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**FOOD SECURITY IN THE SAHEL  
REVIEW OF PAST AND CURRENT STUDIES  
AND AGENDA FOR FUTURE RESEARCH  
AND DIALOGUE ON POLICIES**

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## **PREFACE**

The Regional Program for Strengthening Institutional Research Capacity on Food Security in the Sahel (PRISAS) is an integral part of the socioeconomic component of the Sahel Institute's (INSAH) Five Year Program (1990-1994). PRISAS is financed by the United States Agency for International Development (USAID) under the Cooperative Agreement for Food Security in Africa (FSA-CA No. DAN-1190-A-00-4092-00) with the Department of Agricultural Economics at Michigan State University (MSU). The program was initiated in November 1989 when INSAH and MSU signed an agreement to coordinate research activities aimed at improving the food security of Sahelian populations. The objectives of this agreement are the following:

- to reinforce local institutional capacity for research on food security policies and strategies in the Sahel,
- to improve dissemination of research results,
- to strengthen the training of Sahelian researchers in research methods on different aspects of food security, and
- to stimulate the implementation of new studies relevant to food security in the Sahel.

The documents produced by PRISAS are conceived with these objectives in mind. It is hoped that these documents will assure a wide diffusion of scientific and technical information which can contribute to the design, monitoring, evaluation, and continual fine tuning of food security policy in the Sahel. While acknowledging the financial contribution of the different agencies that support this program, the authors accept full responsibility for the ideas and opinions expressed in the documents.

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## **NOTICE**

*This document does not pretend to present an exhaustive review of all previous and current studies and research dealing with questions about food security in Sahelian countries. The review is limited to a number of broad questions which are currently important factors in determining food security policy. Thus, this document should be seen as an initial contribution to a much larger synthesis of existing scientific and technical information. This synthesis will make that information more accessible to a wide audience of researchers, decisionmakers in the Sahel, and donors to Sahelian states. Part VII of this document provides a summary of the text's main points.*

*We are very interested in receiving comments and criticisms about the content of this review in order to improve upon the product in the future. In some instances, apparent omissions of existing documents in the bibliography can be explained by difficulties in gaining access to results of studies and research. We would appreciate information about any studies that we have omitted or overlooked. All comments, critiques, suggestions, and references concerning omitted documents can be sent to the following two addresses:*

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# **FOOD SECURITY IN THE SAHEL: REVIEW OF PAST AND CURRENT STUDIES AND AGENDA FOR FUTURE RESEARCH AND DIALOGUE ON POLICIES**

**Josué Dioné<sup>1</sup>**

## **I. INTRODUCTION: FOOD CRISIS, STRUCTURAL ADJUSTMENT AND FOOD SECURITY IN THE SAHEL**

The food crisis in the Sahel captured the attention of the international community during the devastating drought of 1968-73. During that period the notion of "food security" emerged. The term food security was actually coined at an International World Food Conference in Rome in 1974, where participants discussed the potentially drastic consequences of rising world market prices for grain and concomitant declining production in many Asian and African countries. At the beginning of the 1970s, many people predicted chronic food shortages and famines in lower income countries (Siamwalla and Valdés, 1984; Eicher and Staatz, 1986). At that time, concerns about food security focused mainly on questions of aggregate supply (increasing domestic production and constituting international security stocks), but later more emphasis was given to questions of domestic demand, purchasing power, and food access. (Reutlinger and Selowski, 1976; Sen 1981; Drèze and Sen, 1989).

In the Sahel, the climate has been viewed as the determining force in deciding populations' food security. Yet experience has shown that the roots of the food crisis go beyond mere climatic factors. Political, technical, and structural constraints contribute to chronic food shortages. Some of these constraints are the result of the colonial strategy of surplus extraction, while others have resulted from inappropriate development plans initiated by newly independent countries or, more recently, by governments that have received erroneous advice from a multitude of expatriate technical assistants (Eicher, 1982; Eicher, 1988). The explosion of the food crisis coincides with a second problem of perhaps equal significance: the financial and institutional collapse of a plethora of public and parastatal entities that had been charged with the task of managing the most vital sectors of the national economy.<sup>2</sup> This endemic stagnation precipitated the implementation of structural adjustment programs in nearly two-thirds of the countries in sub-Saharan Africa. As part of structural adjustment programs many of these countries have initiated liberalization and privatization policies. Because cereals play such a key role in the diet of Sahelians, the

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<sup>2</sup>. This phenomenon is clearly illustrated by the fact that virtually all of the parastatal and state-run enterprises recently experiencing serious difficulties in Mali were initiated under economic and social development plans which were conceived and elaborated during a period (1961-1966) when the country did not possess any specialists in planning (Dioné, 1989a).

cereal sector (including markets and prices) has been targeted for reform in many cases. Empirical results of studies done in the Sahel have played a major role in transforming the narrow goal of privatization or liberalization of the cereal sector to a broader one of reforming the food system.

Studies which have often served as the basis for formulating food security policy have evolved with the changing concept of food security. In the Sahel, studies initially centered on establishing food balance sheets at the national level. Recently, however, studies have addressed a wide range of factors that figure in the broader scheme of understanding the food system. Efforts have been made to study the structure, functioning and performance of grain markets; to look at consumption patterns and factors that affect those patterns; and to examine problems of nutrition. The most recent studies have gone a step further and looked at the interactions of several different factors that influence food security. The studies on intra-regional grain flows and those on the interactions of technology, institutions and food security policies fall into this category.

Although these types of studies have been useful in the formulation, monitoring and evaluation of institutional and policy reforms on food security in the Sahel, they have been too sporadic, isolated, and dispersed (Sahel Institute, 1990). In addition, it has all too often been the case that international organizations undertake studies in Sahelian countries, yet do not provide results to local decision makers who could benefit from the information. When studies are conducted at the regional level, this problem is even more pronounced. Hence, the first step in any attempt to systematically organize information about food security should be to summarize past studies on the subject.

This is the goal of the present paper. Without pretending to present an exhaustive synthesis of all studies done to date in the area of food security in the Sahel (a long-term goal will be to do just that), this paper gives a selective overview of the scientific findings on the subject of food security in the Sahel. This first review focuses on current or proposed food security reforms. The goal is to identify a list of questions that still need to be addressed in the realm of food security and to come up with an agenda of research pertinent to food security policies and strategies in the Sahel.

## II. FOOD SECURITY: DEFINITION AND DIMENSIONS

Food security has many different interpretations, making it necessary to spell out precisely what is meant here by food security and explain its various dimensions. Food security can be defined as follows:

*"access for all at all times to a level of food sufficient for an active and healthy life."*  
(World Bank, 1986, p. 1)

or, alternatively:

*"the ability of a country or a region to assure, on a long-term basis, that its food system provides the total population access to a timely, reliable and nutritionally adequate supply of food."* (Eicher and Staatz, 1987, p. 216).<sup>3</sup>

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<sup>3</sup>. Each of these definitions of food security combines the fundamental elements of time, of the individual, and of nutrition.

The usefulness of these definitions is that they integrate the notions of availability and accessibility and address quantitative as well as qualitative aspects of food security (consumption patterns and nutritional status). More broadly, they imply a disaggregated interpretation of food security that looks beyond national level balance sheets to the level of regions, zones within regions, households and individuals. Finally, by stressing the importance of long-term food security, they take into account the dimension of stability which distinguishes between transitory and chronic insecurity in the availability and accessibility of food products.

From the preceding points, which fall into what Rukuni and Eicher (1987) call the food security equation, it is important to note that the availability of food can be assured by a combination of sources, including domestic production, storage and trade. In the same vein, access to food can be assured by production for home consumption, markets and other mechanisms of food transfer. The vast majority of Sahelian populations live in a rural environment of quasi-subsistence, with cereal production playing the dual role of guaranteeing availability of and access to foodstuffs. In fact, availability and accessibility are one and the same for most rural families. Thus, this present review covers literature dealing with the dimensions of food production, cross-border movements of food (both intra-regional and extra-regional flows), internal commercial transactions, consumption and nutrition.

Particular emphasis will be given to cereals because of their importance as a staple in the diets of Sahelians and also because food security policy in the Sahel revolves around cereals. Throughout the Sahel, cereals furnish at least half of calories consumed, and in most Sahelian countries they furnish as much as 60 to 80 percent of caloric intake. It is hardly surprising then that in a time of food crisis and financial and institutional collapse of public and parastatal entities in the Sahel, many of the structural adjustment programs were geared to the cereals sector, specifically to cereal markets, which had long been the target of state controls and monopolistic marketing boards. This review is not limited to studies of the cereal sector, however. It takes a broad look at the literature concerning alternative sources of revenue, basic education, health, etc., all aspects that logically tie into the overall picture of food security (Drèze and Sen, 1989).<sup>4</sup>

### III. PRODUCTION

Studies and research on cereal production in Sahelian countries are too numerous and varied to summarize in the present document. This review is limited to a broad overview of the primary categories of studies that directly relate certain attributes of food production systems to food security strategies and policies.

#### 3.1. Controversy Concerning the Food Self-Sufficiency Option

It is hardly surprising, given the explicit national food self-sufficiency policy positions of Sahelian governments, that efforts to evaluate cereal production have centered on whether the agricultural sector can meet the aggregate consumption requirements of the domestic population. The Diagnostic Permanent (DIAPER) project was initiated by CILSS to improve

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<sup>4</sup> We will see further on that these two authors recommend that, in any analyses of under-nutrition and malnutrition, distinctions be made concerning the concepts of food self-sufficiency, food adequacy, rights of access to food and nutritional capacity.

the quality of production statistics available in Sahelian countries. Since 1984, project representatives have reinforced the national agricultural statistics services by instituting a standardized methodology for estimating agricultural production. National governments and CILSS use these data to provide a good regional perspective on the food situation across the Sahel. However DIAPER analyses are limited to an aggregate level and focus only on the supply/availability dimension of food security.<sup>5</sup>

An important number of studies has examined the principal determinants of cereal production and the major constraints to establishing and maintaining equilibrium between production and consumption. Regional syntheses of these studies invariably reveal two common overriding constraints that limit the capacity of national agricultural sectors to feed their populations: the instability of agroclimatic conditions and a lack of improved technologies (Matlon, 1987; Shapiro and Berg, 1988). To address these widely recognized constraints, certain macro-level studies were initiated to explore options for food self-sufficiency based on comparative advantage. In general the results of these studies show that the domestic resource cost (valued at world prices) of grain production, especially of rice, is sufficiently high that a strategy of food self-sufficiency involves very high opportunity costs and actually results in declining food security for the country's populations (Abt Associates, 1985; Stryker et al., 1987; Martin, 1988; Shapiro and Berg, 1988).

