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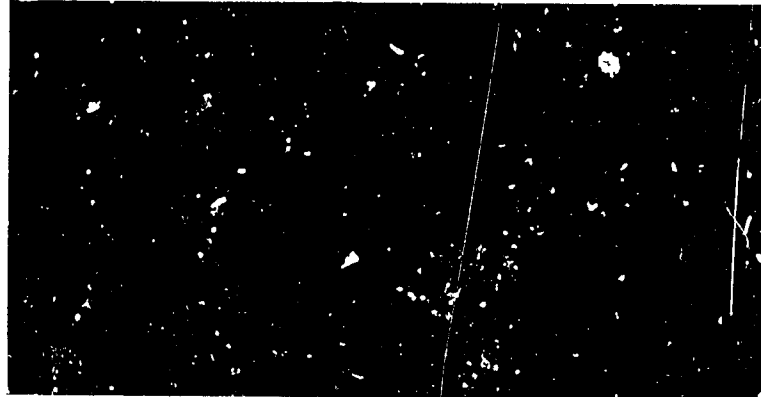
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U.S. Department of Agriculture
Office of International Cooperation
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Technical Assistance Division

IN
COOPERATION
WITH

U.S. Agency for International
Development
Bureau for Science and Technology
Office of Nutrition



NUTRITION ECONOMICS GROUP

The Nutrition Economics Group was created in 1977 with funding from AID under Project 931 "Nutrition: Economic Analysis of Agricultural Policies." The Group's full-time staff of economists and other social scientists is available to assist AID and developing country agricultural planners and analysts develop, implement and evaluate their food and nutrition programs and to evaluate the impacts of their agricultural policies and programs on people's food consumption and nutrition. With its location within the Technical Assistance Division of the U.S. Department of Agriculture, the Group is able to draw upon a wide variety of other agricultural specialists to complement its work.

Further information can be obtained from:

The Nutrition Economics Group
Technical Assistance Division
Office of International Cooperation and Development
U.S. Department of Agriculture
Washington, D.C. 20250
Telephone: (202) ~~472-8707~~ **475-4167**

AID Missions may Contact:

Office of Nutrition
Bureau for Science and Technology
Agency for International Development
Washington, D.C. 20523
Telephone: (703) 235-~~9020~~ **9062**
Telegram Caption: S&T/N

PN AAQ 038
IDN: 34681

Summaries
of
Consumption Effects of Agricultural
Policies in Selected African Countries

April 1984

NUTRITION ECONOMICS GROUP

Office of International Cooperation and Development
Technical Assistance Division

U.S. Department of Agriculture

A report prepared under RSSA BST-1171-R-AG-3125-01
(Economic Analysis of Agricultural Policies)
with the Office of Nutrition, Bureau of Science and Technology
Agency for International Development

BACKGROUND

Studies of the consumption effects of agricultural policies are now available for five African countries -- Cameroon, Senegal, Sierra Leone, Sudan, and Tanzania. These studies were sponsored by AID's Office of Nutrition under their Consumption Effects of Agricultural Policies (CEAP) project and implemented through the Nutrition Economics Group of the U.S. Department of Agriculture. Summaries of the results of these studies are included in this document. Copies of the complete studies can be obtained from either AID or USDA (see back of front cover for the respective addresses and phone numbers).

To provide a common basis for review and discussion, each summary has been prepared according to a uniform format. Topics covered in each summary include the policy focus of the study; the policy environment in the country at the time the study was undertaken; the policy impacts identified by the study, including the consumption impacts; the experiences collaborating with host country institutions and individuals; the dissemination of the results of the study and the reactions to the findings; and the data sources and analytical methods used.

The studies themselves were designed to explore and systematically analyze the linkages between selected agricultural policies and the food consumption patterns of groups likely to be at risk of malnutrition in these countries. Relationships analyzed in these studies include how such policies affect the amount and type of food available to these groups, their incomes and the prices they pay for food. How these groups alter their consumption patterns when their incomes and prices change were also analyzed. The studies were expected to produce (1) information and policy guidance for policy makers and analysts in the host countries, (2) examples of the types of analytical methods which can be used to evaluate the consumption impacts of agricultural policies and how to use them and (3) guidelines suggesting how to undertake comparable studies in other countries.

An additional objective for a number of these studies -- those required to be completed in less than a year -- was to illustrate the feasibility of performing significant food policy analyses within a short time period using data readily available in most developing countries. The longer-term objectives of all these activities are to sensitize developing country planners and analysts to the need to start thinking of improved consumption and nutrition as legitimate goals of their agricultural sectors and to start including the consideration of consumption/nutrition impacts in their evaluations of policy alternatives.

The African studies were carried out during 1981-1983. Studies of the consumption effects of agricultural policies were also initiated in Latin America during Phase I of the CEAP project. Two of these studies are still underway -- in Honduras and Peru -- and two were completed recently -- in Jamaica and Panama. Both sets of studies were reviewed at a November 1983 workshop. The results of this review, also available in summary form from the Office of Nutrition or the Nutrition Economics Group, will be used to guide the second phase of project activities.

Phase I: Policy Impact Evaluations in Selected African Countries

<u>Country</u>	<u>Policy Being Examined</u>	<u>Host Institution</u>	<u>Length</u>
Cameroon	Opening the border with Nigeria to agricultural trade	Department of Studies and Projects, Ministry of Agriculture	Short-term
Senegal	Promotion of increased food crop self-sufficiency	Senegalese Institute of Agricultural Research	Short-term
Sierra Leone	Price policies for basic staples	N.A.	Longer-term
Sudan	Elimination of wheat price subsidy	Ministry of Planning	Short-term
Tanzania	Reversal of previous policy to emphasize food vs. export crops	Market Development Bureau, Ministry of Agriculture	Short-term

COUNTRY: Cameroon

CONTRACTOR: Center for Research on Economic Development (CRED)

Study Focus

The Cameroon Study had a dual set of objectives: the substantive aim was to analyze the potential impact of improved trade possibilities and better roads on the nutrition of inhabitants of the Northwest Province; the methodological aim was to develop and test procedures to carry out such an analysis in a brief 25-week period.

