 480 Officer, USAID/Liberia.

percent of total use in 1981 (Interministerial Technical Committee on Food and Nutrition Planning, 1982). Political decisionmakers view rice self-sufficiency as a desirable goal believing that reliance on imports may lead to rice shortages and rising prices which in the past have been known to provoke riots (e.g. in 1979).

## B. Review of Government Policies

### 1. Production Policies (Monke, 1979a).

Until 1960, the government of Liberia (GOL) did not show much interest in the agricultural sector. Tubman's open door policy in the 1940's attracted large concessions in the iron ore and rubber sectors. The result was an export-oriented economy with half of GDP coming from the concessions. Between 1950 and 1960, agriculture's GDP fell from 40 percent to 15 percent. Agriculture received less than 2 percent of government expenditures. But, attention toward agriculture increased in the 1960's when self-sufficiency arose as a policy objective.

a. 1963: Operation Production Priority Number One was launched by Tubman as the first agricultural development program. Self-sufficiency and patriotism were among the reasons cited for increasing production. Rice extension programs began and both USDA and FAO installed experiment stations for swamp rice. This program failed because of a lack of financial support.

b. 1968: Crash Program for Agricultural Development was launched. Of concern was the existing traditional marketing system which was judged inefficient and exploitive.

Cooperatives were installed as market outlets. The swamp rice program continued, with the installation of demonstration plots and large-scale mechanical land clearing projects. To control importation of rice, a Liberian Rice Committee was created which formed the cornerstone of subsequent government rice policies.

c. 1971: Total Involvement for Higher Heights was instituted by Tolbert, with emphasis on integrated rural development. Self-sufficiency in rice was a goal of the plan. Two divisions, Special Projects and Expanded Projects, respectively, were created within MOA. The first was concerned with the management of large swamp areas including water control and the resettlement of farmers to these areas when necessary. It promoted tree crops on uplands. and advocated the abandonment of shifting slash-and-burn practices. The project was phased out in 1977.

The second division, Expanded Projects, was started in 1972 and was concerned with the improvement of small family swamp plots. The program was disbanded in 1979.

By the mid 1970's the results of the government efforts to promote new technologies had met with little success. New techniques (such as improved seed) were used by only 2 percent of the farmers, on 1 percent of the cultivated area.

d. 1977: Beginning of new development strategies. Based on the success of the concessional model in rubber production, large-scale, fully mechanized rice farms were proposed. A study for a pilot project of 1,800 ha. in Grand

Gedeh was completed in 1978. However, the proposal was discarded because it required substantial government subsidization to sustain production.

e. 1986: Recent Policies

Self-sufficiency remains a cornerstone of current rice policies, but some new provisions have been added. A Green Revolution was announced as a new policy in early 1986 by President Samual Doe. It incorporates a "back to the farm" emphasis in accomplishing its objectives, but specific contents of the new policy and how it relates to agricultural development are still evolving. More recently, the President has announced a new policy of Privatization, which is to pervade the entire economy, not just agriculture. It involves the sale of Government corporations back to the private sector, in whole or in part.

These and other policies and their ramifications will be examined in the final report when the consumption parameters will be available to enable policy appraisal in the context of consumer demand. Many related policies, such as the recent changes related to the Liberian Produce Marketing Corporation (LPMC), also need to be examined along with production policies.

2. Price Policies

"Policy makers soon realized that the exhortations of the 1960's were not sufficient to induce increased production and that prices and profit incentives were necessary [to increase production]" (Monke, 1979a, p. 127). However, there was a

conflict between producers' and powerful urban consumers' interests, which the following evolution of government price policy illustrates.

The Minister of Commerce is responsible for rice policy, as chairman of the Rice Committee created in 1968. Such policies include those for domestic rice, as well as imports.

Domestic rice policies included a producer price support scheme operated by the Liberian Produce Marketing Corporation (LPMC) which started in 1973. The program however, faced several problems. First, LPMC was not able to buy enough rice to establish market prices, due to the lack of funds, so farmers were forced to sell much of their produce to private merchants at lower prices. A second factor was that LPMC's buying prices were kept constant all year long. During periods when rice becomes scarce, farmers can make more money by selling to private traders. A third problem was related to the high operating costs of LPMC, about \$300/mt in 1982, which led to marketing inefficiencies between import and retail levels and led to competition from private traders.

Import policies proved more successful than domestic rice policies. A control over import prices has significant effects on both rural and urban prices because imports constitute a large part of marketed surplus, particularly in Monrovia. The four categories of imported rice include (1) P.L. 480 imports handled by LPMC, (2) commercial rice in large bags, (3) luxury rice in small package, and (4) rice imported as wage goods by the concessions.

Prior to 1986 (when LPMC was granted a monopoly on imports), commercial imports were controlled through a system of import levies and licensing agreements. Import prices were allowed to rise up to world levels during the 1973/75 food crisis. By 1977, world prices were down but domestic prices were kept at the 1973/75 levels, implying import tariffs of 52 percent. This was equivalent to subsidizing producers at the expense of consumers. However, world rice prices increased in 1979, exceeding domestic prices, thus replacing the producer subsidy by a consumer subsidy. In 1981, the domestic price was raised, eliminating the consumer subsidy. But, again, prices at retail were fixed at that time and not lowered when world prices declined in subsequent years.

Government policies affect the substitution between rice and cassava. Between 1974 and 1976, a 30 percent increase in the real price of rice was followed by a fall in imports by 29 percent. At the same time, the real price of cassava increased, suggesting that consumers had shifted toward cassava.

The tariff policies led to increased marketed supply, with an estimated elasticity of 1.8. The import subsidies reduced domestic sales, and caused imported rice to penetrate deeper into rural markets, displacing domestic supplies. However, aggregate production was not responsive to prices, because of physical constraints to increasing production. An aggressive price policy under such conditions mostly causes inflation in the market for the constraining factor, i.e. labor.

C. Different Views on GOL Policies of Self-Sufficiency

The question here is whether self-sufficiency in rice is feasible. If so, at what cost? The answer depends to whom one talks to. Thus, during our first visit in Washington D.C., an agronomist and an agricultural engineer at the World Bank thought that Liberia had the necessary physical resources to become self-sufficient. The most widely held view however, (in particular among economists) was that self-sufficiency policies involve high private and social costs. This is illustrated by a series of papers published by Oklahoma State University.

