

**URBAN FOOD CONSUMPTION PATTERNS AND
NATIONAL FOOD POLICY IN LIBERIA**

Report 3

RICE SELF-SUFFICIENCY IN LIBERIA

March 1987

by

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Purdue University

for

**Nutrition Economics Group
Technical Assistance Division
Office of International Cooperation and Development
U.S. Department of Agriculture**

**A Report Prepared Under Cooperative
Agreement 58-319-R-6-013 With
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URBAN FOOD CONSUMPTION PATTERNS AND
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REPORT 3: RICE SELF-SUFFICIENCY FOR LIBERIA

EXECUTIVE SUMMARY

The purpose of this report is to analyze the implications of the findings from the March 1986 urban household expenditure survey. These findings, including the statistical analysis, will be analyzed with respect to food and agricultural policies in Liberia, with special attention to the policy of rice self-sufficiency.

Rice self-sufficiency has been an important food policy in Liberia since the 1960's. In 1973, this policy took the form of subsidized prices paid to farmers to encourage them to increase production and to restrict imports. Several policies were instituted to increase productivity in production, such as encouraging swamp rice growing, experimenting with improved cultural practices, and using improved seeds. More recently, rice self-sufficiency has taken the form of a Government policy called the "Green Revolution." This policy strives to encourage domestic production and is concerned with the self-sufficiency of all foods, but rice constitutes the bulk of all food imports.

Consumer prices have been held stable at levels that were generally above world market prices for the purpose of paying for producer

programs and stabilizing markets for rice. Even so, imports of rice have increased as consumer demands have grown--the results of population growth, urbanization, and rising consumer incomes over time. P.L. 480 shipments from the U.S. have helped to supply these domestic needs since 1980.

The urban household survey conducted in March 1986 reported that rice accounted for 17 percent of the total food budget in Monrovia (Report 2, Part 1). This percentage was larger in outlying urban areas, ranging up to 36 percent in Zorzor. It also found that many foods other than rice also were important in the Liberian diet. For example, in Monrovia 15 percent of the food budget went for cassava, starchy vegetables, and cereals other than rice. Animal products accounted for another 29 percent of the budget.

Computations of income elasticities of demand, in Report 2, Part 2, showed that rice is a product in relatively high demand at low income levels. But, on average, an increase of 10 percent in income is associated with an increase of only 1.6 percent in spending for rice. At income levels above \$600 per month, there is actually a decline in the amount of rice demanded as income increases. This situation exists with respect to about one-fourth of the urban population.

Country vs. Imported Rice

According to the survey of all rice purchased or reported being used, only 18 percent came from Liberian production, 1 percent from

concessions, and 81 percent from imports. Consumption of imported rice was reported to be the highest in Monrovia, at 20.0 pounds on a monthly basis. But, consumption of imported rice actually exceeded consumption of country rice in two of the interior urban areas, Gbarnga and Zorzor.

One might question whether this finding was due to the particular time period of the survey. However, in general, annualized consumption levels from the survey matched rather closely the annual average consumption for the entire country based on domestic production and import data.

The above data might be used to suggest that imported rice is regarded as somehow superior to country rice. Nevertheless, the findings from the statistical analysis in Report 2, Part 2 indicate that a true difference in demand exists between Monrovia and the outlying areas in demands for country relative to imported rice. These findings showed positive coefficients for all of the outlying urban areas (except for Buchanan) with respect to the demand for country rice and negative coefficients with respect to imported rice. These models took account of income and demographic differences among the areas.

The statistical models did not include price variables because of data problem. However, independent price comparisons fail to offset the above conclusions. Imported rice did sell for slightly less than did country rice in Monrovia and country rice (in bags at least) did undersell imported rice in outlying urban areas, as one would expect on

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Therefore, the projected doubling of import needs for rice projected by the World Bank is somewhat larger than is consistent with Alternative I assumptions in this study. Growth in total demand for rice under this alternative is projected at about 4 1/2 percent annually or 10 to 11 m.m.t of rice. Most of this increase is due to population growth and increased urbanization.

Furthermore, while the quantity of rice demanded will increase substantially over time, the rate of increase in demand will be much less than the rate of increase for several other foods that have demand elasticities of 1.0 or more. These include cereals other than rice, such as wheat flour and cornmeal, starchy vegetables, animal products, and fruit. Increased policy attention should be given to the production or importation of these other products which have high consumer preferences and growing demands.

Alternative II

Under Alternative II, which would be a continuation of the current situation, per capita incomes are assumed to decline by 3 percent per year. This means that somewhat less rice, perhaps 0.5 percent per year, will be demanded in the out years than under Alternative I. However, population growth and urbanization will continue to expand the need for rice by perhaps 3 percent annually or 7 to 8 million metric tons per year.

A declining trend in real income, if continued, would have a larger

adverse impact on food products that have high income elasticities than those with relatively low demands. Per capita demands for cassava would be expected to decline by about 1 percent per capita on an annual basis, but total requirements would continue to increase along with population growth.

Alternative III

Currently, imported rice accounts for about one-third of the total supply. Rice self-sufficiency, under Alternative III, would require price increases or income declines that in total would reduce the quantity demanded by this amount, or alternatively, local supplies available would need to increase by this amount.

Demand coefficients from this study coupled with price and supply elasticity data from other sources would suggest that retail prices would need to increase from the current levels of \$23.10 in Monrovia and \$26.10 in outlying areas to around \$29.00 in Monrovia and \$33.00 in other urban areas, to reach self-sufficiency. These figures assume that coefficients computed for March 1986 are representative for the year. They imply an increase in retail prices of about 27 percent and an increase in Liberian production of about 3 percent in response to the higher prices.

This policy would result in a shift to substitute foods that are in relatively high demand, such as cassava, other cereal products, and starchy vegetables. However, the extent of these shifts is not known

precisely, because of the inability to compute cross-demand relationships from the survey data. Such increases in prices would have adverse income impacts of approximately 5 percent of income in Monrovia and 8 percent in other urban areas. Report 4 of this series will explore further the demand relationships among rice substitutes.