Three factors account for the poor competitiveness of Sahelian agriculture (grain production). First, the prospects for technological innovation in Sahelian agriculture appear to be very gloomy. There is a lack of drought-resistant, high-yielding varieties of millet and sorghum; chemical fertilizers provide little or no profit with cereal crops; irrigated agriculture has prohibitive costs associated with the construction and maintenance of rice perimeters; and there is very little additional good-quality land available, which limits increasing production by bringing more land under cultivation, particularly for maize (Shapiro and Berg, 1988). Second, factors such as the risk management strategies used by farmers inhibit them from responding to grain price signals. This is particularly true because technological improvements are slow to materialize in the Sahelian setting, which is characterized by severe agroclimatic constraints and insufficient infrastructure and public goods and services to reinforce the agricultural sector. Third, urbanization has tended to change consumption patterns. In the urban setting, costs (including time costs) associated with food preparation, processing and changing taste preferences of consumers are factors leading to a shift in consumption patterns for imported cereals like rice and wheat. This has been detrimental to traditional cereals such as millet, sorghum and maize (Delgado, 1987; Rogers and Lowdermilk, 1988; Reardon, 1989). The changing structure of consumption contributes to the inability of Sahelian countries to attain food self-sufficiency because both rice and wheat, preferred grains in the urban setting, are cereals for which Sahelian countries possess a particularly weak comparative advantage.

The view that this situation eliminates the option for assuring grain availability strictly through internal production in the Sahel is not shared by all analysts who study food problems of Sahelian countries. Gentil and Ledoux (1988) and Gentil (1989), in particular, advise against the anti-protectionist theories currently propounded for the Sahel. Their critique of Shapiro and Berg's conclusions attempts to show that there are in fact ways to increase cereal yields in the Sahel by using short-cycle, drought-resistant millet and sorghum

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<sup>5</sup> It should be noted, however, that in its regional food situation report in 1988/89, DIAPER does include some mention of food access in its reference to the relatively low level of prices which resulted from the favorable harvest.

in zones of less than 600 mm of rainfall, and using chemical fertilizers on sorghum in zones of more than 600 mm of rainfall, or by using animal traction and fertilizers for maize production along the fringes of the humid subregion. They also argue that increasing rice production could be a realistic goal if investment costs were reduced. This could be accomplished by increasing private competition, decreasing outside technical assistance, involving peasants in the management decisions of perimeters, adopting less burdensome techniques of rehabilitation and exploitation of existing perimeters, and further developing rainfed rice production in zones of high potential, such as southern Mali. These researchers refute three other hypotheses generally propounded in anti-protectionist themes: (1) the apparent incompatibility between attaining food self-sufficiency and increasing cash crop production (arguing that the two go hand-in-hand because of the complementarity between the two types of crops), (2) that of the unresponsiveness of peasants to price incentives in situations where there is a guaranteed market and adequate availability of factors of production (land, labor, and equipment) and (3) the irreversibility of consumption patterns (arguing that these could in fact be reversed by improvements in cereal processing and a reduction in both marketing costs and price levels of local cereals).

### **3.2. Myth of the Net Producer/Seller of Cereals**

While the scientific and political debate about the feasibility of achieving national food security through a strategy of food self-sufficiency continues, another category of studies looks at household food security strategies among the different strata of the Sahelian population, including the different strata within the agricultural population. These studies, while taking a micro-level perspective, incorporate macroeconomic factors as well. They look not only at the behavior of farming families vis-a-vis production, but also at the effects of the interaction of technology, institutions and policies on farmer behavior. These empirical investigations provide insights into farmer/merchant behavior at the micro level, while simultaneously permitting a reassessment of certain assumptions that have been used to guide food policy in the past.

The implicit hypothesis of a dichotomy between farmers, perceived as a homogeneous group of producers and sellers of cereals, and consumers, viewed as (generally urban) buyers of these products, has been disproved in all cases where empirical studies have addressed this question by looking at farm families in the Sahel. In Mali, for example, it was shown that as many as 43 percent of farm families are net purchasers of grain even in years of good production and even in the most agriculturally favorable zones in the southern part of the country. (Dioné, 1987; Dioné, 1989a). These net purchases, which can be as high as 20 percent of a family's total production in certain zones of southern Mali, account for 40 to 96 percent of grain consumed by rural households during the "hungry season" in the more arid zones of the north, such as Gao (Dioné, 1989a; Steffen and Mehta, 1989). A similar study reveals the same scenario in southeastern Senegal, where net purchases varied among farm families in 1986 from 33 to 48 kg per adult. This amounts to between 16 and 25 percent of yearly cereal consumption (Goetz, 1988; Goetz et al., 1988).

These facts imply greater complexity in the formulation, monitoring and evaluation of food policies because, contrary to the classical view, many producers of basic food products like cereals must also be included as consumers and net buyers of these products. This situation, true even in countries like Zimbabwe (a net exporter of grain), exacerbates the

dilemma of the dual role of prices for food products in the Sahel.<sup>6</sup> A policy of raising producer prices for cereals creates a conflict between the objective of stimulating production in the long run and the immediate concern for maintaining equity in the short run for consumers (especially the poorest among them) whose real revenue and purchasing power are largely determined by the price levels of basic foodstuffs (Dioné, 1986b). In the Sahel, purchasers/consumers of grain include a significant number of deficit grain producers. Higher grain prices would reduce their purchasing power and access to food, in the absence of any compensatory measures, and would be one of the prices paid to assure greater availability of grain in the long run.

The arguments in favor of trying to stimulate grain production by raising prices are weakened by the results of studies on the determinants of the behavior of Sahelian farmers vis-a-vis staple food production. Market prices of products are only one factor (and perhaps not the most important) that influences both the willingness and the ability of farmers to increase production of their marketable grain surplus. The willingness and capacity of farmers to produce depends not only on the level of effective demand, but also on the availability of agricultural technologies and the performance of institutions such as input markets and extension and agricultural credit services, which decisively influence farmer investments (Dioné, 1988; Weber and Jayne, 1988; Staatz, 1989). It is also feared that in the presence of weak effective demand and significant institutional imperfections, producer response to increasing grain prices could be too weak to compensate for the erosion of consumer purchasing power that higher food prices would cause in the short term.

### 3.3. Diversification, Capital Formation and Growth

More and more studies tend to point to capital formation at the farm level as deserving more consideration in development strategies if farmers are to be expected to respond appropriately to market price signals. Meanwhile, diversification of production into high-value enterprises also appears to be a crucial element in the process of capital formation. This suggests that cash crops destined for the export market and certain off-farm activities could be important components of food strategies at the rural level as well as at the national level (Liedholm and Mead, 1987; Dioné, 1987; Reardon, Matlon and Delgado, 1988; D'Agostino, 1988; Dioné 1989a; Goetz, 1989; Lele et al. 1989; Maxwell and Fernando, 1989; Ndoye, 1989).

The important roles that both cotton and peanut revenues have played in improving food security and the ability of farm families to increase investment in farm activities cannot be doubted in countries such as Burkina Faso, Mali and Senegal. Dioné (1989a and 1989c) shows that in the CMDT zone of Mali, for example, growth in the agricultural sector has been maintained at a steady rate over the course of the last two decades by following a strategy of multiple goals (research, extension, supply of inputs and credit, processing, marketing and investment in infrastructure), that has been vertically coordinated to stimulate revenue growth

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<sup>6</sup>. Timmer, Falcon and Pearson (1983) and Timmer (1986) present a good discussion of this dual dilemma of food prices. They conclude that food prices are the core of food policies. Weber et al. (1988) present a synthesis of the empirical evidence of this critical problem established in studies performed under the Cooperative Agreement between USAID and Michigan State University on food security in Mali, Senegal, Somalia, Rwanda and Zimbabwe. Rohrbach (1988) reports that depending on the rainfall zone, 15 and 25 percent of small agricultural producers are net buyers of grain. Specific examples of this problem are presented by Dioné (1989a) for Mali and Goetz (1989) for Senegal.

from the cotton sector. These revenues have served not only to support the cotton sector, but to allow farmers to meet other monetary obligations (fees, taxes, debts, etc.) and to finance farmers' investments in cotton production and secondary activities, including animal husbandry, trade, and construction of community infrastructure (health and maternity centers, schools, adult education centers, etc.). This large investment in cotton has a beneficial carry-over effect on grain production. The technical improvements involved in cotton production (animal traction, residual effects of fertilizer in crop rotations, etc.) contribute to increasing cereal crop yields. This explains to a large extent how farmers engaged in cotton production produce more cereals than those who grow only cereal crops.<sup>7</sup>

This empirical evidence suggests a need to examine more closely macro-level strategies of the Sahelian food sector because attempts to build up capital by diversifying activities (cash crops, off-farm employment) could provide effective opportunities to promote cereal production as well as contribute to attaining a higher and more lasting level of food self-sufficiency. The results of recent studies on food security in sub-Saharan Africa indicate that more emphasis needs to be given to synergies between (a) diverse production activities (farm-level and subsector networks), (b) policies at various levels (prices, markets, financing, taxes, etc.), and (c) institutions and technologies that influence the incentives, capacity and performance of the national food and agricultural system (Weber and Jayne, 1988; Dioné, 1989a).

#### IV. EXTERNAL EXCHANGE: TRADE AND AID

In terms of the food security definition adopted above, outside sources of food (commercial imports and aid) constitute alternatives or complements to domestic production and storage and therefore contribute to food availability. At the national level it seems logical that during periods of production shortfalls, when available domestic production and stocks cannot meet consumption needs, the availability side of the food security equation be met in part by imports, either commercial imports or food aid. Yet the role of imports in the food security equation, however evident and simple it may appear, is the basis for one of the principal debates on food policies and strategies in the Sahel, giving rise to innumerable studies. Many Sahelian policy makers continue to feel a sense of vulnerability vis-a-vis the exterior because of their steadily increasing dependence on the outside for food. This dependency emerged throughout the 1960s, 70s, and 80s because per capita cereal production declined while per capita consumption of imported rice and wheat increased.<sup>8</sup> To better understand policy makers' concerns,

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<sup>7</sup>. During the 1985/86 and 1986/87 agricultural seasons in Mali, the per capita cereal production of a sample of farmers in the cotton-producing CMDT zone was as much as 2.7 times the level of farmers in the OHV zone, which is a zone of comparable agricultural potential but which is only marginally involved in cotton production (Dioné, 1989c).

<sup>8</sup>. Delgado and Miller (1984) estimate that in the Sahel, from 1961-65 to 1976-80, per capita annual cereal production fell 2 percent for millet, 1.3 percent for sorghum, 3 percent for maize and 1.4 percent for rice; while per capita consumption between 1968-70 and 1976-80 rose 29 percent for rice and wheat and fell 12 percent for millet, sorghum and maize. For the Sahel as a whole (excluding Cape Verde) average annual imports of grain have increased progressively from 681,000 tons in 1970-74, to 698,000 tons in 1975-79, 1,201,000 tons in 1980-84, and 1,444,000 tons in 1985-88 (Shapiro and Berg, 1988).

it is important to distinguish between dependence on food aid and commercial imports, and for commercial imports to distinguish between intra- and extra-regional commercial transactions.