As often occurs at the start of a survey project, a major effort is needed to delimit the focus of the study to viable proportions. In the case of the Cameroon Northwest Province, a radical reorientation of the project was necessary from the outset. The survey was limited to farmers in eight villages of the eastern highlands area of the Northwest Province. Thus, excluded from the survey were towns, low-lying areas and the western half of the Province. Most of the Province population is concentrated in the eastern highland zone, where corn, beans, and potatoes are the main food crops, while arabica coffee provides the principal source of cash revenue.

Policy Environment

At the time when the Cameroon Northwest Province study was conceived, there was under review the possible relaxation by the Cameroonian government of official proscriptions against exports of agricultural products toward the booming markets in southern Nigeria. High food prices in Nigeria led many to anticipate a highly profitable market for food crops from the Northwest Province, with a corresponding diversion of food supplies from the local and other national markets.

By the time the study was carried out on the ground, official concern had shifted, in part by the drafting of the National Food Plan (1981), to the impending food scarcity, particularly in the southern coastal regions around Douala where rapid urban growth and the recent discovery of oil deposits gave urgency to finding adequate food sources.

Major Issues Addressed

The orientation of the CEAP Cameroon study changed accordingly, to reflect the shift in government concern from increased exports to Nigeria to securing self-sufficiency in food for Cameroon's dynamic southern region. Nevertheless the issue of the potential impact of the Nigerian market was of major concern to many, and was addressed in some detail in the report. But the major focus is placed on the consequences of the

expected increase in demand for food crops in the Douala area on the food situation among farmers in the Northwest highlands. Similarly the study postulates a major effort, already under way, to improve the transport infrastructure to and within the Northwest Province; the nutritional impact of such a program is therefore also examined. Finally the adequacy of current agricultural development programs to maintain and improve the nutritional well being of farmers is addressed.

Trade Prospects with Nigeria The prospect for expanded agricultural trade from the highlands of the Northwest Province toward Nigeria are of small consequence. Road transport from the area to the main coastal towns in Nigeria are almost non-existent. The road through Mamfe has been in a bad state of disrepair for several years and there are no known plans to improve it. The only trade in farm products from the highlands to Nigeria takes place through the trails that connect Ndu with Gembu, on the Mambila Plateau in Nigeria. Nigerian traders purchase small volumes of rice, but also beans and corn, for sale in Nigeria at substantially higher prices. Although the nominal profits seem high, they probably do not compensate for the rapid depreciation of the landrovers use. The main reason for the landrovers to come into the Northwest Province is to bring manufactured goods and equipment into Cameroon, unofficially. The present small level of agricultural exports to Nigeria can be considered a side-line of this trade and subject to its prospects in the future.

Demand Prospects in Southern Cameroon Of greater significance for the Northwest Province agricultural sector is the growth of demand in the urban centers of the coast. The rapid urbanization that Douala and surrounding towns exhibited during the 1970's may accelerate as a result of the discovery of oil. Population in Yaounde and other urban centers is expected to grow at over 7 percent in the 1980's. Rural-urban migration will further contribute to accelerated urban growth. These trends would result in alarming food deficits in Cameroon, from grain cereals to tubers, according to the 1981 Plan Alimentaire. The problem will be especially acute for the coastal areas around Douala.

Improvement in Road Infrastructure Within the Northwest Province the main artery of commerce is the "ring road," a loop connecting Bamenda with the main provincial centers. Although the ring road can be travelled all through the year, the smaller access roads into the highland villages are passable only in the dry season. Under such circumstances, only a small percentage of produce is marketed. Until now coffee has constituted the main export item from the highlands, thanks largely to its high value to weight ratio. Corn, beans, and potatoes are becoming increasingly commercialized and in some villages the share of potatoes marketed may already exceed home consumption. During the past few years, as a result of increased attention by the Federal Government to the development of the Northwest Province, some progress has been made on the road system. Further work on the ring road and on feeder roads is expected in the future.

Policy Impacts Identified

It is evident from the above considerations that over the next few years highland farmers in the Northwest Province will see prices for their food crops increase at favorable rates. The two main reasons are the anticipated expansion of the coastal market for food produce and the likely improvement of road infrastructure within the province. Reductions in the cost of transport will likely be reflected in higher farm-gate prices since the current trading system seems to work competitively, and improved transport facilities would lead to additional traders becoming interested in villages until now too remote to visit.

The central topic of this study was therefore to trace the potential impact of these anticipated price increases on the food consumption of highland farmers. Two opposite types of economic effects on consumption can be recognized, a direct negative and a positive income effect from the higher revenues received. The direct negative price effect is the familiar response of consumers to higher prices, namely a decrease in quantity consumed. Farmers exhibit this same behavior even though they might not purchase the food in question; at higher prices farmers would try to sell more by sacrificing home consumption.

Farmers, however, in their role as producers and sellers of food products, would benefit from higher incomes as a result of more favorable prices; consequently, farmers' consumption of food and other items would increase from this revenue effect. Farmers income increase in two distinct manners. First they receive more money for the same quantity sold, and second, they are able to shift production to increase the quantity sold. In the short run only the former is observed, but in the long run adjustments in cropping patterns would result.