Another perspective to self-sufficiency under Alternative III would be to combine the income assumptions from either Alternatives I or II with the implicit price assumptions in Alternative III. The quantity of rice demanded under self-sufficiency, which assumes no direct change in income, would be reduced to domestic market clearing levels, with imports eliminated and some increase in Liberian production. However, the assumptions regarding income and population changes over time will determine future trends in demand, along with price trends.

Demand pressures from income and population growth under self-sufficiency will continue to represent an increase in demand for the total supply of rice of 3 to 4 1/2 percent, according to the assumptions of Alternatives I and II. If these supplies are not forthcoming, prices will need to trend higher at somewhat larger rates, around 3 1/2 to 5 percent in real terms, to keep supplies rationed.

A sub-option to this alternative would be to attempt to become self-sufficient only in commercial markets for rice and continue to receive P.L. 480 rice from the U.S. Some of the rice could be distributed free, or at costs of distribution, to low-income households to offset the

Income losses from the increase in prices in commercial markets. Such a policy also would be little hardship to the one-fourth of the population with monthly incomes above \$600 monthly which have negative income associations with increasing rice purchases.

Alternative IV

The fourth alternative, the free trade option, has as its objective to increase the overall economic growth of the country by giving producers incentives to produce their highest valued products. For farmers, this means increasing production of tree crops such as coffee and cocoa and importing more rice than currently to meet market needs. Export duties on tree crops by LMPC would be eliminated. But, import duties on rice and price markups by LPMC would be maintained and perhaps increased to offset revenue losses on tree crops.

Increased market demands would not be great because urban areas already import about 81 percent of total supply (96 percent in Monrovia), according to the household survey. Much of the remaining market supply represents surplus production rather than production targeted to produce revenue. Subsistence needs of rural households would likely continue to be met by home production because of personal preferences for country rice, high costs of transportation to interior markets, and the need to ensure security of food requirements due to imperfect markets. However, prices reduced in line with world levels would stimulate rice consumption to some extent.

Rather unstable international markets would cause instability in consumer prices in Liberia, even though presently prices would be reduced significantly. Reduced revenue to the Government would be offset in the long run by increased export earnings and duties generated on the increased imports that could then be purchased. For that reason, a careful policy of transition would need to be developed. Continuing to receive P.L. 480 shipments and setting aside a portion of them for free or low cost distribution to low income people would offset some of the problems of rice instability in the long run.

URBAN FOOD CONSUMPTION PATTERNS AND
NATIONAL FOOD POLICY IN LIBERIA

REPORT 3: RICE SELF-SUFFICIENCY FOR LIBERIA

I. INTRODUCTION

The objective of this report is to explore the implications of the findings from the urban food consumption survey in Liberia conducted in March 1986 with respect to agricultural policies for that country. Findings from the survey were reported earlier in Report 2, Part 1, Results of the Household Survey (Hiemstra and Savadogo, 1986b) and Report 2, Part 2, Statistical Analysis (Hiemstra and Savadogo, 1986c).

Agricultural policies in Liberia will be briefly discussed as a backdrop for this analysis. Then, the implications for various alternative policy scenarios will be examined in view of the findings from the statistical analysis of income elasticities and marginal propensities in Report 2 (2). The question of rice self-sufficiency for Liberia will be considered in the context of these alternatives. Selected policy analyses and recommendations made by earlier analysts will be reexamined in the light of new information from the household survey.

II. AGRICULTURAL POLICIES IN LIBERIA

Rice production and consumption has long been a central focus of agricultural policy in Liberia because of the central place that this food holds in the diets of the people. The price and availability of rice are considered to be key factors in the stability and well being of the country.

A. Rice Import Trends

Prior to World War II, Liberia was self-sufficient in rice. Imports expanded over the years in concert with the urbanization of the country and growth in world trade, particularly since the largest city is on the coast and somewhat remote from major producing areas (table 1). Growth in imports has been particularly strong since P.L. 480 shipments from the U.S. began in 1980 following the rice riots in April 1979. The riots at that time are commonly attributed to an announcement of significant increases in prices for rice. Imports peaked in 1984 when they accounted for 101 m.m.t., about 25 percent of the total rice supply of 399 m.m.t. (Ministry of Agriculture, 1985b).

More recently, commercial rice imports have been difficult to finance due to declining export earnings, as noted in Report 1 (Hiemstra and Savadogo, 1986a). But, P.L. 480 imports expanded again in 1986 because the drop in U.S. export prices, authorized by the 1985 U.S.

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.

farm policy legislation, allowed larger volume purchases within previous dollar limitations.

B. Agricultural Policies Prior to 1980

Self-sufficiency as a policy issue in Liberia arose during the 1960's during which time agriculture's economic importance had declined relative to the balance of the economy. Since then, considerable effort has been made to stimulate agricultural development of various kinds. These efforts have included attempts to increase production by several means. These included mechanical land clearing projects; development of areas suitable for growing swamp rice which has much higher production per acre than the traditional upland production; expansion of demonstration plots and experimentation with application of fertilizer; and, the development, propagation and distribution of seed from improved rice varieties such as LAC-23.

Attempts to stimulate agricultural production, principally rice, were only marginally successful despite the many efforts at encouraging improvements in production. Some attempts have been made to improve upon the traditional farming methods of "slash and burn," but these procedures have not adopted to any significant degree. Problems include heavy tropical rains that leach upland soils and provide meager returns to fertilizers. Funds from P.L. 480 rice sales have been devoted largely to production research and agricultural development projects of various kinds, but productivity gains have remained small. Some researchers have noted that rice production response to price increases is very low, with the supply elasticity in the range of 0.1 (Trapp,

Rogers, and Wilkens, 1985, and World Bank, 1984).