#### **4.1. Imports from Outside the Region: Comparative Advantage, Dependence, and Protection**

In general, Sahelian states have not pursued policies of opening their borders to commercial imports to assure food availability. This fact has been documented by Badiane (1988) whose findings of a strong correlation between domestic production and consumption and a non-negative correlation between production and cereal imports in six West African countries -- five of them in the Sahel -- led him to conclude that these countries rarely relied on imports to stabilize national consumption during the 1960s and 70s. The mistrust regarding a strong dependence on imports, or alternatively, the relative propensity for protectionism of Sahelian states, depends on several factors.

First, Sahelian states predominantly take the view that reliance on exterior sources for basic food needs puts the food security of their populations at the mercy of food-exporting countries (Shapiro and Berg, 1988). This perception is strengthened by the belief that world grain prices are maintained at artificially low prices because of dumping by large grain producers such as the USA, Thailand and other major grain exporters. Such imperfections in the world grain market result in unfair competition for Sahelian farmers in the short run. In addition, Sahelian governments consider it risky to build long-term plans based on the continued availability of cheap grain on the world market because large grain exporters might change their export policies and world grain prices could become prohibitively high.

Matthews (1989) estimates that a liberalization of agricultural trade and a reduction in production subsidies in developed nations subsequent to the Uruguay Round of GATT negotiations could have very unpredictable results for West African countries. Matthews' estimates of potential losses in revenue range from 35 to 165 million dollars and his estimates of changes in balance of payments range from a loss of 60 million dollars to a gain of 200 million dollars. Rising world grain prices would reduce the terms of trade of West African countries and have negative repercussions for food security. The decline in the terms of trade for Sahelian countries from an index of 130 in 1977 to 95 in 1987 (base 1980=100) constitutes another reason governments in the region have been averse to free trade policies for agriculture (Ghersl, Martin and Larivière, 1989).

The instability of world prices for agricultural products imported by Sahelian countries is also perceived as a destabilizing factor that limits the potential for relying on the world market. The residual character of the world rice market means that even slight climatic fluctuations in major producing countries can cause significant changes in both availability and prices of this product on the world market (Shapiro and Berg, 1988). Yet in spite of unstable world prices, Blein, Daviron and Tubiana (1989) see little chance of decreasing reliance on imports by increasing protection in the region. On the one hand, the low prices in the world market have encouraged countries to import. This has been reinforced because Sahelian states have negotiated preferential trade agreements on a bilateral basis with exporting countries. On the other hand, export earnings necessary to finance protectionist policies will be compromised by increased international competition. In this context, Badiane (1988) argues that the positive correlation between cereal production and export receipts is

evidence that these very same foreign exchange constraints limit the capacity of Sahelian countries to rely on imports to stabilize their food consumption.

The tendency of consumption patterns to be increasingly oriented towards (largely imported) rice and wheat, for which domestic production is still relatively inefficient, continues to be seen as a threat to food security. The historical reasons for this shift in consumption have been documented in studies summarized above. Briefly, these reasons include favorable relative prices of imported cereals, urbanization, changing employment structure, higher processing and fuel costs for preparing local cereals and the rising opportunity costs for the time it takes women to process and cook local cereals as opposed to imported cereals, which tend to require less preparation time (Delgado, 1989b; Reardon, 1989; Reardon, Thiombiano and Delgado, 1989). A major implication of the low cross-elasticity of demand for other cereals with respect to rice is that an increase in the price of rice under protectionist measures would significantly reduce the real income of poor urban workers, deteriorating their purchasing power for rice and for other products, and consequently reducing their food security. In addition, Badiane (1989) finds that even at the regional level, West African food systems are so unstable that isolating national markets from extra-regional sources of supply would aggravate problems of food insecurity.

Despite concerns about how restrictions on cereal imports may hurt the short-run food security of certain vulnerable groups in society, the protectionist option is still an important research issue in light of theoretical arguments for protecting infant industries (including certain branches of agriculture). This issue is highlighted by Donaldson (1984) who in his review of the scale and mechanisms of grain trade concludes that "countries can, with some confidence, make use of the international grain market as a residual source of supplies, provided they do so judiciously. However, a grain trading strategy is no substitute for sensible domestic production policies. Internal distribution problems in importing countries make grain imports an expensive and hazardous source of supply for all except those in major cities. Further, since the vast majority of the population in developing countries is in rural areas, and their incomes are dependent on farm production, imports cannot provide a long-term solution to their food security." In this vein, high production costs of local cereals, especially rice, given the existing state of technology in the Sahel, constitute an additional reason to protect farmers in the subregion until they become sufficiently strong to stand up to what is considered unfair foreign competition.<sup>9</sup>

Many analysts nonetheless note that certain national policies of Sahelian states have been at least as important as export subsidy policies of foreign countries in eroding the trade balance of the countries of the subregion. A combination of fiscal policies, such as export taxes on agricultural products and monetary policies such as the over-valuation of the CFA, actually discourages exports and encourages imports, leading to a continued deterioration of the trade balance of these countries (Cleaver, 1985; Castillo et al., 1986; Krum, 1987; Stryker et al., 1987; Shapiro and Berg, 1988; Delgado, 1989b). However, the negative impact of a devaluation with its anticipated inflationary consequences on the availability of imported agricultural products and inputs is a major concern of food policy decision makers in Sahelian countries.

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<sup>9</sup>. Estimates by Martin (1988) and Shapiro and Berg (1988) show that despite a 50 percent increase in the world price of rice between 1987 and 1988, the price of rice produced in the Senegal River Valley and transported to Dakar was still between 2.3 and 3.6 times the average price of rice imported from Thailand to Dakar.

Furthermore, Delgado (1990) has demonstrated the difficulty that governments of Sahelian countries have in effectively managing the real exchange rate of the CFA franc using conventional fiscal and monetary tools, given that the governments often do not hold the reins of these tools. This difficulty is due to the direct relationship between the internal opportunity costs of labor and the productivity of cereals (millet and sorghum in particular). Very high transport costs and large variations in rainfed production cause the domestic equilibrium prices of millet and sorghum (which in turn affects that of maize) to fluctuate widely between their respective import and export parity prices. At the international level, this specificity confers upon these two traditional cereals a character of economic fixity, or of non-tradeable goods, which Sahelian countries have neither the interest nor the ability to import or export.<sup>10</sup> These cereals account for a considerable part (as much as three-fourths) of the implicit income of farmers. Thus the productivity of rainfed agriculture determines to a large extent the level and variability of labor costs. A substantial increase in this productivity appears to be a necessary precondition for reducing labor costs, which in turn free resources to increase production of tradeable goods to take advantage of a more promising export market that would result from an eventual currency devaluation (Delgado, 1990, pp.36-38).

The discussion above demonstrates the complexity of the debate over protectionist policies for Sahelian agriculture. This complexity results from several factors. First, studies of the comparative advantage of Sahelian agriculture have not reached any consensus conclusions. This is partly because it is difficult to isolate the dimensions, determinants and dynamics of those advantages. In addition, there is the delicate problem of analyzing the costs and benefits of protectionist versus free trade options. To a great extent the principal investigators of benefit cost studies, depending on whether they have a penchant for protectionism or free trade, tend to give greater weight to either the costs or the benefits of each of these options, without making a real effort to summarize the anticipated net effects on the food security of the population. The diversity of the alternatives that need to be identified and included in the analyses also gives rise to debate. In this sense, very little research has been done to date on what Delgado (1989b) appropriately calls "the missed opportunities in the Sahelian livestock sector." The comparative advantage that certain Sahelian countries (Burkina Faso, Mali, Mauritania, Niger and Chad) have had until recently in supplying coastal countries of West and Central Africa with livestock and meat is being lost for lack of appropriate measures to develop the livestock sector (Delgado, 1989b; Jøsserand, 1989). Nonetheless, livestock represents, like certain oilseeds, a type of production that both provides for home consumption and serves as an important cash crop. As such, livestock should play an important role in studies of food security policies and strategies in the Sahel.

#### **4.2. Intra-Regional Trade: Disparities, Integration, and Intersectoral Synergies**

As a point of reference in the debate about cereal policies in Sahelian countries, the CILSS/Club du Sahel Mindelo Conference in December 1986 served as a catalyzing force for a multitude of studies on regional trade in West Africa that have been launched during the past five years. Conference recommendations called for "growth in the productivity [of cereals] in a regional area ... sufficiently extensive, contiguous and inclusive of the coastal states of West Africa ... inside which national production would be protected and inter-state trade encouraged" (CILSS/Club du Sahel, 1987, pp. 41-53). The protection of the regional

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<sup>10</sup>. It would nonetheless be useful to determine whether this "commercial fixity" of millet and sorghum is equally valid for extra-regional transactions and internal exchanges within the region and subregions of West Africa.

grain zone needed to give "special emphasis to rice and wheat, which play key roles in Sahelian markets" (ibid., p.43).

The recommendations of the Mindelo Conference are based on three fundamental conclusions drawn from discussions of the results of certain studies.<sup>11</sup> First, given the increasing dependence of Sahelian states on outside sources for basic food needs, any plans to support cereal markets in the region would have to consider the impact of imported grain. Second, the persistence of international grain surpluses that exporting countries offer at subsidized prices on the world market continues to expose Sahelian grain producers to unfair competition. Third, the development of agricultural potential in the Sahel through intensification of crop production requires profitable outlets for that production. This in turn, because of increasing dependence on outside sources for food, requires action to liberalize trade within the region while protecting it vis-a-vis the exterior.

Unlike the current deadlock in the free trade-protectionist debate with respect to the world market, most analysts agree with the idea of liberalizing trade (especially grain trade) in the subregion, whether that be the Sahelian subregion or the entire West African region. Efforts in this domain resemble longtime efforts of regional organizations and institutions such as the CEAO, the CEDEAO and the UMOA to create economic integration throughout West Africa (Dioné, 1989d). The arguments already put forward in the recommendations of the Mindelo Conference favoring a regionalization of food issues have been reinforced by the results of a rigorous study done by Badiane. His study concludes that in West Africa a regional approach to questions of food security would have comparative advantages over both isolated national strategies that are limited by administrative, budgetary and political constraints, and international efforts that are often ineffectual because of political factors.

Badiane (1988) related food security to the level and stability of food production, income, imports and prices in agricultural and other economic sectors. Based on this interpretation, he draws certain conclusions from the results of a series of analyses done on Burkina Faso, Ivory Coast, Mali, Mauritania, Niger and Senegal. His first observation is that, in these countries, the level of food consumption is highly variable.<sup>12</sup> This observation, along with a second finding of a strong positive correlation between consumption and domestic production and a non-negative correlation between domestic production and imports, implies that during the 1960s and 1970s food consumption instability in these countries resulted primarily from fluctuations in national production. Imports do not appear to have played their assumed stabilizing role. Finally, the positive correlation between staple food production and export earnings suggests that foreign exchange constraints have limited the capacity of these countries to rely on imports to offset the instability of their domestic production. In addition, the inappropriate implementation of import management policies contributes to the weak degree of complementarity noted between domestic production and food imports (Coelo, 1989; Dembélé and Staats, 1989b). By destabilizing domestic food availability and limiting the capacity to import, the instability of agricultural production (and

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<sup>11</sup>. For details, refer to the working documents from the Mindelo Conference (CILSS/Club du Sahel, 1987) presented by Bailhache, Egg and Igué, Gabas and Giri, Giri, Hirsch, and Zampou.