Results from the statistical analysis of the survey data yield relationships between food consumption, prices, and income, both highly significant and conformant with anticipated behavior. For the sake of simplicity, the three main foods in the highland diet - corn, beans, and potatoes - were lumped together as a single food item. Price elasticity of food consumption was estimated at -1.16 , meaning that a 10 percent increase in food prices will induce a reduction of 11.6 percent in food consumption. Income elasticity on the other hand was estimated at $+0.17$; in other words, an increase in income of 10 percent will result in 1.7 percent higher food consumption.

Consumption Effects of Policies Studied

Negative Short-Run Effect on Consumption The net combined effect of higher food prices on farmer's food consumption is, in the short run, negative. That is, higher prices for farm produce lead to lower food consumption by farmers. Emphasis must be made that this result is the short run impact, before farmers have had time to adjust their production

and sales patterns to the new prices. That is, these results assume production stays constant, a likely short run condition. Numerically the result can be derived quite simply: a 10 percent price increase lowers food consumption directly by 11.6 percent, and raises income by 2.0 percent since the three foods in question contribute 30 percent of income. The resulting increase in income induces a mere .5 percent increase in consumption, far from sufficient to compensate for the negative price effect. The net impact is a drop of 11 percent in food consumption. Calorie intake however is affected less drastically, since the three foods provide only 69 percent of energy intake. The 11 percent reduction in food consumption results in a 7.6 drop in calorie consumption. Protein loss is similarly calculated at 8.4 percent.

Long-Run Effects on Food Consumption It bears repeating that the above result is only the short period impact of a rise in food prices. In the long run there is reason to believe that the negative impact will be considerably reduced and possibly transformed into a net positive effect. First, farmers will adjust their food consumption to increase the intake of items other than corn, beans, and potatoes, so that calories lost from the latter would in part be compensated from other sources. Second and most important, farmers would increase production and sales of those products with higher prices, even when that implies substituting for other less profitable crops. Increased production will result from higher yields per hectare as well as more land being used to produce the now more attractive crops. Thus increased production would result from more land being devoted to crops with higher prices. In addition, yields per acre can be expected to increase as higher output prices raise the profitability of using new inputs.

Need for Promoting Food Production Higher prices are necessary to increase the flow of foodstuffs from the Northwest highlands to the coastal urban areas. If agricultural production is not increased accordingly, farmers' food consumption and nutritional status would suffer from the reallocation of a constant food stock. Serious deficits in calorie intake of rural families might develop since one in five already fail to meet recommended calorie levels. Food crop production must therefore increase if such a scenario is to be averted. We are suggesting therefore that agricultural development policy in the Northwest Province be reoriented toward the promotion of food crops, a sector which until now has been neglected.

Fortunately, the agronomic characteristics of the three main highland food crops - corn, beans, and potatoes - are well-known, and offer favorable prospects for increasing yields through the application of inputs and the use of improved varieties.

Experience Collaborating with Host Country Institutions and Individuals

An intensive survey such as the one conducted requires an exceptional degree of cooperation and forbearance on the part of the sample households and villages. We were required to go through the traditional authority structure to gain access to a sample of nine households in each village. In villages with Fons, chiefs or strong quarterheads, we went through them to select three quarters, and three households per quarter. We also consulted with local agricultural extension and community development workers, as well as members of town councils in villages where these were the primary instruments of local government. Fortunately, two of the field researchers (Goheen and Matt) had a combined total of seven years of experience living in the highlands, working with local cooperatives, doing research on land tenure, marketing and labor allocation. There was therefore no difficulty in obtaining the full cooperation of village heads and sample households.

Enumerators and field workers were selected and recruited locally on the basis of experience, education, ability to interact and communicate with local people, and personal experience in the area. Three women enumerators recruited to do the actual dietary recording were recommended and borrowed from one of the local agricultural cooperatives. The same farmers cooperative provided office facilities for the duration of the survey.

The large number of villages to be covered in such a short time required high mobility by the entire team. A four-wheel drive vehicle well-adapted to the conditions of the terrain during the rainy season, as well as an experienced driver, were assigned to the survey by the Department of Studies and Projects, Ministry of Agriculture, in Yaounde.

Various individuals, both Cameroonian and expatriates, were involved at the initial stages in setting the guidelines for the survey and advising on field procedures and questionnaires. Especially helpful were officers at the Ministry of Agriculture, the National School of Agriculture, the University of Yaounde, and the USAID mission to Cameroon.

Dissemination of and Reactions to Findings

A preliminary draft of the report was prepared in-country and discussed thoroughly with personnel at the Department of Studies and Projects, and the USAID bureau in Yaounde. The final report has been submitted, in French as well as English, but no response has been received, probably due to the departure of several key persons directly involved in having the studies carried out. There has been no opportunity to present verbally the results of the Cameroon Study to the national government, so far.

Data Sources and Analytical Methods Used

Findings of the Cameroon Study are primarily based on data obtained directly in the field in the course of a 12-week survey. A set of nine questionnaires was designed at the Center for Research on Economic Development prior to departure of the team for Cameroon. This is ordinarily not advisable, but under the mandated time limitations, it was not possible to defer the design and duplication of questionnaires until arrival in the field. Their contents covered: Household demographic information, daily food consumption, market purchases in the previous week, seasonal variations in diet, farm crop sales, off-farm income, socioeconomic indicators, individual crop field information, calendar of crop activities in the previous year, and supplementary questions.