A producer price support program was initiated in 1973, a time of high world prices, in an attempt to improve producer incomes and increase incentives for local rice production. The program was operated by the Liberian Produce Marketing Corporation (LPMC), a marketing parastatal established by the Government of Liberia and given broad authority. Producer rice prices were set at 11 cents per kilogram initially in terms of paddy rice. Subsequently, prices were raised as high as 40 cents per kilogram, or 18 cents per pound in terms of paddy rice (28 cent milled equivalent), in 1982 following another cyclical peak in world prices. However, only small amounts of rice were purchased at these price levels which were well above market clearing prices (World Bank, 1984). During the peak year of the program, 17 million metric tons (m.m.t.) were purchased (calendar year 1984), which amounted to 11 percent of total production of 157 m.m.t. (Monke, 1985). Commercial producer prices were in the range of 6 to 10 cents for paddy rice, depending on time of the marketing year.

LPMC and a sister agency also control exports of tree crops (coffee, cocoa, and palm kernel products) which they purchase below world prices and sell abroad at a profit. Profits from these sales plus the proceeds from import duties on rice and other products are used to subsidize the producer prices.

However, relatively small proportions of each crop have been sold at the support price levels due mainly to inadequate funding. Inadequate

seasonal and geographic pricing differentials have also resulted in inefficient use of the monies that were used for producer purchases. Inadequate funding was due in part to only partial collection of import duties, and high LPMC costs of administration. The net result has been an inability generally to raise producer prices for rice effectively to the levels officially established by the price support program.

There also have been some important economic reasons for the lack of success in increasing rice production much beyond subsistence needs. Several policy analysts have emphasized the comparative advantage to Liberia in producing tree crops and importing rice to satisfy market needs, at least in coastal areas (for example, see World Bank, 1985, Trapp, Rogers, and Wilkens, 1985, and Tweeten and Rogers, 1984).

This type of policy recently has been espoused (see next section) but not gained strong adherents due in part to an overriding interest in becoming self-sufficient in rice production for security and nationalistic reasons. Foreign trade in agricultural products has faced increasing problems in recent years in obtaining the necessary foreign exchange due to balance of payments problems which are largely external to agriculture. The Government sees the taxing of exports as an easy way to try to alleviate some of these problems. It becomes part of a short-run solution but at the expense of exacerbating long-run problems.

Food policies have been fostered which have had the impact of limiting the growth of consumer demand for rice and at the same time encouraging

rice production. Retail prices have been set administratively by the Government and held above world levels for most years since the world rice shortage in 1972-74. Retail prices essentially had been set at peak world levels initially but not decreased along with world prices; they only ratcheted upward when world prices again increased cyclically and again held stable, since 1981 (World Bank, 1984).

C. Current Policies

Rice self-sufficiency has been and continues to be an important long range policy objective of Liberia. An agricultural policy statement prepared in 1980 (revised in 1981) by the Ministry of Agriculture (MOA) pointed to the need for broad agricultural development (MOA, 1980). It recognized the large mass of small subsistence farmers and lack of adequate infrastructural and institutional support for these activities. Nevertheless, "striving for food self-sufficiency within the limits of technical and economic feasibility will remain an objective," according to the report. The primary thrust of the development effort was to be directed to the subsistence sub-sector. As Liberia's agricultural output increased, consumers would benefit by more abundant and cheaper food supplies.

A more recent draft report prepared in December 1985 continued to stress achieving "a high level" of food self-sufficiency and utilization of land resources to their maximum potential, subject to available capital (MOA, 1985). This report contained the following points as immediate development goals:

1. An increase in the quantity of rice produced.
2. An increase in the production of cassava and other secondary staples.
3. A more complete understanding of the uses and potentials of these cassava and secondary staples.
4. An increase in the production of cattle, poultry, fish and other high protein foods.
5. An improvement in the production and supply of vegetables throughout the year.
6. Improvement and strengthening of applied and adaptive agricultural research in the staples, animal husbandry, fishery, vegetables and selected tree crops.
7. Promotion of agro-processing and food preservation.
8. Although emphasis will continue to be on small farmers, commercial farming will also be encouraged most especially where the technology is known and the analysis shows that these are economically viable.
9. An improvement of the marketing system for agricultural produce to ensure stable and fair prices so as to encourage the production of these items.
10. Investigate and encourage the growing of nontraditional agricultural products that have export potential.

Many of these objectives appear to continue to represent current policy based upon discussions with officials from the Ministry.

The most recent agricultural policy statement available was announced on

January 9, 1986 by President Samuel Doe. Termed the Green Revolution, this policy stresses a "back to the farm" philosophy as a way of regaining food self-sufficiency (MOA, 1986b). Total food self-sufficiency is envisioned, not just for rice, along with increased production and sale of export crops. However, the plan does not stress producing such crops for export so as to enable buying those foods on overseas markets that can more efficiently be produced elsewhere.

The Green Revolution is to be built around the establishment of Nucleus Estates in each of the 10 counties that don't already have an Agricultural Development Project. It also depends importantly on the rural integrated development projects (FAPs) and stresses development of the rural infrastructure, including development of a strong marketing network.

The Nucleus Estates are to be "privatized" after a period of Government ownership and development. An accompanying general business policy of privatization involves the sale of Government corporations and other assets to the private sector, in part to obtain scarce foreign exchange.

This policy may have important policy ramifications for LPMC which continues to have sole rights for importing and exporting rice and other agricultural products in Liberia (Ministry of Commerce, 1986). LPMC also has responsibility for importing PL 480 rice and selling it to wholesale dealers (U.S. AID Mission to Liberia, 1986).

LPMC itself has been announced to be for sale under the policy of

privatization. At the time of data collection for this study, LMPC had not been sold. But, if it were, there is some possibility that the organization would become more efficient as a marketing agency and less concerned with political considerations which may have been the cause of some of their high costs of operation. There is also the question of whether or not as a private organization LMPC would continue to enjoy the sole rights of buying and selling important agricultural products that it has in the past.

It remains to be seen how well the Green Revolution policy will be implemented. At the time of this study, implementation plans were still under development and relatively few resources appeared to be available for early and rapid completion.