<sup>12</sup>. The instability of food consumption can be demonstrated by looking at two indicators of consumption for the period 1963-83. The coefficient of inter-annual variation of consumption is as high as 11.5 percent for Burkina Faso and Mali, 21 percent for Niger and 27 percent for Senegal. The probability that annual consumption falls below the 90th percentile is 19 percent for Burkina Faso and Mali, 32 percent for Niger and 36 percent for Senegal (Badiane, 1988, p.7, 181).

staple food production in particular) constitutes a major source of food insecurity, especially in the countries of the Sahel (Badiane, 1988).

Badiane (1989) extends his study of the probable effects of regional integration on the stability of the food supply to 16 countries in West Africa.<sup>13</sup> This analysis reveals that grain production is more stable at the aggregated regional level than at the individual country level. For 1961-1986, the coefficient of variation for national cereal production is approximately 15 percent for the region and varies by country from 8 percent (Ivory Coast) to nearly 35 percent (Mauritania). For the Sahelian countries covered in the study, these coefficients vary from a minimum of 14 percent in Mali to a maximum of 35 percent in Mauritania. These empirical results support Badiane (1989) in his conclusion that a regional integration of national markets could contribute to stabilizing the intra-regional grain supply and thus improve the food security of the populations in West Africa. This can be explained by the fact that unless there is a perfect positive correlation (100 percent) between cereal production of the different countries of the region, the negative variations in production in one country will be at least partially offset by the positive variations in another during the course of the same year.

At the Mindelo Conference, Egg and Igué (1986) reported, however, that official export statistics greatly underestimate cross-border trade between the countries of West Africa. By cross-checking secondary data and conducting surveys at border markets, these researchers concluded that official trade figures needed to be multiplied by a factor of from 1 to 10 to get a closer approximation of actual trade figures.<sup>14</sup> Several studies of West African regional trade have been initiated since the Mindelo Conference under the auspices of CILSS and the Club du Sahel. The first results of these studies corroborate the above conclusion that, in terms of regional integration, "the trading networks built upon the solidarity of peoples, yet operating for the most part on the margins of legality, achieve what political projects and inter-governmental negotiations have failed to accomplish" (Egg and Igué, 1986, p.279). Thus, commercial integration in the West African subregion has been carried on by a network of transnational merchants who, since the time of the Mali Empire, have relied on durable traditional social relations to adapt to the different upheavals that have visited the region (Lambert, 1989; Lambert and Egg, 1989). Based on strong ethnic solidarity (Hausa, Mandé, Yoruba, etc.), these commercial networks operate in the "national fringe" areas in border towns, periodic markets and border warehouses. These areas constitute de facto free trade zones between neighboring countries (Igué, 1989).

All researchers involved in the regional trade work of CILSS and the Club du Sahel recognize that significant informal trade has existed for ages in West Africa and has persisted despite state policies that have tried to circumscribe cereal markets within national borders (Amselle, Grégoire and Bagayogo, 1988; Egg, Igué and Coste, 1988; Egg, 1989a, Egg and

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<sup>13</sup>. Badiane's analysis (1989) for the period 1961-1986 covers 8 of the 9 member countries of CILSS (Burkina Faso, Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal and Chad) and 8 non-Sahelian coastal countries (Benin, Cameroun, Ivory Coast, Ghana, Guinea, Liberia, Nigeria and Togo).

<sup>14</sup>. These researchers give several examples of this underestimation of trade. Niger, for example, annually received 140,000 tons of nonregistered imports of millet, sorghum and maize from Nigeria in the period 1978-83, and 80,000 tons from Benin, Ivory Coast, and Togo in 1985. Niger's official trade figures show exports of 19,000 tons of cowpeas by SONARA, while estimates of nonregistered exports of cowpeas show Niger exported on an annual basis 115,000 tons of cowpeas to Nigeria and 6,000 tons to Benin. Burkina Faso annually imports 50,000 tons of food from Ivory Coast, Ghana and Togo.

Igué 1989; Igué, 1989; Lambert, 1989; Lambert and Egg, 1989).<sup>15</sup> According to Coste (1989), cross border trade, which totaled approximately 1,250,000 metric tons, represented close to 20 percent of grain transactions in 1987/88 in West Africa, inclusive of Chad and Cameroon. In the same season, the intra-regional flow of locally produced grain was estimated at 400,000 metric tons, a third of the total volume of cross border trade. The remaining two-thirds of intra-regional trade thus came from re-exports of cereals initially imported from outside of West Africa.

The explanation for the considerable magnitude of re-exports in intra-regional cereal trade leads to the heart of the debate about the liberalization of food markets in West Africa. Whereas trade in the West African region was historically based on the complementarities between the forest, savannah and Sahel zones, during the colonial period intra-regional trade became based upon exploiting price and monetary policy differences between countries governed by different colonial powers. Since then, and especially since independence in the 1960s, the large disparity between states' economic policies, more so than any complementarity based on comparative advantage, has constituted the principal force driving intra-regional trade. In this regard, Badiane (1989) maintains that, in West Africa, the preference accorded extra-regional flows over intra-regional flows is in part a result of national economic policies that negatively influence factors that would normally make the regional export markets more attractive than the extra-regional ones. Hence, the strategies of the transnational trader networks under the current situation are largely speculative, taking advantage of the rents to be made from differences in exchange rates, customs, export taxes, production subsidies, consumption subsidies, etc. (Egg and Igué, 1986; Egg, 1989a, Igué, 1989; Lambert, 1989; Ndoye, Ouédraogo and Goetz, 1989; Somé, 1989; Veron, 1989; Vallée, 1989).

The current environment in the subregion, with the multiplication of re-export operations, thus increases exposure of the West African markets to the world market. Consequently, the distortions brought about by national economic policies, the frequent changes in these policies and the strong fluctuations of world prices for imported cereals constitute factors that reinforce the argument that the current environment will maintain, if not increase, the instability of markets in West Africa. In this unstable environment, the disparity of the economic policies of West African states creates opportunities in the commercial sector while hindering the region's development of agricultural production. Consequently, the regional harmonization of policies constitutes a key factor in any strategy whose goal is to stabilize and reorient intra-regional trade to stimulate agricultural production in the countries of the Sahel and in West Africa (Egg, 1989a).

In terms of regional integration, most studies recommend that goods other than just cereals be included in regional trade agreements. The available results show in all cases that a wide variety of products are traded in the subregion, some of which are directly exchanged for cereals. Drawing from results of an analysis of a series of indicators for national production and intra-regional trade, Badiane (1989) shows that the potential for agricultural trade is much higher than the actual level in West Africa. Changing the structure of production would enhance this potential. He warns, however, against the danger of putting too much effort into just integrating the cereal markets while isolating sectors that may be more promising for intensifying regional trade. With an eye toward a more global view of

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<sup>15</sup>. Apart from policies which explicitly restrict imports and exports, Zampou (1986) gives a good overview of the administrative, legal and financial constraints which hinder free trade between certain CILSS countries.

economic cooperation in West Africa, Bailhache (1986) recommends going beyond a simple "division of agricultural activities based on natural vocations" to create "intersectoral synergies" that would enable countries in the subregion to decrease their dependence and the precariousness of individual economies while simultaneously allowing them to increase their trade and develop their respective markets (p.509). Delgado (1989b) argues along the same lines when he states that in designing a comprehensive strategy for developing smallholder agriculture in the Sahel, policy makers need to identify potential markets that are likely to serve as profitable outlets over the long term, for production resulting from a strategy based on comparative advantage.

It seems evident then that regional integration of markets in West Africa offers a potential option for increasing food security in the region. To stimulate and support the development of production, trade and consumption of local products requires both a regional harmonization of state economic policies and concerted action in the domains of policy, institutions and technology. This entails identifying and promoting market openings for production leaders (food crops, export cash crops, livestock, etc.) based on comparative advantage, anticipated effective demand and intersectoral synergies necessary for a durable growth in production and in trade.

Free circulation of goods in West Africa would not result in an equal distribution of market integration benefits. The analysis by Badiane (1989) indicates that at the national level, regional integration would reduce the instability of the cereal markets of one group of countries, the majority of them Sahelian (Gambia, Ghana, Guinea-Bissau, Mauritania, Niger, Senegal and Chad) and increase the instability of the domestic markets of certain coastal countries (Benin, Cameroon, Ivory Coast, Guinea and Liberia).<sup>16</sup> At a more disaggregated level, a simulation by D'Agostino and Staatz (1989) indicates that for the farmers in the southern zones of Mali, greater stability of inter-annual cereal prices could simultaneously increase the cash outlays of net cereal buyers and decrease the receipts of net sellers, or vice versa, depending on whether the previous year's harvest was good or bad. In addition, there is uncertainty whether liberalization of regional trade alone will lead Sahelian farmers to view cereals as a cash crop. Traditionally, farmers have preferred to stock cereal surpluses over several years as a buffer against food insecurity risks. It is not clear whether they will change this behavior quickly and adopt a purely commercial attitude towards cereal production (Dioné, 1989c; Thiombiano, 1989). These different factors and the instability of the food systems at the regional level lead to the conclusion that in the short run it will be necessary to keep the door to outside sources (commercial imports and food aid) open as a buffer against instability of supply to avoid further destabilizing the precarious food security of Sahelian populations.

#### **4.3. Food Aid: Complementarity, Triangular Trade and Targeting**

Since the drought of 1968-73, food aid has become an integral part of the food system of Sahelian countries, serving as a complement to local production and commercial imports. From 1965 to 1985 food aid as a percentage of total grain supply has accounted for an average of 17 percent in Mauritania and 2 to 4 percent in the other CILSS countries, with the exception of Cape Verde (Bascom, 1987). From 1981 to 1985, food aid as a component of total grain supply played only a minor role in Niger (3 percent), yet was as high

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<sup>16</sup> The level of cereal market instability of a third group of countries (Burkina Faso, Mali, Niger and Togo) would be little affected by regional integration of trade.

as 26 percent in Mauritania and between 6 and 7 percent of total grain supply in Burkina Faso, Mali and Senegal (ibid.). Food aid accounts for approximately half the annual cereal supply in Cape Verde (Diagnostic Permanent, 1989). CILSS countries together received on average, between 1980/81 and 1988/89, approximately 564,000 metric tons of food aid grain annually (CILSS/Club du Sahel, 1990). Between 1987/88 and 1988/89, food aid covered the consumption needs of 2 to 2.5 million Sahelians [based on Diagnostic Permanent (1989) per capita consumption figures].