Using a representative farm linear programming modeling approach, Epplin and Musah (1985) estimated the shadow price associated with rice at \$.26 per pound. This value indicated that the farmer would economically benefit from selling rice only if the off-farm price was above \$.26 per pound. Since rice was actually sold at \$.12 a pound on the market, the result suggested that the farm family would be better off buying rice and producing an alternative commodity.

Trapp, Rogers, and Wilkens (1985) argue in favor of rice security rather than rice self-sufficiency as a short-term objective. Rice security was defined as the holding of enough reserves (by GOL) to ensure that demand is met under foreseeable production and price situations. Using an econometric model of the Liberian economy, it was shown that even doubling producer price from \$.18/lb to \$.36/lb. would not lead to sufficient increase in production to displace imports. Such a high price would incite producers to import rice from neighboring countries

and sell it as Liberian rice. The authors also discard raising consumer prices as bearing unacceptable political and humanitarian consequences. Their final proposal was to use P.L. 480 shipments as reserve stocks, and their estimates showed that this involved much less cost than a self-sufficiency program.

Tweeten and Rogers (1985) analyzed the costs, benefits and income redistribution from GOL rice policies. They concluded that promoting self-sufficiency goals was detrimental to production efficiency and producers' income. They also noted that the highest form of food self-sufficiency was food security, the same conclusion reached by Trapp, Rogers and Wilkins. On a macro basis, current rice price support policies were seen as reducing national income.

Following an economic analysis of the rice sector, the World Bank (1984) concluded that both upland and swamp rice were poor investments for import substitution in the case of Monrovia. They concluded, however, that rice production for home consumption and sales in rural areas and rural towns appeared economically profitable. Their recommendations, therefore, were that Monrovia should be supplied with imported rice at much less cost to the economy, while self-sufficiency for the rural areas should be pursued as a policy objective.

#### IV. FOOD AND NUTRITION SURVEYS

##### A. Nutrition Survey

Between 1975 and 1976, the Ministry of Health and Social Welfare (MHSW) of the Republic of Liberia conducted a survey to

assess the nutritional status of children and mothers and to quantify the number of those malnourished (Republic of Liberia, MHSW, no date). In 1984, Dr. Richard Lockwood submitted a report to USAID in which he described the nutrition problems in Liberia based on the 1975-76 survey. The following discussion of nutritional issues is based on the publication of MHSW and the Lockwood report. It also includes information from a communication from Christine Babcock (ARD/AID) to John Flynn (USAID/Liberia) summarizing the major points of the Lockwood report (1984), and the report on a visit to Monrovia March 7-11, 1978 by M. L. Booker who made recommendations regarding data tabulation (Booker, 1978).

For the population at large, nutritional problems are not acute in Liberia, according to Lockwood. In particular, protein deficiency is limited because rice is the staple and contains about 7 percent protein. Babcock notes that a 2,100 calorie diet at 70 percent of calories from rice yields 30 grams of protein.

The most common nutrition-related problem is anemia, in particular for young children. The nutrition survey found that at least 60 percent of children aged 6-59 months were anemic. This finding is hard to reconcile with the conclusion by Lockwood of no acute nutritional problems. It suggests that for one important segment of the population, there are some serious nutritional problems. However, Lockwood indicated, in a personal communication, that he regards the main problems as health related. Such problems include poor sanitation, bad water, and prevalence of diseases and parasites.

1. Extent of Malnutrition

The malnutrition problems vary by area (urban vs. rural vs. concession), by season (normal vs. "hungry season") and by age or sex (nursing vs. weaning children, women vs. men).

a. Seasonal Malnutrition

During the "hungry season" (July-September) stocks of rice are depleted and cassava becomes the main staple. Because cassava has very low protein content (1 to 2%), protein-calorie malnutrition (PCM) becomes apparent. During this period malnutrition affects mostly nursing children due to inadequate energy and nutrient intake of their mothers. Cumulated energy demands for maintenance, reproduction, lactation, and work are so great that women must cut back on either physical activity or physiological functioning. It is usually the latter that is compromised.

b. Regional Differences In Malnutrition

Although up to 18 percent of children in the sample had impaired growth due to chronic PCM, the prevalence of chronic PCM was higher in agricultural areas (20 percent) than other rural areas (12 percent), Monrovia (8 percent), and concession areas (9 percent).

c. Age Differences

The survey found that malnutrition problems were minimal for nursing children 2-5 months old independently of regions, indicating the protective nature of breast feeding. Malnutrition (PCM) occurred more frequently for children aged 6-23 months, corresponding to the weaning period when

family food replaced the breast. Agricultural areas had three times more occurrences of chronic PCM for the 6-11 month age group than other areas.

d. Sex Differences

Generally, lactating mothers are more affected by malnutrition, particularly during the "hungry season". The survey also found that for the 6-36 month age group, chronic PCM was significantly higher in males than females.

2. Solution To The Nutrition Problem

A nutrition problem is generally recognized at least during the hungry season. Cassava, which is then consumed in large quantities, is known to be nutritionally deficient. Suggestions for solving the seasonal malnutrition problem include:

- a. Substituting sweet potatoes for cassava. The main advantage of sweet potatoes over cassava is its higher vitamin A content. Sweet potatoes would not be as good as cassava as a source of calories or minerals (iron, calcium). Since vitamin A can be obtained from cassava leaves, other green leafy vegetables and palm oil, sweet potatoes lose much of their appeal as a substitute for cassava, particularly when it is considered that such recommendations in the past have not increased the use of sweet potatoes. Cassava appears to be the preferred food.
- b. Complementing cassava with vegetable proteins (mung beans, cowpeas, peanuts). This practice is common, but its

extent is unknown. The current study should provide data on the use of these vegetable proteins.

c. Complementing cassava with fish. Whether to promote aqua culture or not would depend partly on the availability of vegetable proteins. However, several projects aimed at increased consumption of fish are underway in Liberia.

d. Encouraging the use of protein-rich local products (such as peanuts) as weaning food instead of imported milk products.

#### B. Food Consumption Survey

A household survey of food and nonfood consumption and expenditures was conducted in Liberia in 1976-1978. Data were collected by the Ministry of Planning and Economic Affairs from about 2,500 households, which represented 1 percent of the population. The sample was drawn from the 1973-74 national population census and was chosen to be representative of the entire population other than those residing in very small, remote villages and towns. Data were based on daily expenditures recorded by each household for 7 consecutive days twice during the survey period.