Six days were allocated for data collection in each village, during which time extensive interviews concerning production, income, expenditures, and consumption were carried out. Daily consumption was recorded nightly for three days in a row, each household being interviewed immediately preceding the evening meal preparation. Food for the evening meal was weighed and measured in standardized local measures. Consumption for the rest of the day were obtained by recall from the person responsible for cooking, using standard local measures as proxies for amounts cooked. Two fields were measured for each household, for a total of 18 fields per village. Additional information was also collected for other fields concerning crops, yields, land costs, tenure arrangements, input use, labor time, etc.

Some data processing was carried out in the field concurrently with data collection, but the statistical analysis for the sample as a whole was done at the University of Michigan. Efforts were made at USAID's invitation, to use an Apple II Micro-computer to enter field data and to perform some nutritional analysis. Some preliminary results were obtained, but retrieving the data from the floppy disk was a time consuming process. Micro-computers have real possibilities and advantages for in-country data analysis, but their use should be carefully planned ahead and appropriate software must be ready to use.

Part II of the Project File Report presents the analytical methods and field survey techniques developed for this study. Two alternative general methodological approaches were developed at CRED for this project, one based on a linear programming farm planning model, another using consumption and production elasticities to derive the price effect on farmers' nutrient intake. The Cameroon Study illustrates the application of the latter methodology, that is, it estimates price and income elasticities based on the data collected. It then uses these basic parameters to infer potential effects from external changes, such as price increases on farmers' food consumption.

COUNTRY: SENEGAL

CONTRACTOR: Center for Research on Economic Development (CRED)

Study Focus

In 1974 the Senegalese Government reversed its export oriented agricultural policy and began to emphasize food self-sufficiency. Rice and wheat imports were restricted and the domestic production of such substitutes as millet was encouraged. Consumer price subsidies were also reduced and farm gate prices raised. The Senegal study was designed to evaluate the impact of these policies on agricultural production, and the incomes and food consumption patterns of households in selected villages in the Peanut Basin.

Policy Environment

Although the agricultural sector in general and production for domestic consumption in particular received scant attention in the past, there is a growing awareness among policy makers in Senegal of the interrelatedness of policies relating to food and those relating to other sectors of the economy. Food security as a long term strategic goal has gained importance relative to the importance of increased foreign exchange earnings per se; net foreign exchange earnings can be increased by substituting domestically produced food for imports, while Senegalese producers--a sizeable proportion of the total population--would gain in income and nutritional status.

Major Issues Addressed

There are important interrelationships among peanuts, millet, and rice at the micro-level in Senegal. Peanuts, an important export crop, are raised by farmers for cash; millet, a less-preferred staple, is grown by peanut farmers for on-farm consumption. When millet supplies are inadequate, rice is purchased as a substitute, and some peanut land is preempted for millet. To ensure production of peanuts (to earn foreign exchange) the Government of Senegal must maintain adequate availabilities of cereals. Thus, Senegalese agricultural policy must promote cash and food crops simultaneously. This study concentrates on policies aimed at raising productivity in mixed agriculture: the peanut/millet production relationships and the place of cattle in traditional farming. We also examined the penetration and effects of rice, the most important imported food, upon Senegalese rural production and consumption patterns.

Policy Impacts Identified

One policy initiative continues to be support for the farm gate price of peanuts. This seems to have led to real income gains by farmers; there is, however, greater uncertainty regarding peanut yields than millet yields, and millet has continued to be a basic staple food. A significant reallocation of household resources from millet to peanuts seems unlikely. Both extension and research have been aimed at increasing yields of peanuts and millet together. This, together with integration of cattle into household farming systems and improvement of grain storage techniques appears to have promise. In addition, liberalization of the delivery of key inputs for both crops and improvements in the marketing of peanuts have had positive results.

In short, simultaneous attention to productivity in both cash and staple crops have had a favorable impact on farm incomes so far. Nevertheless, improvements in productivity have been very uneven, especially in the case of peanuts, and more agricultural research and extension are clearly needed.

Consumption Effects of Policies Studies

We have noted that, where peanuts and millet are grown together, the former is a major source of farm income and the latter is a major food staple. Expansion of millet at the expense of peanuts on a given farm reduces income earning potential; expansion of peanuts at the expense of millet reduces the on-farm food stock. Rice is a principle substitute for millet, preferred but more costly.

Interrelationships affecting the farm gate prices of all three crops clearly influence farm incomes and, hence, decisions about consumption. A complicating factor is the fact that the majority of rice consumers live in urban areas. Efforts to limit rises in rice prices appear to have stimulated greater urban consumption of rice at the expense of millet; in rural areas where little rice is consumed, the effects of lower rice prices are felt as slackening in demand for millet. While limitations of the study have precluded in-depth investigation, it seems likely that one or both of two things may occur, should policies to keep rice prices down continue: on the one hand, rising peanut yields and corresponding levels of income per unit land may stimulate rural households to substitute rice for millet over time; alternatively, farmers will be able to grow more of both peanuts and millet as technological improvement continues. Urban consumers, of course, consume more rice than they otherwise would at higher prices, and this has consequences for Senegal's balance of payments so long as the bulk of Senegalese rice is imported.

Clearly, much will depend upon events in the world markets for peanuts and rice and how successful future efforts to augment crop yields will be.

Rural nonfarm earning activities are substantial, and they involve a high proportion of women. Policies designed to lighten the workload of women in activities such as water drawing and food processing would increase total household income and, presumably, food consumption.

Experience Collaborating with Host Country Institutions and Individuals

Collaboration with Senegalese institutions and individuals proved to be very fruitful and cordial. This was the most important single factor responsible for successful completion of the project in view of the limited time constraints.

Principal collaborating institutions were:

- Institut Senegalais de Recherches Agronomiques (ISRA).
- Office de Recherche sur l'Alimentation et la Nutrition en Afrique (ORANA).