These statistics attest to the importance of food aid in the Sahel. Concerns about the impact of food aid and the management of food aid policy were first aired at the Nouakchott Conference (1979) and continue to occupy Sahelian governments and donors.<sup>17</sup> Governments of Sahelian countries see their growing dependence on food aid, like their dependence on commercial imports of food, as an impediment to moving closer to long-term food security for their populations. The reasons for this perception are two-fold (Bossard, 1989). First, food aid donors tend to provide the types of grain that they have in surplus, and these cereals do not correspond to the consumption habits of Sahelian populations. Consequently, food aid can lead to an extraversion of the food consumption habits of recipient populations, leading to even greater reliance of the recipient countries on the products and policies of the donor countries. Secondly, poorly managed free or heavily subsidized food aid distributions can, through the competition they create with local products, disrupt food markets and production of local staples in recipient countries or the region as a whole.

During the last decade, these two types of concerns have led donors and local decision makers to experiment with approaches for using food aid as a development tool. These new approaches emphasize moving away from the concept of food "aid" towards the concept of food "insurance." They envision the establishment of an international stock of food aid and a fund for local purchases and triangular food aid operations in the Sahel. In addition, they call for broadening food aid beyond the products that have been traditionally supplied, the substitution of commercial imports for food aid, the establishment of a regional food aid management plan and an international code of conduct governing food aid for the region (Jost, 1986). Among these new propositions, those of an international code of conduct and of giving priority to local purchases and triangular operations continue to receive the support of most food aid donors and recipient countries today. A basic premise for the concept of an international code of conduct, which spawned the Food Aid Charter for the Sahelian Countries, officially adopted in February 1990, is reflected in an observation by Jost (1986): "We now have fairly extensive knowledge of the positive and negative aspects of food aid and we are starting to realize what should be done and what should not be done. Nevertheless, donor countries and beneficiary countries continue to do what they should not do or not do what they should do." (p. 331).

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<sup>17</sup>. One could say as much for the allocation and management of the entirety of public development aid (PDA). Between 1975 and 1987 this aid totaled approximately 21 billion dollars for all the CILSS member countries (Club du Sahel, 1990). In 1987 alone, the total amount of PDA funds amounted to 59 dollars per capita for the Sahel. This was 2.3 times higher than the average for Africa and 6.6 times higher than for Asia. It is disturbing that the 21 billion dollars of PDA accorded to Sahelian countries between 1975 and 1987 did not result in a perceptible improvement in food production, availability or the access of populations to food. This result is understandable, however, given that only 25 percent of the total received was invested in production and only 4 percent went to increasing the productivity of reined agricultural production (de Lettre, 1988).

The Mindelo Conference (1986) recommended that donors and recipient countries adopt a "code of good conduct," defining their reciprocal food aid engagements. This conference explicitly recommended that food security in the Sahel be based on two lines of defense: (a) maintaining local stocks at the household, village and national level and establishing an early warning system and (b) guaranteeing a food insurance system based on the commitment of the International Community to furnish the necessary assistance "to transfer available grain from surplus zones to deficit zones or, as a last resort, to rapidly mobilize the necessary food aid" (CILSS/Club du Sahel, 1987, pp. 47-48). The Food Aid Charter reiterates and delineates the above ideas of integration of food aid into rural and agricultural development policies of the Sahelian countries. It obliges donors to plan their food aid contributions on an annual or multiannual basis to permit recipient countries to take food aid contributions into account in their development policies, to avoid the pernicious effects of food aid on local consumption preferences, production and marketing, to promote cereal trade between surplus and deficit countries through triangular operations and to stimulate regional trade (CILSS/Club du Sahel, 1990b).

According to Bossard (1989), there are five types of food aid transactions:

- (1) bilateral aid, which brings the donor/supplier and the recipient into direct contact;
- (2) triangular aid, where a donor acts as a third party between a distinct supplier and recipient;
- (3) local purchase by a donor from the recipient, who plays the double role of supplier and recipient;
- (4) triangular barter, where a donor supplies a product to an initial recipient, who in turns supplies a different product to a second recipient;
- (5) local barter, where a donor supplies a product to a recipient, who sells it and then uses the counterpart receipts to supply a local product.

To date, attempts at triangular food aid have run into numerous problems. These are related to quantitative and qualitative shortfalls in the information about food aid needs, donor perceptions about the opportunity costs of these operations, the impact of these transactions on private trade, and the technical and institutional difficulties of using the private sector to mobilize local products in a commercial environment dominated by informality and the bureaucratic rigidity of national cereal offices in negotiations of triangular transactions (Ibid.). These multiple constraints explain to some extent why triangular operations have played such a small role to date in food aid in the Sahel.<sup>18</sup> Nevertheless, it is still very important to give special attention to local purchases of products for food aid in the Sahel, given the growing importance of a multitude of nongovernmental organizations (NGOs) operating in the subregion.

Concerns about the possible destabilizing effects of food aid on national systems of production and distribution bring to light the thorny problem of targeting food aid in the

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<sup>18</sup>. No triangular operations took place in the Sahel in 1985/86 and 1987/88, while triangular operations amounted to only 87,000 tons in 1986/87 and 10,200 tons in 1988/87, or respectively 7.6 percent and 2 percent of the global volume of food aid received by CILSS member countries. (Bossard, 1989).

Sahel. As stipulated in the Food Aid Charter adopted by CILSS and the Club du Sahel, the objective of food aid should be to contribute to food security by supporting development and by precisely targeting vulnerable groups as recipients of food aid to prevent crises and correct certain structural insufficiencies. Yet, even in Mali, where since 1982 donors have acted in concert to tie food aid to market liberalization and cereal price policy reforms, the problem of precise targeting of food aid persists. The dilemma posed by targeting is that there is a difficult tradeoff between greater efficiency and cost reductions that could be achieved by cutting down on excess distributions to those not falling into the most vulnerable category, on the one hand, and the administrative costs of more precise targeting of aid, on the other hand.

Staatz et al. (1989) summarize the inherent problems of eight different targeting mechanisms for food consumption subsidies in the Sahel, using Mali as a case study. (1) The implementation of price controls (ceiling prices) at the consumption level generally creates disincentives to production, leads to the development of parallel markets, creates opportunities for corruption and increases transaction costs. (2) Possibilities for geographical targeting are limited by the difficulties in precisely identifying the at-risk zones and the vulnerable populations within those zones, as well as by the negative repercussions of free food distributions on markets and on the willingness of private merchants in the area to store grain from one season to another. (3) There do not appear to be inferior foods that are less desired by better-off consumers, which limits any program that might work on a self-targeting basis for the most needy in the population. (4) Bureaucratic and administrative constraints, in addition to difficulties inherent in estimating family incomes, make it impossible to implement mechanisms of targeting based on income level. (5) The ambiguities in land tenure issues, the difficulties in estimating productive capital, and, to some extent, the weakness of the link between productive capital and the nutritional status of individuals are important stumbling blocks in attempts to target based on property ownership. (6) The effectiveness of supplementary mother and child feeding programs is limited if not accompanied by corollary programs in health, hygiene and general and infant nutritional education. (7) Seasonal targeting, either by injecting food into local markets or subsidizing inter-seasonal storage by private merchants, could only buffer large increases in prices during the hungry season under certain conditions: if there is a high degree of substitutability between the products provided as aid and the food products for which one wants to stabilize the prices, if private merchants have adequate information about planned food aid interventions in the markets and if there are sufficient public resources to influence prices during the necessary period. (8) Cash-for-work programs are preferable to those of food-for-work because the latter tend to create a parallel market for food aid products that disrupts the commercial markets.

These problems of targeting food aid deserve further examination, especially as they relate to the different components of the production-distribution systems that determine a population's access to food.

## V. DOMESTIC MARKETING OF FOOD PRODUCTS

Markets, marketing and cereal prices have been the focus of the largest concentration of studies about the food problems of CILSS countries over the past two decades. This is hardly surprising, especially since government marketing policies and official cereal board prices have been seen as one of the principal causes of the poor performance of food production-distribution systems in the subregion. To avoid getting embroiled in political-

Ideological aspects of this issue -- a pitfall of many studies -- this review covers studies of the roles of markets in food systems, focusing on studies that look at the effectiveness with which the food markets of Sahelian countries contribute to (a) a rational allocation of resources and (b) food product distribution. These two aspects are closely linked to the essential dimensions of food security: access, availability and stability.

### 5.1. Weaknesses and Reforms of Public Marketing Systems

State intervention in the markets of agricultural products in general and cereals in particular is not a new phenomenon in the Sahel. The emergence of public offices or parastatals mandated to manage agricultural product markets in the different countries of the Sahel dates back to the colonial era. This tendency for direct intervention of the public sector in marketing agricultural products was particularly reinforced during the first two decades of independence, when a host of public cereal boards were invested with quasi-monopolistic power in the marketing of cereals. The missions of these boards were largely inspired by "particularly persistent myths" about the "infallibility of the state and its often exclusive responsibility" as "the sole agent and mastermind ... of cereal policy" (Hirsch, 1986, p.102). These boards sought to assure adequate price incentives for the agricultural producer, protect consumer purchasing power and, ultimately, protect consumer and producer interests against presumed exploitation by opportunistic private merchants. To accomplish these often conflicting goals, the cereal marketing boards were charged with controlling grain supply, regulating domestic markets, stabilizing prices, controlling or managing food aid and all commercial transactions with the exterior and establishing and maintaining national security stocks (Traoré, 1986).

Beginning in the 1970s, the disastrous management of cereal marketing boards and problems resulting from the obvious conflicts between their different objectives led to pressures for reforms in cereal policies that were eventually initiated across the Sahel in the 1980s. By that time, the goal of protecting the purchasing power of consumers, who included a politically powerful clientele of salaried urban dwellers, had clearly been given priority over the goal of increasing production incentives. Protecting consumer purchasing power was achieved by implicitly taxing grain producers via the low pan-territorial and pan-seasonal pricing that the cereal boards were obliged to follow. This taxation depressed producer prices and was doubly accentuated because official price levels were set to extract an often non-existent surplus from agriculture to finance other sectors of the national economy (Dioné, 1989c).<sup>19</sup>

The increasing failure of these implicit taxes to cover the costs of maintaining consumer subsidies and the inordinately high operating costs of public marketing systems

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<sup>19</sup> The fiscal rather than commercial nature of the system of taxation is revealed by the fact that governments imposed grain delivery quotas on farmers. In the case of Mali, in addition to the implicit taxation incorporated in the artificially low official prices which were paid to farmers for these fixed quotas, the government imposed direct taxes in the form of a minimum fiscal tax, a development tax, taxes on livestock, and taxes incorporated in the official price schedules for export products such as cotton and peanuts. For example, for a sample of agricultural families surveyed by the CESA-MSU-USAID Project, the minimum fiscal tax and the development tax amounted to between 12 and 23 percent of the total value of cereal production for these families and 39 percent of the estimated cereal deficit for families which had a net cereal deficit (Dioné, 1989a, pp. 211-212). Using available official price schedules, SATEC (1982) estimated that the tax rate incorporated into official prices was as high as 24 to 61 percent for cotton and 48 to 65 percent for peanuts.

resulted in growing budget deficits for the cereal marketing boards.<sup>20</sup> Donors became more and more reluctant to finance these deficits and began pressuring governments to reform cereal marketing and price policies as a backdrop to structural adjustment. All studies at that time tried to demonstrate the many pitfalls of monopolistic official marketing systems: inhibition of incentives to increase marketable surpluses, lack of fluidity in supplying the different zones of the countries, high transaction costs of the parallel private marketing system forced to operate illegally, yet actually supplying most national markets, etc. The results of two decades of official marketing clearly showed the negative impact the cereal marketing boards had on food availability and access to food, as well as on the state budget. Consequently, the solutions called for drastic reforms of the marketing system. Liberalization policies were the reform of choice. They emphasized transferring to the private sector the responsibility and legal right to participate in grain markets and in cereal price formulation.