##### 1. Per Capita Consumption

Following are the per capita consumption estimates which were derived from the survey. Weekly data were converted to annual totals:

<u>Food</u>	<u>Pounds Per Capita</u>
Rice	218.4
Cereals	4.6
Roots	72.1
Fruits	17.4
Greens	21.1
Vegetables	17.4
Meat	24.9
Fresh Fish	20.2
Dried Fish	15.0
Sugar	2.6
Other Food	1.3
Nuts	1.2
Spices	7.8
Oil and Tobacco	61.8
Beverages	3.1

Rice consumption was equivalent to 100 pounds per month per household size of 6. Per capita rice consumption was higher in rural areas -- 222.2 pounds -- than in urban areas -- 213.5 pounds. About 18 percent total expenditures for all items (food and nonfood) was spent for rice in urban areas, compared with 37 percent in rural areas. Food expenditures in total accounted for 54 percent of total expenditures in urban areas, compared with 78 percent in rural areas.

## 2. Nutrient Availabilities

Converting the consumption data to calories yielded the result that 2,270 calories were consumed per day from all foods

in urban areas. Of this total rice accounted for 1,060 calories, or 47 percent of the total. In rural areas, fewer calories were consumed (2,150) but more calories came from rice (1,072), for an average of 50 percent of the total. Protein consumption totaled 58 grams in urban areas and 46 grams in rural areas.

### 3. Data Analysis

These data have not been widely used for analytical purposes, because of known problems in data reporting, and because of the long time delay (7 years) in getting the data tabulated and analyzed. Only 100 out of the nearly 2,500 questionnaires collected were completely filled in. The data have been judged as "suspect" in terms of quality (Tun and Yetley, 1983). Nevertheless, price and income elasticities were computed by Tun and Yetley. The parameters for rice are as follows:

	<u>Price Elasticities</u>	<u>Income Elasticities</u>
Urban Areas	-.52	.80
Rural Areas	<u>-.95</u>	<u>1.10</u>
Nation Average	-.71	.98

These parameters have been incorporated into some of the econometric models used for rice policy analysis discussed earlier.

## V. METHODOLOGICAL REVIEW

### A. Related Surveys

The proposed household food survey has been patterned after related surveys in the U.S. and elsewhere. The historical series of household food consumption surveys conducted each decade since

the 1930's in the U.S. by U.S.D.A. has been used as a guide on many technical questions. For example, the principal data to be collected will be based on 7-day recall on an as-purchased basis. Also, the data are to be adjusted to a full-time at-home equivalent basis as is the custom by U.S.D.A.

Some variations from U.S.D.A. procedures are necessary because of the Rapid Appraisal approach and local conditions known to exist in Liberia such as often buying rice by the 100-pound bag and not typically eating 21 meals per week. An adjustment of consumption based on 14 meals per week may be more appropriate than 21 meals used in the U.S.

A survey conducted of households in Madagascar served as a model in adapting to a Rapid Appraisal approach. This survey, conducted by Theodore Ahlers, currently with the World Bank in Washington D.C., was very short (2 1/2 pages). It tended to ask quite global questions, related to about 13 categories of food consumption or expenditures and about 11 categories of nonfood expenditures. U.S.D.A.'s philosophy is to use a long list of potential foods to aid recall. The Madagascar survey collected 7-day recall of expenditures as well as 3-day recall of consumption by individual meals. They regarded the results as comparable in quality.

The Purdue Team received a copy of the Rural Retail Sample Price Survey, currently being used mostly by the MOA in Liberia to collect data on six food products plus six categories of rice (country vs. imported, parboiled vs. not parboiled, shops vs. market place). A separate but similar survey form is being used

to collect rural wholesale price data. The Retail Price Survey form used in Monrovia to collect retail prices on 60 individual food items was also obtained. Many of these foods are priced separately for different sizes of foods. Generally, three price observations are obtained for each food or size of food.

While in Liberia in February, the Purdue Team obtained a copy of a questionnaire being administered to a National sample of 6,800 households by the Ministry of Planning and Economic Affairs, under contract with Westinghouse Electric Corp. It is called the "1986 Demographic and Health Survey," undertaken in part for purposes of promoting family planning. The questionnaire is long and involved. It is a standardized approach which has been used in other African countries. Sampling procedures include selection of names at random from the 1984 Census of Population and locating specified households by name. The procedure appears too unwieldy and time consuming for use in a Rapid Appraisal.

Kimseyinga Savadago, a member of the Purdue Team, has written a Ph.D. dissertation at Purdue University analyzing household food survey data for 1982-83 in Burkina Faso (1986). Savadago's study developed a complete system of household demand functions focused on foodgrain consumption in relation to other cereals. Price and income elasticities were developed using food and nonfood expenditure data, household characteristics, and implied income. Budget shares were used as dependent variables

in the analysis. Alternative policy scenarios were analyzed using the results of the model.

B. Washington Conference

Hiemstra attended a conference in Washington D.C. on January 27, 1986 called by NEG/OICD to discuss methodological questions related to Rapid Appraisal of food consumption in developing countries. Attendees included Tom Zalla, private consultant, Stan Johnson, Iowa State University, Tom Reardon, IFPRI. They had experience in Zaire, Jamaica and Haiti, and Burkina Faso, respectively.

Methodological issues discussed included the following.

1. Food expenditure vs. food use data,
2. Frequency of data collection,
3. Food recall vs. diary data collection,
4. Practical problems in getting data from households in developing countries,
5. Food identification problems,
6. Data entry and editing problems,
7. Use of computers in analyzing data, and
8. Sample size and selection.

Johnson indicated his preference for drawing a new sample of households during each phase of data collection, even if data are collected quarterly, because of the problems of relocating specified households and changes in household composition over time. He prefers getting one-day recall information from each household, but returning to each household several times during a survey week, rather than asking for 7-day recall.

Zalla spoke on the serious problem of seasonality in consumption in African countries, because of variability in production and lack of storage facilities and resources to cover the entire year with desired foods. He proposed at least two and preferably four data collection points during a 12-month period.

Reardon elaborated at length on the problems of relating personally to respondents and asking the right kinds of questions. He pointed out that the production unit may be quite different from the consumption unit, in terms of household definitions. Purchases do not include large other sources of food such as home production, food gifts, and food received as pay. He also favored using a long prompt list of foods, and going back to the same household for multiple data. His survey team returned weekly to specified households for 13 months, but his sample of households was only around 125. (Reardon, 1985). He collected data on about 100 different food and nonfood products.