Rice prices and specific food marketing practices, including issuance of licenses to import rice, are under the direct authority of a Rice Committee. The Minister of Commerce serves as chairman of the Rice Committee. Both retail and wholesale prices for rice are established and controlled by the Committee. The Committee granted monopoly foreign trading rights to LMPC in the summer of 1986 at a time when concern was expressed regarding the adequacy of rice supplies (Ministry of Commerce, 1986).

Official prices for rice at retail have declined \$1.00 since October 1984 and now stand at \$23.00. This level is up by \$3.00 from the level of \$20.00 in 1980. This price level was confirmed by this study which computed an average of \$23.10 in Monrovia for bagged rice (but prices

averaged \$26.10 in outlying urban areas). Consumer prices had exceeded world market levels by about 7 cents per pound, in recent years (Monke 1985). In 1986, however, U.S. export prices were lowered in response to the 1985 farm bill, so the relationship of retail prices in Liberia to world wholesale prices (at least in terms of U.S. prices) has changed significantly since then. The price spread has widened dramatically from a few years ago.

Funds accruing to the Government from this relatively high price policy have been used in part (but to an unknown degree) to finance the producer price support program. The producer support price level was reduced from 18 cents to 15 cents per pound (paddy) so costs associated with this program have been lowered somewhat at about the same time as income from rice imports has increased.

The Government of Liberia (GOL) in recent years has fallen in arrears on external accounts and loans have been cut off from the International Monetary Fund. As of June 30, 1985, GOL arrears totaled over \$96 million (Stanley and Gallagher, 1985), and informal information indicates that the problem continued to accelerate through 1986.

The reduced U.S. export price for P.L. 480 rice resulted in commensurately larger rice imports in 1986. This allowed Liberia in 1986 to import badly needed rice at a time when export earnings were seriously low. However, the deteriorating export earning and the balance of payments situation in 1986, demonstrated by increases in black market rates for the U.S. dollar, appears to have precluded the benefits from

the increased rice price spread from helping domestic producers to any significant degree. But, there has not been much time for adjustments to these new price levels so perhaps this situation will improve with time if the macroeconomic situation in Liberia improves.

Note that all expenditure and price data in this study have been reported in terms of Liberian dollars with no adjustments for the relationship to U.S. dollars, due to the official exchange rate which is at a ratio of 1 to 1. During the period of study, it has been noted informally that there has been some increase in the value of the U.S. dollar relative to the Liberian dollar, but no attempts were made to measure the amount of these changes.

Reduced income from the sale of export crops and increased administrative and other governmental costs of LMPC appear to have absorbed much of the recent increase in price spread from rice. Further, relatively few data were available to make assessments of the current situation. Requests by these researchers to LMPC for budget and other current data to allow assessment of trade flows and the current marketing situation were not granted.

At the time of this study, the Government was contemplating the possibility of establishing price controls over a broader range of food products than just rice. There is no information on the timing or breadth that such price controls might encompass. However, it is useful to view the price relationships between prices for rice and other products in Monrovia, where price controls appear to have been

effective, with prices in other areas where they have not been tightly regulated.

As noted in Report 2, Part 1, rice currently is almost unique among all foods in selling much more cheaply in Monrovia than elsewhere. Of course, not all of this differential can be attributed to price controls because a large share of rice is imported and therefore transportation costs from the point of entry become a factor.

III. Urban Food Consumption Patterns

The urban household survey conducted in March 1986 showed that food consumption levels in total were somewhat higher than previously expected. The survey demonstrated that some foods other than rice were also very important in the diet. Rice, while being the single most important food, did not dominate consumption patterns as much as expected, particularly at upper income levels. Geographic differences in rice consumption also differed from expectations, with more imported rice consumed in remote urban areas than expected (Report 2, Part 1).

Food and beverage expenditures averaged \$173 per household per month or \$27.81 per capita, according to the survey. In Monrovia, 38.5 percent of total spending went for food which was the lowest of any of the seven urban areas studied. Other areas ranged upward to a high of 55 percent in Zorzor. Food spending as a percentage of income declined over income levels from 57 percent for households with monthly income below \$100 to a low of 20 percent for households with average monthly income of \$1,500 or more, in Monrovia. These levels were higher in other areas.

A. Importance of Rice

Rice accounted for only 17 percent of the total food budget in Monrovia. This proportion was higher in other urban areas, ranging up to 36 percent in Zorzor. Another 5 percent of the budget was spent for cassava and 6 percent for all other cereal products, such as wheat and cornmeal. Other starchy vegetables, such as eddoes, accounted for 4

percent of the budget. In total, starchy food accounted for 32 percent of the total food budget in Monrovia. In other urban areas, cereals other than rice were not as important as in Monrovia. Use of cassava varied considerably among the areas studied. Starchy foods in total were somewhat more important in areas outside of Monrovia, ranging up to 43 percent of the food budget.

Even so, there are some important foods in the diet besides rice and other starchy foods. In Monrovia, animal products accounted for 29 percent of household food expenditures, with fish the most important food in this category. There was not much variation among urban areas in this proportion spent for animal products—even households in Zorzor, the area which had the lowest average income, spent 24 percent of their food budget for animal products. Vegetables and oils accounted for 19 percent of household budgets for food in Monrovia, which ranged up to 24 percent in Volinjama.

B. Income Elasticities

A key reason for collecting and analyzing the household food expenditure data was to examine the nature of the demand for rice and other food products at differing levels of income (total expenditures were used as a proxy for income). These results showed that for total food, an increase of 10 percent in income was associated with a 6.7 percent increase in food expenditures (income elasticity of 0.67, table 2). But, for rice, a 10-percent increase in income would result in an increase of only 1.6 percent in spending. The demand for country rice was somewhat higher than for imported rice, according to the study

(elasticities of 0.21 and 0.12, respectively).

The demand for cassava was measured to be somewhat higher than for rice (elasticity of 0.41), and the demand for other cereals (mainly wheat flour and cornmeal) and for starchy vegetables other than cassava was much higher than for rice. Other cereals and other starchy vegetables both had elasticities greater than 1.0, which means that they will experience proportionately greater increases in expenditures for given increases in income.