The push for privatization did not go so far as to call for the complete elimination of cereal marketing boards. Instead, their roles were redefined and their new *raison d'être* became one of providing needed goods and services in the nature of public goods.<sup>21</sup> Thus, in every country of the subregion there still exists a public cereal board charged with the management of national security grain stocks and food aid, and, less and less, with direct interventions in cereal markets.<sup>22</sup>

Studies on the historic performance of these grain boards gradually fueled the debates about policy reforms aimed at bringing about the boards' progressive disengagement from activities that could be better taken up by the private sector (e.g., supplying consumers who have adequate purchasing power) or that were financially or institutionally unsustainable by the public sector (e.g., commercial management of inter-seasonal stabilization stocks). Thus, in Mali, thanks to a concerted effort between the government and a unified group of principal donors, continued progress has been made in cereal market reforms. OPAM, the former cereal marketing board, has progressively abandoned its direct intervention in the marketing of grain and regulation/stabilization of prices through the maintenance of official commercial stocks (Sall, 1987; Staatz, Dioné and Dembélé, 1989).

While being asked to disengage from activities that can be assured by the private sector, national cereal boards have also been called upon to provide certain services in the nature of public goods: managing national security stocks and food aid, providing market information, training private citizens in grain storage and conservation techniques, serving as an intermediary for private merchants seeking access to credit, etc. (Steffen, Dembélé and Staatz, 1988). Among these services, the majority of which are indispensable to the proper

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<sup>20</sup>. Budget deficits were often exacerbated by the donor practice of requiring marketing boards to foot the costs of emergency food distribution logistical support. For example, in 1976/77, the Malian cereal marketing board (Office of Agricultural Products in Mali, or OPAM), had an accumulated budget deficit of 19.5 million FCFA, which was three times the value of its total annual commercial grain sales (Berg, 1979; Humphreys, 1988).

<sup>21</sup>. Steffen, Dembélé and Staatz (1988) discuss this public good dimension of the redefined roles of OPAM.

<sup>22</sup>. Cereal boards exist in the following countries: OFNACER (Office National des Céréales) in Burkina Faso, EMPA (Empresa Publica de Abastecimento) in Cape Verde, GMPB (Gambian Produce Board) in the Gambia, Armazens do Povo in Guinea-Bissau, OPAM (Office des Produits Agricoles du Mali) in Mali, CSA (Commissariat a la Sécurité Alimentaire) in Mauritania and Senegal, OPVN (Office des Produits Vivriers du Niger) in Niger, and ONC (Office National des Céréales) in Chad.

functioning of the private sector, that of collecting, analyzing and diffusing reliable information about market prices and grain movement stands out as the most important for both private and public participants' decision making. Current evaluations of the efforts undertaken by what have become known as market information systems (MIS) unanimously recommend that the Sahelian states and donors commit themselves to putting in place the necessary ingredients (financial backing, training, equipment, etc.) to establish or reinforce lasting national structures that fulfill this role (Dembélé and Staatz, 1989a; Egg, 1989b; Ouédraogo et al., 1989; Phelinas, 1989; Dembélé, Staatz and Egg, 1990; DIAPER, 1990; Dioné, 1990; Leleu-Keraly, 1990; Ouédraogo, 1990; Souleymane et al., 1990). Improving the quality and quantity of information collected, analyzed and diffused about food markets could turn MISs into key sources of information for strengthening food security policies across the Sahel.

## **5.2. Liberalization of Markets and Prices and Allocation of Resources**

Cereal market reforms initiated during the 1980s attempt, above all, to correct the presumably harmful effects of former public-sector intervention policies on the growth of cereal production and allocation of state financial resources. Consequently, the basic link between liberalization of cereal markets and food security lies in the potentially beneficial effects of a new system of incentives on the production and distribution of staples. From a classical standpoint, free trade of products permits consumers to "vote" for their preferences via their effective demand and, hence, to rationally orient the investment decisions of producers towards enterprises for which there is a revealed preference and for which there exists a comparative advantage. This role that undistorted prices play in guiding resource allocation in a market economy is a principal argument for current reforms aimed at market liberalization.

It should be noted, however, that studies on food policy remain weak in this area. Lack of systematic empirical evaluations about the influence of market liberalization policies on cereal production, for example, can be largely explained by the lack of adequate quantitative information about production and marketing (effective producer prices in particular), for both the period prior to the reforms and today (Dioné, 1988). The weakness of the data is such that attempts to estimate the impact of liberalization policies are open to much criticism because they cannot readily differentiate between those changes in production brought about by producer response to changes in market structure and prices and those resulting from variations in agroclimatic conditions.

An indirect way to look at this question is to analyze the degree of spatial integration of national cereal markets. In theory, indicators of spatial integration of markets reflect the degree to which price signals are transmitted between the different hierarchical levels, i.e., the different economic participants of a subsector (consumers, small-scale retailers, wholesalers, collectors and producers). The most commonly used indicators are price margins between pairs of markets (the more constant these margins are, the more integrated the markets) and coefficients of price correlation between markets (large coefficients imply a strong degree of integration). Utilization of these techniques has shown that the degree of integration of national cereal markets in the Sahel is directly related to two important factors: market accessibility and spatial and temporal regularity of grain supply in the different regions and zones (Dioné and Dembélé, 1986; Ouédraogo and NDoye, 1986; Sherman, Shapiro and Gilbert, 1986; Dembélé and Steffen, 1988; Barry, 1989; Dioné, 1989a). This is a good indication that in zones where the road infrastructure is adequate and the supply of grain is regular, effective competition between private merchants assures a good transmission

of price signals between the different participants in the market. Under these conditions, it is not very likely that a limited number of operators could succeed in manipulating the market to extract excess profits (abnormal profit margins) at the expense of others (producers and consumers in particular). As useful as they are, however, such indications of market integration cannot provide enough information about the real impact of liberalization on effective producer prices and producer response to price changes.

Modeling and simulation exercises provide a different approach to surmounting the difficulties encountered in evaluations of the type "before and during" liberalization. The model elaborated for researchers at the Senegal Agricultural Research Institute (ISRA) is an eloquent example of this type of effort that merits continued attention.<sup>23</sup> Based on linear programming, this model encompasses the objectives of food security at both the farmer and state levels, and thus serves as a conceptual tool of great utility for the simultaneous analysis of questions on food security and comparative advantage at the microeconomic level of the agricultural producer and macroeconomic level of the state. To accomplish this, the model incorporates a variety of model farms developed around enterprise budgets specific to different ecological zones and levels of technology. By iterating on various levels of aggregation and conducting sensitivity analyses, the model can be used to examine the effect of changes in certain key variables (price, for example) on model farms and national food security objectives (degree of food self-sufficiency, for example). Application of this model shows that a policy of simply increasing producer rice prices in Senegal, given the current shortage of land for increasing the area of rice perimeters, would have a negligible effect on increasing production, but would impose substantial costs on consumers. On the other hand, an increase in rice production could be brought about by a joint policy of increasing producer prices and increasing irrigated perimeters incurring high costs for both the state and consumers.

The more classical approach of analyzing peasant supply functions is another possible avenue for reinforcing some of the more rigorous tools used in analyzing the effects of different policies on cereal production. In this vein, Thiombiano (1989) proceeds from the neoclassical theory of supply and assumes that the Sahelian farmer is more inclined to respond to information (prices in particular) about cereal markets in relation to his or her search for an income-goal (volume of money) than as a means of profit for profit's sake. This perspective allows us to understand why certain farmers have, at least in the short term, an atypical supply curve for cereals that depicts them as responding negatively to prices. This situation results because, given the farmer's fixed target level of income, he or she will sell less when prices of agricultural products are high and more when they are low (Dioné, 1989a; 1989d). This apparently abnormal short term response of farmers to prices does not, however, preclude the possibility of a "normal" (in the classical sense) reaction in the long run. In effect, even in the short term, producers endowed with significant alternative sources of monetary income (cash crops, petty trade, livestock, artisanal activities, etc.) do demonstrate classical commercial behavior (typical supply) vis-a-vis cereals, adjusting sales based on market prices (Ibid.).

It is precisely to address this problem of monetarily constrained farmers offering their harvests at relatively unfavorable prices that efforts were made to organize producer groups that could intervene directly in the marketing of cereals. These associations sometimes have

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<sup>23</sup> Martin (1989) provides details on the conceptual framework and empirical applications of this simulation model. The model links data and objectives at the micro-economic (family) level and the macro-economic (national) level.

access to formal credit that they use to begin early collection of member products. Also, they often benefit from the assistance of non-governmental organizations (NGOs) who support many cooperative-type activities of producer groups. As a natural extension of their role in the marketing and collection of products, these associations sometimes participate in the distribution of certain factors of production and, through cereal banks, supply food to rural consumers who otherwise lack significant negotiating leverage vis-a-vis merchants in the normal commercial circuits. Growing interest in these rural associations stems not only from the advantages that members derive from participating in commercial operations, but from other benefits that the associations offer. For example, many associations use the proceeds from money-generating activities to finance collective actions that can improve productivity and general living conditions in the rural setting. They often finance the purchase of grain thrashers, grain mills and irrigation pumps, or the construction of storage facilities for grain and inputs, vaccination stalls for livestock, adult learning centers, primary schools, health centers, maternities, etc. A basic challenge for research will be to determine the minimal conditions (social, legal, administrative, financial, etc.) necessary to assure the spread of these associations and the maintenance of their autonomy given their potential contribution to the evolution of greater participation of rural populations in the management of the activities affecting their self-development.