Johnson plans to include income questions on his questionnaire (at the request of the Haitian Institute of Statistics), but he thinks that better data can be obtained by using food and nonfood expenditures as a proxy for income. Reardon indicated that getting reasonable income data directly can take as much as five hours per household.

The problem of data editing by computer was discussed in some detail. Johnson uses a computer program called CONDOR which he received from the World Bank. He also indicated that Wayne Fuller at Iowa State, Department of Statistics, uses a program called CARP.

Subsequently, the Purdue Team has received an article prepared at Iowa State University called "Variability, Reliability, and Validity of Survey Data", which it plans to reference in its work of cleaning and editing data tapes (Johnson, no date). 1985).

## VI. REPORT ON TRIP TO LIBERIA

This chapter reports on the initial trip to Liberia taken by Stephen J. Hiemstra and Kimseyinga Savadogo, February 1 to 24, 1986. The photographs taken during this trip, including a trip to the market at Sanoyeo, are submitted as an addendum to this report. Included in appendices are the questionnaires, interviewer guide, sampling plan, and hand-editing procedures developed during the trip. A list of the people contacted in Liberia also is included in an appendix.

### A. Purpose of the Trip

The purpose of the trip was to do the preliminary work under the study of proposed Urban Food Consumption Patterns and National Food Policy in Liberia. This included design of the questionnaire to be used, development of sampling procedures to be followed, training of the supervisors, and pilot testing the questionnaire. This work contributes toward the objectives of the Cooperative Agreement between Purdue University and OICD/USDA. All work in Liberia was to be done in cooperation with the Ministry of Agriculture and US AID/Liberia.

B. Accomplishments in Liberia

The major accomplishments on the trip include the following.

1. Discussed Current Rice Policies and Supply Situation

Extensive discussions were held with various members of US AID, ASAPP, MOA, LPMC and two major rice distributors to understand current rice policies and how they interact with the general economic situation. This information is necessary for background and interpretation of the implication of the proposed household food consumption survey.

Rice policies have become critical in the current environment of declining export earnings because of the need for commercial imports to maintain traditional (and growing) supply requirements. The problem has been exacerbated in the past two years with declining P. L. 480 supplies. This year, there is uncertainty about the level of domestic production and its storage quality. Lack of foreign exchange to finance commercial rice imports and timing of P. L. 480 imports conceivably could cause near-term shortages in supply of rice.

At the time of this trip, Francis Dunbar, then the Managing Director of LPMC, was in the U.S. trying to arrange credit to import rice into Liberia. The normal trade of coffee and cocoa sales abroad to finance imports of petroleum and rice has suffered badly this year because of the lack of Liberian dollars for LPMC to buy the coffee and cocoa from farmers. Instead, LPMC has been bartering rice at cutrate to obtain coffee and cocoa. This practice undercuts LPMC's long range policy of trying to support farm level prices for rice. Very little rice has been

purchased from farmers, thereby further increasing the need for imports for the cities.

A shipload of 4,000 metric tons of concession rice was scheduled to arrive in Liberia on February 19, and another ship should arrive in mid-March. But, P.L. 480 rice will not arrive until mid-April or May, which may be late in relation to needs.

Nevertheless, there is not unanimous agreement on the size of the near-term supply problem. Official production figures do not show a cut in output this year, even though there is some concern about storage quality after harvest. Dr. Flynn is among those who think this year's supply problem is overblown.

## 2. Developed the Questionnaire

A draft questionnaire had been developed at Purdue prior to the trip. It was revised on the basis of discussions with the MOA. Then, the survey was pilot tested in the Monrovia area by four interview teams. Each team had an observer, which included the members of the Purdue team plus two local supervisors. On the basis of this experience, the questionnaire was again revised and simplified. The final questionnaire is attached to this report. The questionnaire includes a standardized introductory statement and a procedure for sampling households within structures that are found upon entry to contain more than one household. Random selection is to be based on the alphabetical listing of first names of the household heads.

A question was added to Schedule B at the express request of the Marketing Division of MOA. It queries whether or not the

household is "making farm," that is, conducting farming operations for rice, cassava, coffee, cocoa, rubber or oil palm. This information is in addition to information to be obtained on the sources of food other than purchased that was used during the prior 7 days. Home production, gifts, and food received as partial payment for work are the sources other than purchases.

The product list of both foods and nonfoods was expanded and made more precise on the basis of Liberian and other local information. A detailed list is useful in soliciting precise information on food purchases and in relating prices to expenditures. However, in analysis, the individual products will be collapsed into meaningful subgroups, except for items such as rice and cassava for which there is policy concern.

### 3. Developed Interview Guide and Hand Editing Procedures

An interview guide was developed along with the questionnaire to provide background information and detailed instructions to the interviewers. Hand editing procedures were also developed to assist the interviewers and supervisors in preparing usable questionnaires. Minor modifications were to be made in these materials by MOA based on decisions made the final day during the supervisor's training session.

### 4. Developed Sample Size and Sampling Procedures

In cooperation with Mr. Alvin Potter, ASAPP, and the Statistics Division of MOA, a sampling procedure was developed. The intent is to draw a random sample of 110 households from each of six outlying urban areas plus 275 households in Monrovia, for a total sample size of 935. These numbers include an allowance

of 10 percent for nonresponse and problems associated with the sampling procedures to be used. The intent is to end up with 850 usable questionnaires.

An area probability sampling procedure is to be followed. Housing structures are to be chosen at random and households within structures sampled randomly when multiple households are encountered. Attached is the step-by-step procedure to be followed.

A total of 24 interviewers and 8 supervisors are to be assigned to the task by the Statistics Division, MOA. The expectation is that this work force should be able to do the interviewing in 10 working days.

#### 5. Pricing Survey Expanded

Prices are to be collected in the local markets of Monrovia and each of the six other urban areas in which households are to be surveyed. For the past two or three years, retail food prices have been collected for many food products in Monrovia and for about six food products in selected urban areas of the four targeted counties. A table showing rice prices for December 1984-December 1985, for each the four major counties is attached. Prices for other foods have not as yet been tabulated.

During March 1986, price collection will be expanded to cover all the major food categories for which expenditures are to be collected in the household survey (list of products is attached.) Data will be collected by the same interviewers as are administering the household questionnaires.