Animal products, other than fish, and fruits also had income elasticities that were greater than 1.0. Demands for fish, oils, and vegetables were each in the same range as for the all-food average, around 0.5 to 0.6 in terms of the mean income elasticities.

For most foods, there is a small decline in demand as income increases and consumers shift their increasing resources to nonfood products that could not be purchased at low income levels. For total food, for example, the income elasticity of demand declined from 0.8 at the lowest income level to 0.4 at the highest income level measured.

Table 2. Income Elasticity of Demand for Food and Nonfood Groups, by Income Group, Based on AIDS Model, Urban Areas in Liberia, March 1986.

Income Group	:	Country Rice	Imported Rice	Total Rice	Cassava Tuber	Processed Cassava	Total Cassava
Mean		.21	.12	.16	.30	.56	.41
\$ 0 - 99		.70	.64	.67	.42	.75	.59
100 - 199		.63	.50	.56	.58	.69	.62
200 - 299		.46	.34	.39	.45	.63	.52
300 - 399		.43	.15	.28	.37	.50	.42
400 - 499		.31	.03	.16	.09	.53	.29
500 - 599		.12	.14	.13	.53	.67	.58
600 - 699		-1.27	.17	-.08	.25	.72	.51
700 - 899		-.43	-.46	-.45	-.07	.23	.04
900 - 1,099		-1.65	-.20	-.50	.24	.37	.29
1,100 - 1,499		-2.16	-.91	-1.24	-.72	.26	-.23
1,500 +		-2.93	-1.42	-1.82	-1.30	.32	-.33

Income Group	:	Other Cereal	Other Starchy	Fish	Animal Products	Oil	Fruit
Mean		1.13	1.10	.49	1.25	.55	1.08
¢ 0 - 99		1.16	1.08	.70	1.42	.78	1.14
100 - 199		1.13	1.09	.71	1.30	.72	1.09
200 - 299		1.16	1.11	.63	1.27	.64	1.09
300 - 399		1.16	1.08	.54	1.26	.55	1.08
400 - 499		1.12	1.07	.53	1.21	.58	1.08
500 - 599		1.14	1.11	.48	1.23	.59	1.08
600 - 699		1.07	1.10	.38	1.22	.45	1.08
700 - 899		1.15	1.12	.17	1.23	.44	1.07
900 - 1,099		1.11	1.10	.22	1.25	.40	1.11
1,100 - 1,499		1.12	1.11	.08	1.22	.25	1.07
1,500 +		1.17	1.21	-.43	1.24	.01	1.09

Income Group	:	Vegetable	Other Food	Food at Home	Bev. + Fd. Away	Total Food, Bev	Educa- tion	Other Non Food
Mean		.59	1.04	.66	.93	.67	1.46	1.14
\$ 0 - 99		.77	1.03	.79	.95	.80	4.61	1.19
100 - 199		.74	1.04	.76	.92	.77	2.30	1.17
200 - 299		.69	1.03	.72	.93	.73	1.72	1.15
300 - 399		.63	1.03	.68	.93	.70	1.52	1.15
400 - 499		.59	1.04	.68	.94	.70	1.44	1.16
500 - 599		.61	1.06	.65	.89	.66	1.36	1.16
600 - 699		.58	1.03	.66	.96	.69	1.44	1.15
700 - 899		.38	1.05	.54	.90	.56	1.38	1.12
900 - 1,099		.36	1.04	.55	.91	.57	1.37	1.12
1,100 - 1,499		.34	1.04	.50	.90	.53	1.28	1.14
1,500 +		.14	1.06	.36	.88	.40	1.35	1.10

Source: Hiemstra and Savadogo, Report 2, Part 2, Statistical Analysis, table 2.

For rice, however, the decline in demand over income levels, was quite sharp. Demand was quite strong at low income levels (elasticity of 0.7), but this demand became negative at household monthly income levels of \$600 to \$700 per month and at the highest income levels, the demand was strongly negative (elasticity of 1.8 for all rice). Negative income elasticities indicate that purchases of that product are actually reduced as income levels are increased.

The demand for cassava also turned negative at the upper income levels, but not as strongly as for rice. The negative demand for cassava was confined to tubers as opposed to processed products. The demand for fish turned negative at the highest income level. No other food product groups measured actually showed negative demands. However, demands for oils and vegetables approached zero at the highest income levels.

Meanwhile, demands for other cereals, other starchy vegetables, animal products other than fish, and fruit all remained quite strong with income elasticities greater than 1.0 at even the highest income levels. These data show that consumers shift their preferences among foods in favor of these food groups as income increases.

C. Country vs. Imported Rice

1. Sources of Total Rice

Only about 3 percent of the rice purchased in Monrovia was produced in Liberia, another 3 percent was obtained from "concessions," and the remaining 94 percent was imported from commercial sources (including P.L. 480). Buchanan also received most of its rice from imports, according to the household survey. Gbarnga and Zorzor each purchased nearly one-half of their rice from imported sources, despite their rather remote locations.

In total, only 18 percent of the rice reported in the survey came from Liberian production, 1 percent from concessions, and 81 percent from imports. These data reflect a time period about midway between peak production and low point in supply available. The data also relate only to urban household purchases, not those relying on subsistence supplies.

2. Consumption of Country vs. Imported Rice

In terms of pounds per capita on a monthly basis, consumption of imported rice was highest in Monrovia at 20.0 pounds, compared with 16.1 pounds in Buchanan and only 4.8 pounds in Ganta, according to the March 1986 survey data (table 61, Report 2, Part 1). But, for country rice, consumption varied from only 0.4 pounds in Monrovia to 23.0 pounds in Voinjama.

In most outlying urban areas, country rice consumption far exceeded that of imported rice. But, in both Gbarnga and in Zorzor, consumption of

Imported rice was somewhat higher than for country rice, 11.4 pounds vs. 8.6 pounds, and 10.6 pounds vs. 9.6 pounds, for imported vs. country rice in Gbarnga and Zorzor, respectively.