In conclusion, analysis of farmer commercial behavior necessitates considering factors that are much more complex than previously assumed.<sup>24</sup> The roots of this behavior can be found in certain environmental factors (climate, soil, etc.), technological factors (equipment, seeds, fertilizer, cropping techniques, etc.) and institutional factors (research, extension, markets for factors of production and agricultural products, financial markets, etc.) that determine not only the willingness and, perhaps more importantly, capacity of farmers to respond to commercial stimuli. Secondly, food risk factors (instability of production, uncertainty of cereal market supply, financial market imperfections, etc.) contribute to increasing the propensity of surplus producers to retain a certain part of their grain surplus for interannual security stocks. Thirdly, certain badly understood socioeconomic factors underlie many extra-market transactions or non-monetary transactions (gifts) of cereals between farmers and individuals with whom they have social ties. Finally, nondeferrable monetary obligations (fees, taxes, debts, etc.), often emanating from policies other than those directly related to cereal markets (fiscal policies in particular), force many producers (even the deficit ones) to sell their products at low prices immediately after harvest and grain (often on credit) at high prices during the hungry season. Within this systematic framework of complex determinants lies the necessity of grasping the specific impact of any reform on cereal production of Sahelian countries.

### **5.3. Private Markets and Distribution: Access to Food**

An important aspect of evaluating the effects of grain trade liberalization is measuring the effectiveness of liberalized markets in the distribution of cereals to consumers. By removing barriers to entry to the commercial profession and allowing free circulation of products, grain trade liberalization should lead to healthy competition and reduced transaction costs, thus improving a population's access to food. In essence, legalization of private commercial operations can potentially increase the number of traders, raise their level of intervention and extend their clientele beyond the limits of formerly clandestine or parallel

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<sup>24</sup>. For a detailed empirical discussion of the determinants of the farmers' willingness and capacity to respond to cereal prices, refer to Dioné 1988, 1989a, 1989b, 1989c et 1989d.

markets. The gains made from the resulting economies of scale and increased market fluidity and transparency greatly benefit consumers.

Empirical evidence from several studies confirms that grain trade liberalization results in better consumer service than that offered by cereal marketing boards (Sherman, Shapiro and Gilbert, 1986; Dioné and Dembélé, 1987; D'Agostino, 1988; Somé, Giniès and Coulibaly, 1989). Under a liberalized trade policy, these consumers (often rural and urban noncivil servants) benefit from regular supplies of grain by a competitive market that is not subject to the high risk costs that generally characterize clandestine transactions of parallel markets. The existence and magnitude of these benefits depend not only on the physical proximity of the consumption zones, but also on the number of suppliers (merchants) and their behavior. The greater the possibilities of collusion between merchants, the smaller the possible benefits consumers can hope to gain from liberalization.

The potential for a large degree of market concentration in the hands of a few merchants and the possibilities of collusion between merchants in different consumption zones are, consequently, important questions to examine when looking at both access of populations to food and the effects of liberalization on farmers and cereal production. According to certain studies, in the Sahelian context there are at least four types of factors that allow merchants to concentrate their market power or collude with other merchants. First, the limited self-financing capacity and constrained access to bank credit of smaller merchants gives those few large merchants possessing financial means (either through access to bank credit or import-export activities) quasi-oligopolistic power in cereal markets (Mehta, 1989; Ould Didi, 1990).<sup>25</sup> Secondly, the cloistering or the poor circulation of market information hinders merchants from effectively moving cereals from surplus zones to deficit regions.<sup>26</sup> Thirdly, lack of adequate infrastructure, especially roads, and limited means of transport discourage merchants from competing to supply consumers in those zones that are geographically the most isolated (Steffen and Koné, 1988). Fourthly, the weakness of effective demand (adequate purchasing power), a reflection of the low incomes of most households in certain zones, limits the number of merchants willing to supply these populations and dictates the limited scope of their activities in these poorer, deficit zones (Sherman, Shapiro and Gilbert, 1986).

These different factors suggest that there is still a role for the public sector to play in newly liberalized cereal markets in the Sahel. It appears that private markets can only serve consumers correctly when certain conditions, such as strong effective demand and nonprohibitive transaction costs, permit merchants to make acceptable profits from their commercial activities. Markets will only play the role of effectively meeting consumer demand if all merchants are given more open access to formal credit (a precondition for increased competition among merchants) and market information is made available to all. Improved competition can only be accomplished if the public sector provides accurate quantitative and qualitative information to all market participants about the overall situation and movements

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<sup>25</sup>. Mehta (1989) estimates that in Bamako 40 percent of the total grain sale volume of grain sales in 1985/86, 1986/87 et 1987/88 was dominated by the 4 largest wholesalers, out of a group of 50 who were surveyed by the CESA-MSU-USAID research project.

<sup>26</sup>. Recent experience with grain market information systems (MISs) provides a good illustration of this phenomenon. Certain evaluations of MISs indicate increased competition in private commerce subsequent to improvements in the diffusion of price information. This occurs in the different regions of the country as well as between major markets within large urban centers like Bamako.

within the market. Involvement of merchants in supplying isolated zones will remain limited so long as the public sector fails to take action to reduce transaction costs, most notably by improving road infrastructure. Finally, private individuals operating in a market economy cannot be expected to altruistically respond to the needs of the poorest individuals who lack adequate income to meet their food needs. Thus another public sector activity should be to better target food aid to lessen food insecurity in the short-term while making long-term in the long run efforts to develop income-generating activities that will permit the poor to turn to the market to meet their food needs.

Finally, in terms of food security, there is some consensus that neither complete control by the public sector nor supremacy of the private market should be panacea in themselves. Research must bring a capital contribution to the current debate over integration of public and private sector roles. Fortunately, the current debate is based on a common set of definitions of the roles, functions, ways, means and intervention mechanisms for effectively allowing the public and private sectors to improve food availability and Sahelian access to that food.

A stumbling block of national food systems in the Sahel stems from what Schmid (1990) calls the legal foundations of a market economy. Schmid articulately argues that a market economy must be based on legal foundations or property rights. This foundation is decided upon by the public sector and it influences not only the performance of different market economies but also structures outside the market and, consequently, the speed and content of development (ibid, p.1). It is imperative that research efforts give priority to identifying effective modalities of implementing these indispensable conditions (legal, institutional, administrative, etc.) for the efficient functioning of food system components in general and private markets in particular. These conditions need to safeguard the expectations of different participants, compensate individual effort, control individual action while ensuring its expansion, reconcile social pressures and recourse to modern legal means, arbitrate the social distribution of costs and benefits among different participants (producers-suppliers, intermediaries and consumers) and promote real coordination of and between various networks and sectors.

## VI. FOOD CONSUMPTION AND NUTRITION

Investigation into problems related to human consumption and nutrition is vast, attracting specialists from disciplines as varied as anthropology, sociology, economics, nutrition and health. The particular interests of these different disciplines vary, yet their many interrelationships give the study of food security a highly multifaceted character. A pragmatic approach requires that an operational delineation be established, incorporating the respective contributions of each discipline into a multidisciplinary framework. With this in mind, economic analysis of food security must examine the relations between certain socioeconomic variables at different levels. For example, economic studies need to look not only at indicators of the level, structure and patterns of food consumption, but also at the nutritional status of populations.<sup>27</sup>

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<sup>27</sup>. The author is indebted to Diagne (1990) for his contribution to the synthesis of food consumption studies in the Sahel, especially those concerning efforts to estimate the different types of elasticity of demand and grain expenditures.

## 6.1. Structure, Determinants and Tendencies of Food Consumption

"Food consumption" usually refers to quantitative aspects of human food consumption (e.g., quantity of products consumed). Many food security studies are limited to this level of analysis, based on the implicit assumption that knowledge of consumption levels of a gamut of food products allows one to draw conclusions about the nutritional status of individuals. Undoubtedly, food intake constitutes the indispensable physical basis of nutrition; yet nutritional status is more complex. Questions of nutritional status require much more than a simple calculation of quantities of food consumed.

Two observations stand out concerning the studies that have been done to date in the area of food consumption and nutrition in the Sahel. First, there has been a strong concentration of studies in four of the nine CILSS countries (Burkina Faso, Mali, Niger and Senegal). Secondly, these studies of nutritional status have had a strong medical orientation.<sup>28</sup> Few efforts have been made to tie the results of these nutritional studies to socioeconomic factors. Establishing this link is needed to design policy interventions that will eventually lead to an improvement in the underlying causes of nutritional problems of vulnerable groups. Economic studies have been preoccupied with describing and analyzing the structure, determinants and patterns of food consumption at national and household levels, heavily accenting cereals, prices and incomes.

The overwhelming importance of cereals in the structure of food consumption in the Sahel is undeniable. Many studies estimate that throughout the Sahel, cereals furnish more than 50 or even 60 percent of caloric intake. For countries such as Burkina Faso, Mali, Niger, Senegal and Chad, cereals provide 70 to 80 percent of national caloric intake, with this figure as high as 80 to 90 percent in the rural areas of Burkina Faso, Mali and Niger (Bricas and Sauvinet, 1989; Ghersi, Martin and Therivière, 1989). The dominant role of cereals in Sahelian food consumption can be explained as much by environmental conditions (climate, soils, etc.), which limit agriculture in the subregion to cereal production, as by generally weak incomes which prevents most families from diversifying their diets to any great degree. In fact, the strong dependence of Sahelian national economies on quasi-subsistence agriculture accounts for the dominant role of cereals (millet and sorghum) in landlocked countries (Burkina Faso, Mali, Niger and Chad). In several coastal countries (Cape Verde, Gambia, Guinea-Bissau and Mauritania), rice is quickly surpassing traditional cereals as the main staple of urban populations. This is partly explained by the lower transport costs associated with getting rice to countries on the West African coast.

Apart from natural determinants, economic considerations, such as the effect of income and prices on effective demand of consumers, are very important. Empirical evidence verifies that, in the face of rising available income, consumers prefer food products of animal origin and vegetable origin (beans, fruits, etc.) over cereals which are generally considered inferior economic goods. This tendency towards diversification of food intake with rising income is also true in the Sahel to the degree that urban populations, who are generally wealthier than their rural counterparts, rely less on cereals for meeting their caloric requirements (Mondot-Bernard and Lebonne, 1982; Esta, 1985; Sundberg, 1988; Bricas and

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<sup>28</sup> As an illustration, the December 1989 issue of the catalogue of publications of the Organization for Research on African Alimentation and Nutrition contains some 260 references of studies done between 1959 and 1989 by this organization on medical and nutritional aspects of alimentation.

Sauvinet, 1989).<sup>29</sup> Increased monetary income through increased cash-generating activities or paid employment constitutes a key consideration in policies aimed at improving the diet of Sahelians through more diversified consumption.

The current controversy over food consumption, as described above, lies in the interpretation of principal determinants of structure and forces that cause a shift in consumption towards imported cereals (rice and wheat in particular). Delgado (1989a) estimates that between 1960 and 1980, cereal imports in the Sahel increased at an annual rate of 6.6 percent for rice and 8 percent for wheat. This growing dependency led many decision makers to look for a means with which to curb the rapid expansion of effective demand for these cereals, for which most national agricultural systems are structurally deficient. In most cases, prices were the first instrument of choice for trying to curb demand. It was anticipated that measures to increase consumer rice prices relative to those of other cereals would simultaneously decrease final demand for rice, expand demand for local cereals and, consequently, induce producers to increase production of all types of cereals.