6. Marketing Data Requested

A meeting was held with LPMC and two rice distributors (Transafrique International Corp. and Liberia Bright Stars) to ascertain the types of data that could be obtained to support the household survey data.

Data are needed particularly to measure trade flows of rice by county and urban areas. These data should be available because each of the 11 major rice distributors in Liberia are required to send daily reports to LPMC giving shipment destinations. Surveys of wholesalers and retailers within these locations will ultimately be needed to determine final trade flows by geographic area.

Prices paid for rice by distributors, by wholesalers, by retailers and by final consumers will be needed to fully assess marketing conditions in Liberia.

Finally, cost data at the various levels of the rice market will be necessary to appraise the degree of efficiency and nature of competition in Liberian rice markets.

A letter was sent to Dr. J. Chris Toe, LPMC, outlining the types of information needed for this study, copy attached. It includes data on prices paid for rice by LPMC as well as private traders and trade movements for rice, coffee, and cocoa. It also requests cost data for LPMC, by function, as well as LPMC budget data for recent years.

7. Conducted Supervisor Training

On Friday, February 21, a training session was held with seven of the eight supervisors that will be in charge of the data

collection. The final drafts of the materials were distributed and discussed in detail. Sampling procedures were outlined.

C. Action Plans

1. A meeting was held on the final day in Liberia to clarify responsibilities for action between the Statistics Division and the Marketing Division in MOA. Both Divisions were represented as well as Mr. Alvin Potter, ASAPP, and the Purdue Team. The Marketing Division (Tarnue Koiwou) is responsible for making a few last minute corrections in the training materials, as well as duplicating the questionnaire and other materials for the training school. He will receive the completed questionnaires. Koiwou also is to prepare the letter of introduction to the city Superintendents. The Statistics Division (Reginald Fannoh) is responsible for selecting the interviewers, notifying them of the training school and making physical arrangements for the school. Fannoh and Koiwu are to jointly share training responsibilities at the school.

A letter was subsequently sent to Dr. Richard Edwards, ASAPP, on February 28, 1977, outline the above responsibilities as well as the following actions, as understood by the Purdue Team.

2. Time Schedule

March 10-13: Training school for interviewers.

March 14-15: Travel to designated areas, map the areas, number the structures and draw the sample.

March 17: Data collection to begin.

March 21: Purdue team to return to Liberia.

March 28: Data collection to be completed.

3. The Marketing Division is expected to tabulate, prior to March 17, the food price data that has been collected for the past two or three years. Because of the size of this operation and the lack of computer facilities until this time, they are expected to concentrate on data for one calendar year (1985) and only the cities that are to be included in the household survey.

4. The Marketing Division also will follow-up with LPMC to ensure that they provide the information requested, prior to March 21. If the trade flow data for rice is not available from LPMC, they are expected to obtain copies of daily reports on rice sales submitted by each of the 11 major distributors to LPMC.

## VII. OBJECTIVES AND PLAN OF WORK

The intent of this chapter is to elaborate on the objectives and plan of work related to the overall study of "Urban Food Consumption Patterns and National Food Policy in Liberia."

### A. Objectives of the Study

The specific objectives of the study as outlined in the Project Plan of the Agreement with Purdue University are as follows:

1. Assist the Ministry of Agriculture (MOA) and AID/Liberia in designing, conducting and processing a household food consumption and expenditure survey in selected urban areas of Liberia, focused primarily on consumption of various cereal and starchy foods, but including all other foods as well.

2. Analyze consumption of domestic and imported rice with respect to various income levels, and quantify the substitutability of imported rice, domestic rice, cassava, other roots and tubers and plantains.
3. Assess the impacts of various income-consumption relationships for rice, cassava, other roots and tubers, and plantains at the consumer level on producer and import requirements, with special consideration for (1) the question of food self-sufficiency for urban Liberia, (2) the role of cassava, other roots and tubers, and plantains in meeting urban food demands, (3) the nutritional implications for substituting cassava, other roots and tubers, and plantains for rice, and (4) the role of the Liberian Produce Marketing Corporation (LPMC).

The underlying reason for collecting data on food consumption in Liberia is to have information that will be useful in assessing alternative policies for rice. Rice is the most important cereal product in Liberia and the Government has long had a policy of moving toward self-sufficiency in supply. This overall policy objective has proven to be illusive, however, and in fact, the country appears to be growing more and more dependent upon imported rice as a source of supply.

The bulk of the primary data to be collected in this study is to be obtained from a household consumption and expenditure survey along with retail food prices in surveyed urban areas. Sample urban areas were selected in consultation with MOA and ASAPP during the initial visit to Liberia in February. They

include Monrovia and six other major urban areas, all but one of which are located in the four major rice producing counties.

Detailed quantity as well as expenditure data are to be collected for rice, the product of most concern to the analysis. Expenditures during the previous 7 days will be obtained for all other food products. The expenditure data will be analyzed in conjunction with market price data, to be collected concurrently in each of the sample urban areas, in implicitly deriving quantities consumed.

Careful analysis is to be made of the two principal sources of rice, domestic and imported rice. A third source, concession rice, is to be tabulated and analyzed to the extent warranted, but it is expected to be much less important than the first two sources in the sample areas.

There is major concern for the substitutability of domestic (country) and imported rice. The intent is to quantify statistically the consumption and price relationships for each and to analyze trade flows of each as a separate product.

Secondary to rice consumption and expenditures is primary data related to the main substitutes for rice. These include principally cassava, plantains, and various other roots and tubers. The intent is to collect detailed data for each of these substitute starchy foods and analyze the substitutability of the ones that are found to be the most important.

Cassava is of special concern among this group of substitutes, first, because it is thought to be the most important, and second, because of the known low nutrient content of cassava

tubers. For this reason, a special report is to be directed to an assessment of some of the nutritional implications that would arise if food policies were to significantly increase the consumption of cassava at the expense of rice. Data will also be collected separately for cassava leaves because of their high nutritional content.

The intention is to relate as much household data as possible to data to be collected concerning food markets, especially for rice. Prices have been requested at various levels of the marketing system: (1) initial import or farm purchase level, (2) sale by major distributors, (3) wholesale distribution, and (4) retail sale. Actual prices paid are difficult to obtain for at least two reasons: (1) the fragmented nature of the market and (2) the fact that market prices are officially controlled. Market practices of adjusting quantities to implicitly alter prices make it difficult to measure true prices consistently over time and in different locations. Similarly invoice prices for imports are unreliable because of pressures for avoidance of duties.