These high levels of imported rice consumption, particularly in interior urban areas, may reflect the season of the year and not be completely representative of average consumption levels. However, annualized consumption data from the survey suggest that they don't differ much from annual averages derived from supply and utilization data based on known production and import data. The average for Liberia was 244 pounds per capita from supply and utilization data compared with 252 pounds for Monrovia and 255 pounds for all other areas combined (Report 2, Part 1).

3. Demands for Country vs. Imported Rice

The question of substitutability of country and imported rice can not be answered directly in this study because of the lack of available price variability to compute cross-elasticities, as noted in Report 2, Part 2. However, some tendencies can be observed from the comparative income elasticities, shown in table 2, and by comparing average prices paid with quantities consumed of rice from varying sources by geographic area.

The demand for country rice was somewhat higher than for imported rice, as noted above. In fact, the entire demand curve for country rice has somewhat more slope to it--at low income levels the demand was higher for country rice and at high income levels, the demand was more strongly negative. (See figure 1, Report 4.) No doubt, this relationship was in part due to the geographic differences observed, with much higher consumption in the outlying urban areas (table 62, Report 2, Part 1) where income levels were much lower than in Monrovia.

Note also that the demand function for country rice, reported earlier, showed sizable positive coefficients (all except Buchanan were strongly significant) comparing each urban area's budget share with that of Monrovia (Report 2, Part 2, table 1). In contrast, the coefficients for imported rice were all strongly negative (except for Buchanan) when contrasting Monrovia's budget share with that of each other urban area. These coefficients confirm that the mean differences persist in showing that imported rice is consumed in larger amounts in coastal urban areas and country rice in the interior production areas, even after allowing for differences due to income and demographic differences.

Based on these statistical models, it is safe to conclude that a true difference in demand exists among these different geographic areas for country vs. imported rice. The only reservation to this conclusion relates to the fact that prices were not able to be included in the models. But, price differences were analyzed independently in Report 2, Part 1 (pages 33-36).

Unfortunately, the comparative rice price data reported for bagged rice differed from that for market prices for rice sold by the cup or kenke. In the case of bagged rice, imported rice sold for 0.4 cents per pound more than for country rice, but in the case of market prices, imported rice prices were 1.2 cents less, on average. The net differences were all in the outlying areas.

In Monrovia, prices for all forms of imported rice were somewhat lower than for country rice, as one would expect in view of transportation costs of shipping country rice into the city. However, price differences are small due perhaps in part to the price controls imposed. Price controls appeared to be effective in terms of bagged rice primarily.

In conclusion, the higher quantity demanded of imported rice in Monrovia reported in the statistical analysis is likely due in small part to the fact that prices are slightly lower there for imported rice. But the small price differential is likely outweighed by the much higher quantities demanded.

In outlying areas there is a mixed bag (pun intended). The higher demand implied by the demand function is reinforced by the fact that market prices for country rice were actually higher on average, contrary to expectations. But in the case of bagged rice, the situation is parallel to that of imported rice in Monrovia--that is, that the higher demand for country rice is due in small measure to the fact that prices

for country rice are somewhat less on the average.

Therefore, it appears safe to conclude overall that imported rice is truly preferred in Monrovia and demand for country rice is actually higher in the outlying areas, after allowing for economic and socioeconomic differences between the geographic areas.

IV. IMPLICATIONS OF THE CONSUMPTION DATA

The implications of the findings from the household food expenditure survey will be examined by posing several alternative income and policy assumptions for the future of Liberia.

A. Alternative Assumptions

Alternative I: Improving Income Trends Over Time.

This alternative assumes an increase in income over time of 2 percent per year in real terms. It is expected to characterize the long-term future of Liberia. This alternative is intended to look beyond the present balance of payments problems when economic growth again can be expected. No projections are made as to when such a scenario can be expected to occur.

Alternative II: Continuation of Recent Income Declines.

This alternative assumes a decline in income of 3 percent per year in real terms. This assumption may be the most realistic in the near future, until economic growth again reappears.

Alternative III: Self-Sufficiency for Rice.

This alternative assumes that rice imports would be eliminated, by increasing retail prices sufficiently to reduce demand and increase local production to marketclearing levels. A sub-option considers eliminating only commercial imports and continuing to receive P.L. 480 imports. Consideration will also be given to impacts of varying levels of income as encompassed in Alternatives I and II as variations of this alternative.

Rising prices would occur, either officially or unofficially, if an embargo were placed on rice imports to require self-sufficiency, or if imports were sharply curtailed due to balance of payments problems. Rising prices might be considered as a way of helping to finance the current balance of payments deficits while accomplishing a desired policy objective.

Alternative IV: Free Trade in Agricultural Products

This alternative would eliminate the current price deterrents to the domestic production of coffee and cocoa and encourage their domestic production in line with Liberia's competitive advantage. It would also allow unlimited imports of rice at world levels. However, it would do nothing to further the goal of rice self-sufficiency. It would be difficult to implement during the current balance-of-payments crisis, but would have certain long-run advantages.

B. Alternative I

The World Bank report by Eric Monke projected long-term population growth at 3.3 percent annually and a long-term income growth rate of 2.0 percent (World Bank, 1984). Urban population growth rates were projected at 6.4 percent due to the rural-urban migration, which is expected to continue. Monke also assumed an income elasticity of demand for rice at 0.2, which is very near the rate estimated by this study for urban areas. Consequently, the projections made by Monke do not differ much from an analysis of this alternative. In contrast, Tun and Yetley assumed a much higher income elasticity (1.0) in their analysis (1983).

The World Bank study indicated that the demand creating effects of population growth, and particularly the migration to urban areas, would result in an increase in demand for imports of rice till the year 2000. That study assumed a slow growth in Liberian rice production, based on an elasticity of supply of about 0.2. Import requirements were expected to more than double from the peak level in 1984 to the year 2000 (projected at that time to increase from 98 to 228 m.m.t.). Population was projected to reach 3.5 million by then.