Discussions were carried on concerning various research methods and results arising from Senegalese experiences in agriculture and nutrition research; in addition, the project team was provided access to reports and key experts; finally, the Senegalese Government provided help in locating six highly qualified enumerators.

More general assistance was provided by the Peanut Basin Authority (SODEVA), the Ministry of Health, and other agencies in the capital city.

Dissemination of and Reactions to Findings

French language versions of the final project report were widely distributed in Senegal. In addition, two seminars on the purpose, methods, and findings of the study were presented in the country. The first took place during the Summer of 1981 as part of the National Nutrition Surveillance and Planning Workshop organized with USAID support at the Ecole Nationale d'Economie Appliquee. Nutrition-oriented researchers and planners reacted very favorably to our combination of agricultural and survey methods.

A complete presentation of study goals, methods, findings, and policy implications was made in May 1983, in Dakar. The presentation was sponsored by the S&T/Office of Nutrition of AID. The first session, in English, was addressed mainly to USAID staff. The French language session was oriented towards representatives of the agencies directly involved with our research work as well as others interested in the findings of the study. Participants showed evidence of having closely examined the project report and made well-informed comments and suggestions. Representatives from SODEVA seemed to be especially interested in the idea of integrating nutritional considerations into agricultural research and policy.

Data Sources and Analytical Methods Used

Although the project team made fruitful use of the considerable secondary information provided by the Senegalese Government institutions and gleaned from published sources, most of the information underlying the team's conclusions flowed from field work undertaken directly under the project. Methods used to obtain farm production data were conventional: field area measurements, output and yield estimates, data on produce marketing, allocations of farm labor, sources of income and expenditure, and the like. This information was obtained by field surveying.

With respect to nutrition information, the survey focused upon observations of actual family consumption for three consecutive days per family, complemented by anthropometric measurements. No clinical or biochemical examinations were made. Food intake was broken down only into calorie and unadjusted protein intake components.

A modified linear programming format was used to combine production and consumption activities for households. Owing to the severe time constraints facing the team, this model necessarily was developed at the same time as the field work; the team was later obliged to test the model using secondary data on the Casamance region of Senegal. This effort was successful.

COUNTRY: Sierra Leone

CONTRACTOR: Michigan State University (MSU)

Study Focus

This study concerns rural households in Sierra Leone, semi-subsistence households that produced, on the average, more than 75 percent of each major food they consumed, with the exception of dried fish and palm oil. (Fifty percent of the palm oil consumed was produced by the consuming household.) 1/ At the same time, on the average, these households obtained over one-third of their calories from the market and sold 60 percent of the rice produced and significant proportions of most of the other important foods grown.

Policy Environment

In rural Sierra Leone 32 percent of the children under five were underweight in 1978 and 27 percent were chronically undernourished (were less than 90 percent as tall as a reference child of the same age). 2/ In 1974/75 per capita calorie availability among households spending less than 350 Leones per year was about 1160 calories per day; among households spending between 350 and 750 Leones it was 1630. The average for all households was 2010 calories.

Rice was the principal food, the average household in our sample consuming 612 kg per year or .56 pound per person per day. On the average rice consumption represented 24 percent of the value of annual household expenditures and provided 44 percent of the calories in the diet.

Rural households are generally poor: annual per capita expenditures in 1974-75 U.S. dollars were \$54, \$88 and \$136, respectively, for the low, middle and high-expenditure groups into which we divided our sample.

Major Issues Addressed

Malnutrition is a significant problem in Sierra Leone. This study is specifically concerned with caloric adequacy as it is affected by government policies concerning commodity prices and agricultural wages.

First we had to determine what rural households actually consumed. Then came the question, do rice prices affect caloric intake? For some years Sierra Leone has imported a part of the rice it consumes. The government has tried to encourage greater domestic production, in part by establishing an official producer's price, but the price the farmer receives from the trader is usually considerably below the official price. Were the farmer to receive a higher price, how would this affect the caloric content of rural diets?

Another concern in Sierra Leone is the level of agricultural wages. The issue we look at is how higher prices for rice would affect agricultural wages, and how the wage change, in turn, would affect output, consumption and the caloric adequacy of rural diets.

Policy Impacts Identified

As the consumption figures already given indicate, seriously inadequate calorie levels characterize low-expenditure households. These households depend upon rice production more heavily than the other households; they also produce a larger share of their rice for the market. Agricultural production policies should take account of this special dependence of low-expenditure households on producing rice for the market.

Do semi-subsistence households respond to prices? Definitely. Single-equation regressions gave us expenditure elasticities that were almost invariably positive and often strong, own-price elasticities that were usually negative, and sometimes large (as for dried fish), and cross-price elasticities that were frequently large. Rice consumption among households at low expenditure levels is highly responsive to the prices of palm oil, dried fish, groundnuts and nonfood goods. Note that these single-equation regressions are not structural demand equations, but descriptions of the net result of both demand and supply mechanisms.

Consumption Effects of Policies Studied

To estimate the total effect on calorie availability we used system estimation of a complete household-firm model.

With this model we estimate that an exogenous 10 percent increase in rice prices would increase labor use by 5 percent and rice production by 3.3 percent and reduce rural rice consumption by 5.4 percent, yielding a 7.6 percent increase in the marketed surplus. Per capita calorie availability would rise 3.4 percent among low-expenditure households and fall by 0.3 percent among other rural households. Unfortunately, those others include middle-expenditure households, who average only 1800 calories per capita. The differential effect in favor of low-expenditure households occurs primarily because the marketed surplus per capita among those households (235 kg) is approximately double that for other households.