The role of the Liberian Produce Marketing Corporation (LPMC) will be given special attention in assessing rice marketing costs and practices. LPMC's new role as the sole authorized importer of rice as well as the sole exporter of coffee and cocoa beans means that its costs and market actions are central to rice policy analysis. Budget data, broken down by function, as well as milling costs have been requested from LPMC and will be analyzed to the extent that data are made available.

Careful attention will be given to analyzing trade flows of rice within the country. Daily reports of individual sales by the 11 major distributors are made to LPMC. The intent is to obtain these data either from LPMC or the individual distributors.

Subsequent visits to Liberia will explore other data sources, such as marketing firm surveys, to obtain more detailed data on trade flows and costs of marketing.

Following is a listing of the kinds of information that the Ministry of Agriculture is hoping will be forthcoming from the study, as listed in a letter of February 21 to Dr. John Flynn from Mac Arthur Pay-Bayee, Assistant Minister for Planning:

1. Description of food consumption in urban households,
2. Estimates of the income and price responses of these consumers,
3. Firmer picture of the relationship between country rice and imported rice,
4. Degree that Liberia can expect to be able to encourage other staples to be substituted for rice, given the price differentials that exist,
5. To the extent possible, assess the nutritional intake of urban people, and
6. Report on methodology of analysis together with relevant computer programs to allow Liberia to replicate the first survey at least two more times.

Each of these points of concern will be addressed in the various reports prepared by Purdue University under this Agreement.

B. Plan of Work

This study has been designed as a "Rapid Appraisal" of rice and other food consumption and expenditure patterns in Liberia and an assessment of the policy implications of these findings for rice price and other marketing policies. In the policy analysis, careful attention will be given to the various policy studies that have preceded it. Many of them necessarily made assumptions about price and income elasticities which will be derived in this study. For that reason many of the previous policy conclusions and recommendations are subject to reconsideration on the basis of the results of this study.

Because of the nature of a rapid appraisal, shortcuts in both data collection and analysis necessarily have been and will continue to be made. For example, the household data are not randomly drawn from the entire population. It is a purposeful sample, limited to major urban areas and chosen to represent primarily the major producing areas plus two rice deficit areas, Monrovia and Buchanan. In addition, the sample size is quite small in comparison to the expected variability in the data and the many policy questions being posed.

A further concern is the type and quality of the data themselves that can be expected. The household data collection procedures appear to be equal or better than such procedures used elsewhere, but special difficulties associated with this initial data collection effort in Liberia may adversely affect the results. Possible problems relate to (1) uncertainty in average number of meals consumed per week, thereby making difficult the

estimation of full-time equivalent consumption of food at home; (2) whether total expenditures (which omits savings, loans and perhaps taxes) can appropriately be used as a proxy for income in calculating income elasticities; (3) whether nonfood expenditure groupings are sufficiently detailed to get a reasonable approximation of total expenditures, (4) whether it is feasible to merge "use" data over 7 days for large purchases of rice with actual purchases for smaller purchases, and (5) the use of price data collected in local markets in deriving quantity data from household expenditure data.

In addition, it is recognized that the initial data collection effort may yield results that are not representative of the Nation because of expected sizable seasonality in consumption. Phase II and III data collections are planned to address this concern, but such data will not be available for analysis under the present Agreement.

Plans are to analyze the data from a number of different perspectives and policy concerns. Following is a listing of some of the major activities and analytical procedures that are planned.

1. Data Collection Procedures

a. Household Data

The household survey instrument was designed by the Purdue Team prior to the first trip to Liberia. This instrument was discussed in detail with MOA and revisions made in line with their interests. The instrument was pilot

tested by four survey teams on February 14. Further revisions were made on the basis of the pilot test.

On-site data collection is the responsibility of the Statistics Division of MOA. Plans are to utilize 24 interviewers and 8 supervisors in this effort, as noted in the previous chapter. The Interview Guide and Hand Editing procedures developed in Liberia are in an appendix to this report.

The Purdue Team plans to return to Liberia after the first week of data collection, which is scheduled to begin March 17. The team plans to visit several of the survey sites during the week of March 24, assuming that data collection is on schedule. They will be spot checking questionnaires, verifying hand editing procedures, and obtaining first-hand knowledge of problems and reactions from the interviewers.

b. Marketing Data

Market price data will be collected simultaneous with the household surveys, working in the same urban areas. Procedures are expected to match those used in obtaining retail prices on a regular basis by MOA. The Purdue Team will also visit selected urban markets and monitor price collection procedures.

The market price, cost, and sales data requested from LPMC is expected to be available at MOA upon the return trip to Liberia by the Purdue Team. These data will be analyzed for completeness and reasonableness at that time. If these

data are lacking for analytical purposes, discussions will be held with AID/Liberia (John Flynn) and MOA to fill data gaps. In addition, meetings will be held with LPMC and possibly with selected distributors to fully understand the data received and to ask for any further necessary data.

If necessary, recommendations will be made for a market survey for the collection of primary data related to sales of rice (and possibly substitute products) at wholesale and retail markets. This work would complement efforts already made under the Small Farmer Marketing Project.

c. Recommendations for Improvements

Recommendations will be made for improvements in household and market survey procedures aimed at improving data in Phases II and III. These recommendations will be summarized in Report 5 under the Agreement. However, preliminary recommendations will be provided in the trip report following the second trip to Liberia, based on the actual collection that will have taken place by then. Further recommendations will be made in memo form to NEG/OICD during the data analysis period, in order to provide guidance for Phase II data collection which is scheduled prior to the formal submission of Report 5.

2. Data Analysis

a. MOA Involvement

The household questionnaires will be hand edited in Liberia for completeness and reasonableness. This work will

involve the supervisors on location at surveyed urban areas and spot checking by MOA and the Purdue Team in Monrovia.

The data will then be taken to Purdue University for computer input and analysis. Arrangements have been made for Tarnu Koiwou, Assistant Director of the Marketing Division, MOA to come to Purdue to work with the Purdue Team during the period of concentrated analysis. Koiwou will be expected to participate in all aspects of data cleaning and editing, developing table formats of consumption and expenditures, statistical analysis, and initial report writing. The intent is that he be trained to perform some or all of these functions related to Phase II and III data collection efforts in Liberia.

b. Data Tabulations

Consumption and expenditure data will be tabulated in disaggregated form for products or product groups which have sufficient data as reported to be meaningful. Initial tabulations will be tabulated separately for each survey city.