The perspective that this study adds to the World Bank analysis is that while demand for rice would increase, and would need to be met by increased imports, the demand for most other food products also would increase if income were to resume its previous uptrend. Furthermore, the rate of demand increase for most other food products would outstrip that for rice. This is particularly true for wheat flour and other cereals as well as starchy vegetables, animal products, and fruit.

Rice is currently the dominant food product and this dominance will not be lost any time soon. Growth in demand for rice would continue to grow at 10 to 11 m.m.t. per year under Alternative 1, mostly due to population growth and increased urbanization. This represents an annual increase in total rice needed for consumption of about 4 1/2 percent, based on the 224 m.m.t. level available in 1985 (152.3 m.m.t. local and 71.3 m.m.t. imported, according to table 2, Report 1, and MOA, 1985b).

Nevertheless, if this scenario of long-term growth in income prevails, there will be a continual lessening over time in the importance of rice in overall food policy. Increased policy attention should be given to the production or importation of wheat and other cereals which have higher consumer preferences even though their consumption at this time is at substantially lower levels than for rice.

C. Alternative II

Liberia's monetary economy grew rapidly in the 1960's at over 6 percent per annum, due mainly to significant increases in output of iron ore and rubber products (Stanley and Gallagher, 1985). This rate slowed in the 1970's to about 4 percent annually in the first half of the decade and 1 percent in the second half. From the peak year 1979, gross domestic product in real terms declined till 1984 (latest data available) at an annual average rate of 3.6 percent while population grew at over 3 percent. Per capita GDP in 1984 was down about 15 percent from the level in 1979. The decline in the monetary economy, which is centered in the urban areas, was down even more.

These data suggest that per capita incomes have been declining at the rate of around 3 percent annually in recent years. The positive demand elasticity for rice, even though small, works in the opposite direction for this alternative which assumes a continuation of the decline in real incomes in the near future. This means that somewhat less rice will be needed than indicated in Alternative I as long as income trends continue downward.

This does not mean an absolute decline in quantity of rice demanded over time because population growth is more important than the small impact of the negative demand due to income contraction. The lessening demand for rice due to declining income is in the range of 0.5 percent or 2 m.m.t. per year, whereas the increase in demand due to population growth is in the range of 9 to 10 m.m.t.. In total, this alternative suggests

a net annual growth in demand for rice at about 7 to 8 m.m.t., or about 3 percent of total available annual supply.

In per capita terms, the 0.5 percent decline represents about 1.2 pounds per year. Such a decline is not surprising in view of the decline in per capita consumption of rice that has occurred since 1980, which is the peak year in the past decade for both rice consumption and GDP per capita. According to data reported by Monke, per capita rice consumption declined 33 pounds or 12 percent between 1980 and 1984 (table 3). During this time period, sizable P.L. 480 stocks had accumulated so the consumption decline was not due to supply shortfalls. This decline in rice consumption accompanied a 19 percent decline in GDP per capita in constant dollars. During the four years prior to 1980, per capita consumption increased 23 percent while GDP per capita increased 24 percent.

Table 3. Rice Consumption and Gross Domestic Product Per Capita, Liberia, 1976-84.

	Rice Consumption	GDP
	(pounds)	(constant dollars)
1976	216	344
1977	246	370
1978	255	379
1979	255	420
1980	266	425
1981	246	393
1982	253	387
1983	236	351
1984	233*	345

Source: Monke, 1985.

*The Ministry of Agriculture reported per capita consumption in 1984 at 244 pounds per capita, without allowance for changes in stocks (MOA, 1985).

While these gross annual data suggest a much higher income elasticity of demand for rice than does multivariate statistical analysis of the cross-sectional data from the 1986 survey, it is beyond the scope of this analysis to examine the impacts of other contributory variables over time.

A declining trend in real incomes has more adverse impacts on food products that have high income elasticities than those with low demands. Consequently, demands for other cereals, other starchy vegetables, animal products other than fish, and fruit would be expected to contract more rapidly than for rice during these times of cyclical downturn. These groups would each face declining per capita demands of 3 percent

per year or more as long as incomes decline at recent rates. Consumption of cassava would decline about 1 percent per capita per year. This puts even more importance on assuring the supplies and maintaining the prices for rice during this period of economic contraction.

D. Alternative III

The feasibility of self-sufficiency for rice in the near future, at least in the absence of Government fiat, is closely tied to the nature of the responses of rice production and consumption to price changes.

This study was not able to compute new estimates of price elasticities of demand because of the lack of data related to variations in consumer prices (Hjemstra and Savadogo, 1986c). However, other analysts have estimated price elasticities for rice in Liberia at 0.9 or 1.0, at least in urban areas (World Bank, 1984, and Tun and Yetley, 1983). This suggests that the quantity of rice demanded (at least imported rice) is highly sensitive to its price.

Market prices of rice are regulated by the Government. Retail prices are set at \$23.00 per hundredweight, wholesale prices at \$22.35, and distributors' prices \$21.65. Prices reported by consumers in the household survey were quite close to the retail regulated level in Monrovia, \$23.10 for imported rice and \$23.50 for country rice (bag prices). However, prices paid in the outlying urban areas averaged higher for both kinds of rice, \$26.50 for imported rice and \$26.10 for country rice.

These higher prices likely reflected transportation differentials from Monrovia, the entry point for most imported rice. Government regulation is less well monitored in the outlying areas, and relatively little country rice is marketed in rural areas. Marketings tend to represent surpluses over household needs rather than production intended for marketing, due to the fact that costs of production tend to exceed market prices according to several studies (for example, see Tweeten and Rogers, 1984).

The controlled retail price of \$23.00 per hundredweight currently is down \$1.00 from that charged between August 1982 and October 1984 (MOA, 1985). However, it is up by \$3.00 from the level of \$20.00 in 1980. This increase in price may be partly responsible for the decline in consumption noted above, although it is not known how rice price trends compared with price trends for other consumer goods. The relationship between rice prices in Monrovia and other urban areas also is not known for earlier years.