Higher rice prices increase the demand for agricultural labor and thus raise wages. The result, when rice prices rise 10 percent and wage rates five, is increased calorie availability at all expenditure levels. But again low-expenditure households gain the most: their calorie availability rises by 7 percent; at higher expenditure levels the gains are only 1.8 and 1.4 percent.

Guaranteeing higher producer prices for rice increases calorie availability for the poorest households, but lowers it slightly for middle-expenditure households. If rural wages rise because of higher rice prices, calorie availability increases for all households, but again the poorest households gain more than the others.

Experience Collaborating with Host Country Institutions and Individuals

This project originated in this country so it had no sponsor in Sierra Leone. Nevertheless, scholars and government officials in nutrition, economics and agriculture were extremely helpful to us when we visited Sierra Leone in 1978 (to obtain background information) and in 1981 (bringing some results from the project). The list of those who helped us is much too long to give here, but I must mention at least Mr. Ibi May-Parker, Dr. Joseph Tommy and Mr. Tom Roberts, all at one time or another associated with the Department of Agricultural Economics and Extension of Njala University College.

Dissemination of and Reactions to Findings

Aside from the one-month trip in 1981 the principal means of distributing our findings was a series of eight working papers mailed to libraries, scholars and officials in Sierra Leone, to USAID in Sierra Leone and in Washington, and to a lengthy list of interested scholars in many countries. In 1981 several officials (largely economists and members of the agricultural ministry) expressed interest in our findings, but usually there was no great concern about the nutritional question we were studying. However, at that time we had not yet measured the effects on calorie availability among low-expenditure households.

Data Sources and Analytical Methods Used

The data were from a 1974/75 nationwide survey of rural household farm and nonfarm activities in Sierra Leone, conducted by the Rural Employment Research Project at Njala University College. We estimated household consumption by adding quantities consumed from home production (production minus seed use, sales, etc.) to quantities purchased through the market. As the price of food consumed we used a weighted average of retail and farm gate prices.

To measure consumption responses to prices and other variables we took two approaches. In the first we calculated single-equation least squares regressions for twenty foods and groups of foods.

In the second we estimated a complete household-firm model as a system of equations. The model is recursive: production decisions are made first, the results being used in allocating household full income among consumption goods and leisure. The consumption side is a Quadratic Expenditure System utility-maximization model; the production side a Cobb-Douglas function with outputs expressed by a Constant Elasticity of Transformation function. We estimated outputs and demands for six commodities: rice, four other groups of foods (these five constituting all foods consumed), and nonfood, plus labor demand and supply.

FOOTNOTES

1/ Most of the quantitative information given in this and the following section was developed during the course of this study; little such information specific to rural households was previously available.

2/ Sierra Leone, 1978. National Nutrition Survey, pp. xii-xiv, 40.

COUNTRY: SUDAN

CONTRACTOR: SIGMA ONE Corporation

Study Focus

When the Sudan case study was designed in 1980, the central issue was to assess the nutrient intake reduction which might have occurred following the elimination of the price subsidy on wheat bread in May 1979. The study revealed that rather than higher real prices, the Sudanese urban consumer faced lower real prices that continued to decline in real terms in spite of periodic upward revisions in the nominal price. Thus, the focus of the study was changed to an analysis of the factors underlying the rapid increase in per capita consumption of wheat bread since 1971.

Policy Environment

The policy of declining real prices for bread has been implemented through a number of instruments, including subsidies from the national treasury on the order of U.S. 10 million per year, negative effective protection to domestic production through an overvalued official exchange rate, and retail price controls at fixed nominal prices. This policy has been facilitated by the provision of concessionary imports which currently represent over two-thirds of all wheat imports. The costs of this policy have fallen not only on the donor countries and on the national treasury, but also on domestic producers of wheat and sorghum.

Major Issues Addressed

The growth in per capita consumption of bread in the Sudan in the last fifteen years and the concomitant growth in wheat imports have been an important issue in the Sudan's relations with the international donor community. Policy debates have centered on the pricing mechanisms for bread, wheat and wheat products and on the economic bases for allocating resources to domestic wheat production in the irrigated schemes. These debates are central to negotiations for donor assistance and to domestic resource mobilization as the Sudan continues its program of economic recovery.

There appears to be little economic justification for maintaining the current bread pricing policy of fixing the nominal price of bread to consumers. In the absence of policy change, per capita consumption of bread will continue to grow. Even if the maximum land allocations are planted to wheat in Gezira and New Halfa Schemes, the bulk of the

increased demand will have to be met by increased imports. Furthermore, the Sudan's continuing balance of payments difficulties imply that the Sudan will have to rely even more on concessionary sales and food aid to meet its wheat import requirements. To the extent that donors are responsive to world prices in their levels of aid, the Sudan has become less secure in its wheat supplies.

Policy Impacts Identified

Implementing a policy of import parity pricing throughout the market for wheat and wheat products would benefit domestic producers of wheat and sorghum. Domestic production of wheat would be both privately profitable and internationally competitive and would represent an economically efficient use of the available land and water resources in the Gezira Scheme. These results are conditional on the adoption of improved technology, improvements in the structure of incentives, and timely provision of inputs. Domestic sorghum producers would benefit because the demand for wheat is cross-elastic with sorghum. The reduced consumption of wheat would be in part replaced by increased demand for sorghum.

Even if no increases in domestic production are achieved, by maintaining the real price of bread at import parity the Sudan can reduce domestic consumption and imports of wheat. Under one policy scenario, it was estimated that changing the retail price of bread to real import parity at trend values for the world price of wheat could reduce projected import requirements by about 13 percent. Another scenario which involved changes in pricing policies and increases in domestic production indicated that wheat imports could be reduced by 50-90 percent of the baseline level.