Food products will then be combined into reasonable groups, e.g., fruits, vegetables, meat, poultry, etc., and data tabulated by city or county and cross-tabulated by income level (using total expenditures as a proxy for income). Rice, cassava, plantains and other starches will be tabulated as individual products as well as in a group.

Similarly, primary price data will be tabulated individually, by city, after averages by item are computed.

Prior to tabulating the data, standard checks will be made by computer to aid in cleaning and verifying the data for consistency and reliability. Data tabulations will be reported to NEG/OICD in Report 2.

c. Price Analysis

Various types of price analysis are planned based on (1) the price data collected by urban area at the time of the household survey, (2) historical price data to be tabulated by MOA, and (3) market prices submitted by LPMC.

The data will be arrayed to measure the impacts of the various major dimensions of classical markets: time, form, place and level of market. Concepts of market efficiency will be applied in interpreting price differentials associated with these various dimensions of markets, after allowing for known or estimated marketing costs. Rice will be the primary focus of the price analysis, but comparisons geographically will be made for all products for which data are available.

This information will be reported to NEG/OICD either in Report 2, or a separate Report 2A.

d. Demand Analysis

Statistical demand models will be employed in derivation of income and price elasticities of demand. Cross elasticities will be used in assessing substitution in consumption among the major food products, particularly the relationships among rice and its principal substitutes.

Various model specifications will be employed. Among those that are intended for testing are the Linear Expenditure System (LES) and the Almost Ideal Demand System (AIDS). They are both complete demand systems that have been used successfully in related studies. The recent study by Kimseyinga Savadogo in Burkina Faso found the AIDS model to be successful in explaining consumption behavior. Prices, income, and socioeconomic variables were used to explain household budget allocations.

The AIDS model allows for a flexible representation of income and price elasticities. It is, however, data demanding and its use will depend on the richness of the particular data set. The LES on the other hand is parsimonious in parameters although it implies more restrictive income and price behavior.

Because it is expected that different income classes have different consumption behavior, prices and income elasticities will be computed at different income levels (low, medium, and high). Such variations may have important food policy implications, allowing, for instance, the analysis of the welfare effects of government price or income policies on different consumer groups. Such variations would also be important in developing longterm projections of demand for purposes of assessing the appropriateness of self-sufficiency as a policy objective.

The significance of prices will be tested. If prices are found to be insignificant as explanatory variables, the

system collapses into a standard Engel function. A per capita version of the AIDS model may also be tested to determine the significance of household sex-age composition.

These data would be reported to NEG/OICD either in Report 2 or a separate Report 2A.

e. Rice Consumption Analysis

If reasonably complete sales movements of rice can be obtained and production estimates warrant the calculations, per capita consumption of rice by county can be calculated using supply and demand (disappearance) methodology. Presumably, carryover stocks would not affect the results. Standard conversion factors of milled rice equivalents would be used in converting from paddy rice. Marketing losses from production to consumption would likely need to be ignored because of the apparent lack of data.

Nevertheless, the results may be useful in appraising differential demands in various parts of the country, which are hypothesized to be significant, and which bear on the question of imported vs. country rice demand.

These data will be reported to NEG/OICD in Report 3.

3. Policy Analysis

The central policy issues to be examined in this study involve questions of rice self-sufficiency for Liberia (Report 3), and interrelationships in consumption of country vs. imported rice and rice vs. substitute food products (Report 4). The analysis of interrelationships among products will include nutritional considerations of alternative policies.

a. Rice Self-Sufficiency for Liberia

The policy question of rice self-sufficiency involves a systems approach in synthesizing the results of a number of different variables that bear on the question. The issue will be addressed by examining a number of different elements that have a bearing on the overall result. Then, an attempt will be made to summarize the results by looking at some alternative scenarios and assumptions. The important factors to analyze include the following:

1. Price and Income Elasticities

Several studies dealing with the self-sufficiency question have made explicit assumptions about the levels and curvature of the price and income relationships discussed earlier. The implications of the findings in this study will be examined by partial analysis of some of these previous models.

2. Trends in Production, Consumption, and Income

Analysis will be made of trends in population, migration to urban areas, production of rice and consumption of rice, to the extent that data are available for such analysis. Consumption variations by geographic area will be applied to population movements in assessing future changes in demand. Alternative projections of income will be evaluated in terms of their rice consumption implications by applying income elasticities discussed above. Patterns of country vs.

imported rice sales will be examined in relation to these demands.

3. LPMC Price Policies

Implications of alternative price policies at both producer and consumer levels will be examined in light of the price elasticities discussed above. Import prices will be compared with world prices for similar quality rice, if appropriate data can be obtained.

4. Import Restrictions

Some of the implications of alternative import policies will be examined, particularly those that lend themselves to economic analysis. Price relationships in Liberia relative to world prices will be assessed in terms of supply implications.

5. Technical Production Trends

Expected changes in technology that can reasonably be expected to impact rice supplies will be reexamined. These include: (a) the potential for new varieties, (b) increased yields due to improved cultural practices and use of fertilizer, (c) substitution of swamp rice for upland rice production, and (d) new policies attributable to the Liberian "Green Revolution."

Alternative scenarios to consider include:

1. Complete self-sufficiency at some future target date.
2. Self-sufficiency in major rice producing areas.

3. Rice security, in the sense of assuring a stable source of rice supply.

b. Substitution of Cassava and Other Foods

Report 4 will include discussion of the policy question of substituting cassava or other foods for rice.

1. Economic Approach

This analysis will be based mainly on an assessment of the cross-demand elasticities of rice for various other foods and the own elasticities of these alternatives in relation to rice. Analyzing cross-elasticities by income level will allow testing the hypothesis that cassava is a poor people's food which is consumed only as a last resort.

2. Nutritional Approach

Nutritional implications of various potential substitutions that might be encouraged will be examined. One writer, for example, has proposed that sweet potatoes be encouraged as a substitute for cassava because of the low nutrient level of cassava. While nutrients in the cassava tubers are apparently deficient in protein and some of the vitamins, cassava leaves are quite high in these nutrients. This approach will examine levels of nutrients in hypothetical diets composed of alternative food products.

3. Alternative Scenarios

At least two alternative policies will be examined: (a) trends that likely will occur under free

market conditions, and (b) substitutions that may occur in the event of a policy of no legal importation of rice. The latter policy is sometimes proposed as a way of attaining rice self-sufficiency. It also may be realistic if one hypothesizes a breakdown in the financial structure of the country and a complete lack of foreign exchange.