An increase in the price of rice to consumers, without any changes in income, would be expected to result in reduced consumption, increased rural marketings, and a small increase in production. Imports of rice comprise about 25 percent of the total supply, which represents about 33 percent of the 1984 level of production. If import supplies were no longer available, due to a policy of self-sufficiency, retail prices would need to be increased by about 27 percent to curtail demand to a market clearing price level assuming a demand elasticity of 0.9. This

Impact assumes a long-term supply response from producers of about 0.1 percent.

Some analyses have suggested that farm marketings have a much higher response to price increases than implied by this supply elasticity, at least in the short term. If market supplies would be more responsive to prices, the necessary consumer price increase would be proportionately lower.

In terms of 1986 dollars, prices would need to rise to perhaps only \$29.00 in Monrovia and \$33.00 in other urban areas for self-sufficiency to occur. Monke suggested that prices would need to increase to \$39.00 (1985).

For rice self-sufficiency to occur, many consumers would switch to competing foods for a larger share of their food requirements. Due to the lack of cross-price elasticity data, it is not known precisely which foods would be consumed in increased amounts if prices for rice were raised significantly. However, based on the relative strengths of demand from the income relationships, it appears that other cereal products and starchy vegetables would be high on the list of substitutes. More cassava also would be consumed, but the demand for cassava is less elastic. Report 4 of this series will examine the relative strengths of demand for alternative competing foods in more detail.

An increase in the price for rice has both an adverse income effect as

well as a depressing effect on the quantity consumed. The declining income effects, along with potentially strong personal preferences, are the basic reasons for Governmental concern with raising the price for rice. Since consumers spend about 17 percent of their income on rice in Monrovia and about 29 percent in other urban areas, the adverse income impacts would be substantial--in the range of 5 percent of incomes in Monrovia and 8 percent in other areas. These levels are not as severe as perhaps previously perceived; however, the incidence of these income declines would fall disproportionately on the lower income segments of the population.

These income declines could be offset by Government programs to transfer income or food purchasing power to the lower income groups. However, given the current financial instability, such transfers would not likely be feasible without significant support from U.S. or international agencies.

A suboption to Alternative III would be to seek self-sufficiency only in commercial markets for rice. This would allow the continued importation of rice from P.L. 480 sources. Some of the P.L. 480 rice could be distributed gratis, or at cost of distribution, to the low-income segments of the population that would suffer income loss by the policy of self-sufficiency, and thereby offset the negative income effects of an increasing price policy. This policy of self-sufficiency would be of minimum burden to the households with negative income elasticity of demand, those with household incomes above \$600 per month. Above this income level, foods other than rice are actually preferred as incomes

Increase.

It is known from Report 2(1), table C, that 74 percent of the households in Monrovia and closer to 90 percent of those in other urban areas have incomes (or at least expenditures) below \$600 per month. Rice subsidies would probably be restricted to households with incomes below about \$200 per month, which accounts for 23 percent of the total in Monrovia. Household size limitations would also need to be established. In order to appraise the levels of rice distribution that would be sufficient to offset the negative effects of the increase in prices for rice for the lowest income segments would require further analysis.

Another perspective to Alternative III would be to combine the income assumptions from either Alternatives I or II with the implicit price assumptions in Alternative III. The quantity of rice demanded under Alternative III, which assumes no change in income, would be reduced to domestic market clearing levels, with imports eliminated and some increase in Liberian production. However, the assumptions regarding income and population changes over time will determine future trends in demand, along with price trends.

Demand pressures from income and population growth will represent an increase in demand for total rice supply of 3 to 4 1/2 percent annually, according to Alternatives I and II. If these supplies are not forthcoming, prices will need to trend higher at somewhat larger rates, around 3 1/2 to 5 percent in real terms, to keep supplies rationed.

Alternatively, attaining self-sufficiency in rice production will be a short-term achievement. Imports could again be instituted to meet the needs of a growing and increasingly urbanized population. The rates of growth would depend on the income assumptions explored in Alternatives I and II, assuming that population trends are correct. It is population and urbanization that are the most important determinants of the future levels of demand for rice.

E. Alternative IV

This alternative of free external trade is the antithesis of self-sufficiency in rice. The underlying objective of this alternative is to increase overall economic growth for the country. It capitalizes on the knowledge that the competitive advantage of commercial Liberian agriculture is in the production of tree crops rather than rice. This would not detract from encouraging rice production for purposes of subsistence, only for commercial production. This policy would reduce domestic prices for rice rather substantially at the present time.

To implement such a policy would be to give up the revenue from the current LPMC practice of purchasing coffee and cocoa from farmers at prices below world markets and selling them at a profit. However, duties could still be levied and increased as necessary on imported rice to finance LPMC operations. Now is an appropriate time for such a policy change because world prices have declined due to lower U.S. export prices in 1986.

The supply response to such increased producer prices for coffee and

cocoa is likely much greater than would be the case for changes in rice prices. Farmers would be encouraged to grow commercial crops for export. Foreign exchange earnings would therefore be increased, likely very significantly in a few years. Low market prices for rice, which would be based on world prices, would not deter farmers from continuing to grow significant quantities of rice for their own use because of high personal preferences for country rice and high marketing and distribution costs, particularly in interior locations.

There may be some concerns about allowing internal prices to float on the basis of world levels because of the sizable fluctuations in rice prices on world markets in previous years. These concerns could also be overcome by distributing a portion of the P.L. 480 rice free (or at cost of distribution) to low income consumers. This would mean that only higher income people would be subjected to the vicissitudes of external rice markets.

Distributing significant quantities of rice free or at cost to low income people could eliminate an important source of GOL revenues. This revenue loss could be a problem in the near term until the benefits from free trade became evident in increased export earnings. For this reason, a careful policy of transition would need to be developed. It might be possible also to get an increase in P.L. 480 distributions earmarked for free distribution, which would not disturb commercial markets. Likely, there would be tremendous popular support for such a policy in these times of crisis in Liberia.

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