Consumption Effects of Policies Studied

The study showed that higher income households consume twice the per capita quantities of bread than do the lowest income households in urban Khartoum, and substantially more than do rural households. The study also showed that the own-price elasticities for the middle and upper income strata are 50 percent greater than those for the lowest income stratum. The consumption effects, per se, of implementing the suggested new pricing policy would fall principally on the higher income strata. At the present time the middle and upper income strata consume five loaves of bread for every loaf consumed by the lowest income stratum. With the suggested policy change the upper and middle strata would consume one loaf less. This would have no deleterious nutritional effects on these groups. Implementation of a policy of import parity pricing at all points in the distribution chain would have some deleterious nutritional effects for the lowest income quartile of the urban population. However, there are more effective tools which could be used to improve the nutritional well-being of these persons.

Experience Collaborating with Host Country Institutions and Individuals

Members of the Wheat Price Study Steering Committee in the Ministry of Finance and Economic Planning were actively involved in both the design and the analysis of this study. The chairman of the steering committee, Dr. E. A. A. Zaki, visited Raleigh, North Carolina several times to review the work and to convey the comments of other committee members to the study team. Another member, Dr. Abdus Sattar of the IBRD/UNDP Planning Assistance and Training Project, provided useful insight and data about domestic production of wheat during his two visits to Raleigh and on numerous occasions in Khartoum. The Department of Statistics in the Ministry of Finance and Economic Planning provided the 1978/1979 Household Budget Survey tapes, helped design the Minihousehold Survey, conducted the survey itself and supervised the transcription from Arabic to English of the survey questionnaires.

Dissemination of and Reactions to Findings

Three drafts of this study were reviewed by members of the Wheat Price Study Steering Committee and by staff members of the Office of Nutrition and USAID/Sudan. The final report takes into consideration comments of the Wheat Price Steering Committee and USAID/Sudan. The results of the study were presented at the joint Government of Sudan and FAO workshop on Agricultural Price Policy held in Khartoum in June 1983.

Given the political sensitivity of wheat bread pricing issues in the Sudan, there was a reluctance to accept the major conclusion of the study, namely that changes in bread pricing policies would have a significant impact on consumption and wheat import requirements. Much more emphasis was placed on policy-immune factors such as urbanization, increasing female labor force participation, and growth in real incomes as more significant determinants of the growth in wheat bread consumption.

Data Sources and Analytical Methods Used

This study is based on econometric analysis of the 1978/1979 Household Budget Survey, a re-sampling (Minihousehold Survey) of the greater Khartoum conurbation in 1982 after the increase in the nominal price of bread, and available time series data on consumption, imports, production and prices. The analyses consist of Linear Expenditure System estimates of the urban demand structure, aggregate demand functions and the components of an import demand model. The study also uses simulation analyses to develop scenarios on alternative pricing and production policies and their impact on import requirements.

COUNTRY: Tanzania

CONTRACTOR: SIGMA ONE Corporation

Study Focus

The economic development policies of Tanzania have been implemented through official intervention in the markets for basic grains, particularly for maize, the principal food for most Tanzanians. The interaction of monetary and fiscal variables with explicit pricing policies and parastatal marketing activities has exacerbated the problems of food security for Tanzania.

The focus of the two studies in Tanzania has been to identify and measure the incidence of the effects of these policies on the maize consumption levels and food costs for different segments of the country's population so as to help develop pricing and marketing alternatives which are more equitable, more secure, contribute to the country's goal of self-reliance and minimize the risk of deleterious nutritional impacts on market-dependent consumers of maize products.

Policy Environment

Contrary to popular belief, Tanzania's goal of self-reliant development has not included a "Food-First" policy; rather Tanzania has pursued a capital intensive approach towards industrialization as its major development thrust. Within this thrust, the Agricultural Sector was to provide surpluses of food for urban dwellers and workers in other sectors and exportable surpluses of so called "cash" crops.

A policy of fixed exchange rates in the presence of high domestic inflation and deteriorating export performance distorted incentives in all agricultural markets. In the markets for maize, producer prices were fixed below real import parity and maintained constant in all regions of the country (pan-territorial pricing), prices were to be controlled by a state marketing monopoly, the National Milling Corporation (NMC), and prices were highly subsidized for those consumers having access to the supplies of the National Milling Corporation. As a result of the interaction of all these economic variables, an increasing share of domestic production was sold through illegal parallel markets. The system of pan-territorial pricing was intended to be equitable to all producers; as the parallel markets evolved, they operated at prices which were two to three times higher than in official markets. That any maize was acquired by the NMC is testimony to the effectiveness of the State's enforcement of the legal prohibition against private sale, transport or storage of maize. The wedge between equilibrium prices and each of the consumers and producer's price created conditions of excess demand in official markets. The excess demand was met through imports which were usually obtained on concessionary terms.

Major Issues Addressed

In Tanzania, the project has consisted of two studies. The first study focused on the issues of incentives to agriculture and the hypothesized cash versus food crop trade-off. These were studied in the context of the country's development strategy and the role of policies on trade, money and the implicit and explicit taxation of agriculture. The principal focus became an understanding of the official market for maize and the NMC's role in providing cheap maize to certain urban areas.