#### VIII. CONCLUSIONS

This study represents a pioneering effort at a Rapid Appraisal of household food consumption based mainly on the collection of food expenditure data analyzed in conjunction with local market prices for similar foods.

The data should provide a useful basis for derivation of price and, especially, income elasticities. This information should serve as important information in addressing policy questions related to production and the need for importation of rice, the dominant cereal product consumed in the country, and consumption of alternative food products. The nature of these demand curves should have an important bearing on the feasibility of self-sufficiency as a policy objective, in view of the fact that domestic supplies appear to be quite inelastic with respect to price.

Nevertheless, the study poses a number of risks. Several innovations in data collection have been made, in keeping with the concept of a Rapid Appraisal. In addition, any time that micro data are analyzed for macro policy purposes, there is a

possibility of sampling and aggregation problems. Partly for this reason, it is prudent to simultaneously collect as much market flow data as possible to substantiate the household consumption data by comparing with aggregative disappearance data.

The household consumption and expenditure data should be useful for a number of purposes aside from the primary purposes of the study, assuming it is judged to be reasonably reliable. Only one previous household expenditure survey has been conducted in Liberia and little is known about consumption/expenditure patterns in the country. The expenditure data may be sufficiently complete to serve as a basis for adjusting the weights in the country's food component (and perhaps, even other components) of the Consumer Price Index.

In addition, nutritional information in the country is quite lacking. Only one previous survey of this type has previously been conducted, and those data were quite sparse. While this survey cannot be considered an adequate basis for assessing nutritional status, food consumption patterns may be sufficiently indicated to warrant broad generalizations regarding the availability of nutrients in the food supply.

All of these potential data uses await an assessment of the quality of the data collected in this survey.

IX. List of References

1. Booker, M. L. (1978). "Report on Visit to Monrovia 7-11 March 1978." Addis Ababa (April).
2. Johnson, S.R. (no date). "Variability, Reliability, and Validity of Survey Data," Cereal Foods World.
3. Lockwood, Richard M. (1984). Nutritional Considerations for the Agricultural Research and Extension II project Paper, John Show Public Health Group, Inc. (March).
4. Martin, J. (1984). Scope of Work: Domestic Rice Marketing Study, Small Farmer Marketing Access Project (Oct.).
5. Martin, Jerry (1985). Phase II Report - Liberian Marketing Assessment, Small Farmer Marketing Access Project (Oct.).
6. Martin, J., and John Holtzman (1985). Liberian Rice Marketing Assessment. Phase III Research Design Workshop Report, Small Farmer Marketing Access Project (June).
7. Monke, Eric A. (1979a). "Rice Policy in Liberia," in Pearson, Stryker and Hamphreys (eds), Rice Policy in West Africa, Stanford WARDA Study, Food Research Institute, Stanford University, Chapter 3.
8. Monke, E. A. (1979b). "The Economics of Rice in Liberia," in Pearson, Stryker and Hamphreys (eds), Rice Policy in West Africa, Stanford WARDA Study, Food Restaurant Institution, Stanford University, Chapter 4.
9. Pay-Bayee, MacArthur M., Sovan Tun, and Mervin. J. Yetley (1983). Household Structure and Food Consumption in Liberia, 1976-78.
10. Reardon, Thomas, and Taladidia Thiombiano (1985), Methodological Issues in the Collection of Household Food Consumption and Expenditure Data in Ouagadougou.
11. Republic of Liberia, Interministerial Technical Committee on Food and Nutrition Planning, (1982), Recommended National Food and Nutrition Plan for Liberia (Aug.).
12. Rep. of Liberia, Ministry of Agriculture (1985), Production Estimates of Major Crops 1986. Monrovia (July).
13. Rep. of Liberia, Ministry of Health and Social Welfare, (no date). Liberia National Nutrition Survey, December 1975 - March 1976, Monrovia.

14. Rep. of Liberia, Ministry of Planning and Economic Affairs (MPEA), 1981. External Trade of Liberia; Exports, 1980, Monrovia.
15. Rep. of Liberia, MPEA (1981), External Trade of Liberia; Imports, 1980, Monrovia.
16. Rep. of Liberia, MPEA (1984), Economic Survey of Liberia, 1983, Monrovia (December).
17. Rep. of Liberia, MPEA (1986). 1986 Demographic and Health Survey, Monrovia.
18. Savadogo, Kimseyinga, (1986). "An Analysis of the Economic and Sociodemographic Determinants of Household Food Consumption in Ouagadougou, Burkina Faso," unpublished. Ph.D. Thesis, Purdue University, Department of Agriculture Economics, West Lafayette, Indiana.
19. Schuftan, Claudio (1982). Basic Background Information for a Food and Nutrition Plan in Liberia, Consultant Report, Monrovia (July).
20. Simmons, Emmy (1978). Memorandum: Trip Report on Liberia TDY, November 1978.
21. Stanley, Edward T., and Mark Gallagher (1985). An Analytical Description of the Liberian Economy, USAID/Liberia (Sept.)
22. Trapp, J. N., B. Rogers, and Rudene Wilkens (1985). "Liberian Rice Policy: Rice Self-Sufficiency versus Rice Security," Oklahoma State University, Stillwater, Oklahoma.
23. Tun, Sovan, and Mervin J. Yetley (1983). Impact of Increased National Supply of P.L. 480 Commodities on Food Consumption in Liberia.
24. Tweeten, Luther, and Dean Schreimer (1984). Increasing Capacity for Agricultural Policy Analysis in Liberia, Oklahoma State University (Feb.).
25. Tweeten, L., and Boima Rogers 1984; Costs, Benefits and Income Redistribution from Liberian Rice Policies, Oklahoma State University.
26. USAID/Liberia (1984). Country Development Strategy Statement FY 1986-FY 1989, Monrovia (Feb.).
27. USAID (1976). Liberia National Food Nutrition Survey, Office of Nutrition Washington D.C.

28. World Bank (1984). Liberian Agricultural Sector Review.  
Vol. 1: Main Report. (April).
29. World Bank (1984). Liberian Agricultural Sector Review.  
Vol. 2: Supporting Papers (Apr.).
30. World Bank (1984). Liberian Agricultural Sector Review.  
Vol. 4: Supporting Papers (Apr.).