The second study focused on the growing conditions of excess demand brought about by the widening gap between official and parallel prices for producers and the growing level of consumer subsidies in the official market. The growing need for imports, the growing fiscal burden and the high foreign exchange costs of transporting maize from remote regions (which were implicitly subsidized by pan-territorial pricing) led to official consideration of alternative pricing policies and market structures. The specific issues studied were the probable impacts of regionally differentiated producer pricing, removal of subsidies, the unification of official and parallel markets and significantly, the need to prevent deleterious nutritional impacts in low income populations which have had access to official maize. Important ancilliary issues that had to be addressed related to estimation of marketed surpluses by region and potential supply response to increased real prices for maize at the farm or village level. The study also addressed the issue of impacts on food security which could arise from regionally differentiated pricing.

Policy Impacts Identified

The share of the marketed surpluses captured by the NMC has declined sharply while the amount sold in urban parallel markets has remained fairly constant. An increasing percentage of marketed maize has apparently been lost to the country through spoilage and/or illegal international trade.

Average per capita consumption of maize and other preferred staples has grown significantly since 1969. An important reason for this has been the increasing level of subsidization of these foods, especially ground maize (sembe). For urban areas well-served by the official market (principally Dar es Salaam and Tanga), the low price of NMC sembe has induced conditions of excess demand. This overstatement of urban maize needs, induced by the sembe subsidy has led to an overstatement of Tanzania's need to import maize.

In normal years national surpluses of drought staples (sorghum, millet and cassava) have exceeded national deficits in maize and rice. This implies that Tanzania has the capability to be food self-sufficient if consumers were willing to substitute the less preferred for the more

preferred grains. However, in all but the major sorghum producing regions, average per capital consumption of the drought staples has been declining. This is largely due to the fact that official consumer prices have been artificially set such that the relative prices of preferred and drought staples do not reflect the true value of these foods to consumers, i.e. drought staples are more expensive.

The present dual market structure combined with the subsidization of NMC sembe has driven parallel market prices and import requirements higher than necessary had a unified national market existed in which private trade was legal. The primary effect of official intervention into the marketplace has been to bias maize consumption in favor of the population with access to NMC maize and sembe at the expense of maize producers and urban consumers with a limited access to the official market. In 1979/80 the existence of a dual market structure led to a net welfare transfer of approximately Tsh. 87 million from producers and from consumers dependent on the parallel market to NMC customers, as well as a national outlay of foreign exchange of about seven million dollars greater than would have been spent had an unsubsidized, and unified market existed.

Consumption Effects of Policies Studied

The existence of an unsubsidized unified market for maize in the base year (1979/80) would have produced a real income decline of about 11 percent for the beneficiaries of the NMC in Dar es Salaam while average per capita consumption of maize would have been 7 percent lower.

Policy measures which would reduce or eliminate consumer subsidies and/or remove restrictions on private trade in maize and other grains would likely cause the nutritional status of low income households to fall below acceptable levels. Protective measures should be provided by the international donor community in the form of guaranteed concessionary food aid and technical assistance to Tanzania during the undeniably difficult transition toward a more efficient allocation of domestic resources within the agricultural sector.

National self-sufficiency in preferred staples could not be achieved within the present dual market structure, especially with subsidized consumer prices for sembe. Even with market unification and removal of the subsidies, self-sufficiency could only be achieved in the short-run through large reductions in per capital consumption and severe income redistribution. Over the long-run, however, self-sufficiency at adequate nutritional levels and without major redistribution of income could be achieved if efficient resource allocation and aggressive institutional actions could lead to a highly price responsive food production subsector.

1. the absence of the policy reform, farmers and market dependent residents of the many areas not served by NMC experience poorer nutritional states than would prevail with a more neutral structure of agricultural incentives. For these households, maize is already expensive and the country's goal of equity is not being fulfilled.

Experience Collaborating with Host Country Institutions and Individuals

The principal collaborators for both studies were the professionals at the Marketing Development Bureau (MDB), an agency of the Ministry of Agriculture, which is responsible for formulating pricing recommendations for agricultural commodities. The Director of MDB participated in the review of the analytical results and in the structuring of the final report of the second study. Other important collaborators provided data and insight, these included the staff of the Tanzania Food and Nutrition Center, the National Milling Corporation, the Tanzania Cotton Authority, the University of Dar es Salaam branches in Dar es Salaam and in Morogoro, FAO and the World Bank. Regional agricultural development officers and villagers also provided valuable information regarding production, consumption and distribution of maize. High ranking officials of the Ministries of Agriculture, Planning and Labor reviewed drafts of the first study and provided keen insight into the political economy of food markets in Tanzania.

Dissemination of and Reactions to Findings

Over 300 copies of the first study and nearly 100 copies of the second have been distributed worldwide, with at least 50 of each to scholars and officials in Tanzania. The first study was presented in draft form at the annual meeting of the Tanzania Society of Agricultural Economics. The recommendations of that study were incorporated into the World Bank's agricultural sector review in 1982. The issues in both reports continue to be the matter of intense debate within Tanzania, but the recommendations have not been adopted by the government.

Data Sources and Analytical Methods Used

Both studies were based on secondary data obtained from other scholars and official sources during field work in Tanzania. The second study estimates maize consumption and market demand elasticities (income and price) with a subset of the data from the 1977/78 Household Food Consumption Survey.

Supply response was synthetically estimated with a simple rural Household Production/Consumption Model which simulates the response to real changes in the prices of food, cash crops, factors of production and consumer goods. The model is based on neo-classical theory and is a comparative statics rather than a dynamic model. The synthetic supply parameters in the model were developed from farm management data such as production, consumption, prices received, income and cost shares, as well as factor use in agricultural production. Demand parameters were developed from the Household Budget Survey Data and estimated by the Frisch technique. A linear programming/transportation model was implemented on MDB's and USAID's Apple computers for use in price policy simulations by MDB/FAO and IBRD staffs.

SELECTED REPORTS FROM CEAP PHASE I AFRICAN STUDIES

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