It has already been shown that the realization of such theoretical goals depends on three assumptions that have not thus far been substantiated by available empirical evidence. First, IFPRI/CEDRES studies of consumption indicate that expansion of demand for rice results less from the response of consumers to relative prices of cereals than from other factors: urbanization, the employment structure, opportunity costs with regard to women's time, preparation costs of cereals, etc.. Secondly, there does not appear to be a definite dichotomy between rural producers and urban consumers that would permit one to distinguish the net effect of a change in relative prices on effective demand and cereal production. In the short run, farmers, of whom a large proportion are both cereal buyers and sellers, would be simultaneously helped (as producers) and hindered (as consumers) by an increase in relative prices of cereals, including rice whose consumption is growing even in the rural setting (Reardon, Matton and Delgado, 1988; Rogers and Lowdermilk, 1988; Sundberg, 1988; Bricas and Sauvinet, 1989; Dioné, 1989a; Goetz, 1989; NDoye, Ouédraogo and Goetz, 1989). Thirdly, farmer response to cereal prices is generally hindered by constraints stemming from other economic policies as well as institutional and technological limitations.

The first of the above assumptions exposes the difficulties surrounding different types of elasticities of demand for food products in the Sahel. Diagne (1990) advises that great caution be used in interpreting the results of previous studies of price elasticities. For example, all that one can infer from the results of the studies on consumer budget shares and income elasticity of demand for principal food products is that (1) rice is not a luxury food whose consumption will increase with rising consumer incomes and (2) neither millet nor sorghum is an inferior food product will be consumed less as the population becomes wealthier.<sup>30</sup> Empirical evidence that wealthier consumers spend less on cereals and more

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<sup>29</sup> The more pronounced monetization of urban populations' income contributes to this tendency towards diversification of food consumption. In the rural setting, food consumption is much more closely tied to household agricultural production, which is also the principal determinant of the family's global income.

<sup>30</sup> Sawadogo (1985) and Reardon, Thiombiano and Delgado (1989) demonstrate that rice is a staple food of the urban poor both in terms of total quantity consumed and the share of this product in total spending on cereals. Conclusions about the economic character of rice, millet and sorghum are based on an examination of the budgetary proportion that consumers from different income groups allocate to expenditures on food products and on the income elasticities of these same products. These questions have

on other food products does support the hypothesis that cereals can be regarded globally as inferior goods (Sawadogo, 1985; Sawadogo and Brandt, 1988).

Two additional observations noted in recent studies are the relative inelasticity of demand for different cereals based on own price elasticities and the poor substitution between cereals (zero or even negative cross elasticities). One major implication of these results is that price policies would have a negligible effect on the level and structure of cereal consumption. Shapiro and Berg (1988) estimate, nonetheless, that the evidence concerning responsiveness of consumption to price changes is qualitatively very weak, especially given the short observation periods that the evidence is based on and the dangers of misinterpretations of estimated elasticities in past studies. Bricas and Sauvinet (1989) note in their studies on diversification of food consumption that the consumer thinks more in terms of meals prepared from different cereals than cereals themselves. This gives special significance to the work of the organization for the Promotion of Local Cereals (PROCELOS), especially their processing work. It also suggests that looking at diverse elasticities of demand for food, using the theoretical approach of product attributes could shed some light on the existing preconceptions about consumer response to changes in income and prices. It would thus be possible to explore, for example, the assumption that increased demand for rice stems from a package of attributes that make rice-based meals more attractive than those made from other cereals (millet and sorghum in particular), which would imply that for a comparable budget outlay, a meal made from rice translates to greater consumer utility.

## 6.2. Nutrition: Beyond Food Availability and Consumption

The two definitions of food security given at the beginning of this document refer to nutritionally adequate food intake. This reference clearly indicates that the examination of food insecurity problems, like the efforts dedicated to their solution, must be conceived in the context of nutritional well-being. Yet, up to this point, only food availability, access, and consumption have been discussed. This is not fortuitous since many economic studies of food security rarely go beyond the limited framework of a comprehension of the food consumption phenomenon to systematically link its principal factors (policies, institutions, technologies, etc.) to nutritional status of well-identified target populations. Such an approach implicitly assumes that knowledge of what is happening at the consumption level of these products (itself a useful tool) allows one to make correct inferences about nutritional well-being. In other terms, this approach equates consumption with nutrition.

Some recent efforts in economic analysis of nutritional problems lead one to doubt that the relation between consumption and nutrition is as simple or direct as one would suppose. In one review of food consumption and nutrition in Mali, Sundberg (1988) noted that in 1984-85, the rate of occurrence of protein and caloric malnutrition in the south (CMDT zone) was among the highest in the country. Despite the fact that this period coincided with a poor agricultural season, this observation is still troubling. Mali's southern region is normally considered its most productive agriculturally, such that good year or bad, its level of food security was assumed to be the highest in Mali. To further substantiate this observation, Sundberg (1989) empirically demonstrated the absence of a direct link between cereal production and nutritional status in children of agricultural families in Mali's Upper Niger River Valley region. This conclusion, drawn from a comparative analysis of

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been examined in studies by Sawadogo (1985), Rogers and Lowdermilk (1988) and Sawadogo and Brandt (1988).

anthropometric information taken from the south (which produces more grain per capita) and the north of the zone in question, is not surprising in that it had already been established that net per capita cereal availability throughout the zone was not significantly different. The zones did differ with respect to the source of cereals. While availability in the south was guaranteed by home production, northern families met their food needs in the market by using proceeds from a wide range of money-generating activities to purchase grain. (Dioné, 1989a, pp. 191-204). What is surprising about Sundberg's results is the absence of significant statistical correlation between the security family food consumption and the nutritional status of children within the family.<sup>31</sup>

That there are two categories of particularly vulnerable people, children and women, is a current theme in all studies concerning the nutritional status of populations. Certain studies indicate that the countries of sub-Saharan Africa, in contrast to those of other developing regions (Asia in particular), suffer very little from nutritional discrimination based solely on sex (Drèze and Sen, 1989; Sundberg, 1989; Svedberg, 1989). This is because women in Africa often have a greater degree of autonomy, more opportunities for participating in money-generating activities and greater responsibility in managing the family's food budget. These general conclusions need to be substantiated by empirical studies that cover a broader area and are done at a more disaggregated level. This approach is necessary because it is equally evident that ethnic and religious considerations decisively influence the social distribution of rights, roles, responsibilities, taboos and privileges within African families. The case study done by Sundberg (1989) indicates a certain age discrimination in malnutrition, with the most severe nutritional problems manifested in children during the weaning period, when solid food is first introduced to their diet (6-36 months) and also when children first take on energetically demanding responsibilities (6-7 years), at which time protein and calorie intake are below normal for respective levels of growth and activity.

The above discussion demonstrates that the economic problems of food security -- extended to include nutritional well-being -- cannot be fully understood or resolved by limiting the field of investigation to only those aspects of availability of, access to, and consumption of food products. Thus, economists participating in nutritional research agree with specialists who look at the medical and para-medical aspects of nutrition. Both point to factors beyond quantity and variety of food consumed as potential contributors towards determining the nutritional status of individuals. Among these factors are education, health and hygiene (Sen, 1981; Eicher, 1988; Drèze and Sen, 1989; Pinstrup-Andersen, 1989; Von Braun, Hotchkiss and Immik, 1989).<sup>32</sup> Studying factors that affect access to food at different levels of disaggregation (national, regional and household) and distribution of food within the family can only partially contribute to understanding the nutritional well-being of the different categories of vulnerable individuals (children, lactating women, etc.). Ultimately, however, even among families of the same income level, the structure and practices of food consumption and nutrition vary according to the level of nutritional education formally or informally acquired by the person in charge of managing the family diet. In addition, synergies between sickness and malnutrition are such that isolated knowledge of the

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<sup>31</sup>. In this case, a family's food consumption security can be measured by ordering households according to a group of indicators, including number of meals eaten per day, number of meals containing meat or fish, number of ingredients in the sauce which accompanies the main meal, and frequency of nutritionally inadequate meals (Statz, D'Agostino et Sundberg, 1990).

<sup>32</sup>. The volume by Gittinger, Leslie and Holsington (1987) includes two sections with numerous articles by different authors who investigate the multidisciplinary dimensions of nutritional problems.

composition, level and distribution of food products is not enough to predict an individual's nutritional status.

The importance of the dimensions of health, hygiene and food security is eloquently expressed by Drèze and Sen (1989) who maintain that "although famines imply -- and are typically initiated by -- lack of food, many people who die of hunger die not from lack of food, but from the endemic sicknesses that are brought on by famine." One could say as much about under-nutrition and chronic malnutrition, which are frequent results of insufficient income and lack of education and primary health care. With respect to the economic aspects of policies concerned with health, hygiene and primary education, this confers a merit that should not be underestimated or given secondary status vis-a-vis policies concerning production, trade and consumption of food products. In conclusion, a global understanding of food security in the Sahel requires an extended perspective, one that progresses "respectively (1) from food self-sufficiency to adequate food supply, (2) from adequate food supply to the right of access to food and (3) from the right of access to food to nutritional capacity." (Ibid., p. 178).

## **VII. SUMMARY AND AGENDA FOR RESEARCH AND DIALOGUE ON POLICIES**

For the countries of sub-Saharan Africa, and particularly those of the Sahel, the 1960s and 1970s were marked by a severe food crisis and a generalized structural crisis that affected the most vital sectors of national economies. In addition to climatic factors, which for a long time, were looked upon as the major determinants of the Sahelian food crisis, observers began to understand the importance of a complex combination of other factors such as policy decisions and structural, technological and institutional limitations that were hindering the ability of individual countries to meet basic food needs. The endemic structural and financial crisis of public and parastatal agencies led most states to adopt, often under pressure from donors, structural adjustment programs that limited public sector intervention and encouraged the private sector participation in the management of economic activities that previously had fallen under state control. Under structural adjustment, a strong emphasis was placed on the liberalization of cereal markets as a prime means for improving the food situation. Based on a definition of food security that incorporates the idea of permanent access to adequate food and nutrition for all, this document presents a review of the studies focusing on current issues of food security and sketches an agenda for future research in the Sahel.

### **7.1. Update on Studies of Food Security in the Sahel**

The focal points of the studies presented above are summarized here. These points are brought together in conformity with the adopted definition of food security which focuses on the dimensions of availability, access, stability and nutrition. With respect to these different dimensions, an examination is made of economic studies on production, intra- and extra-regional trade, food aid, domestic marketing, consumption and nutrition. Because of their importance in consumption and the current nature of policy debates concerning them, cereals have received the greatest attention in the studies so far considered in this review. Yet available studies that go beyond the narrow framework of cereal food security are also reviewed.

Three major themes relevant to food security policies dominate the studies concerned with domestic agricultural production of Sahelian countries. At the top of the list is the unresolved controversy concerning the option of food self-sufficiency, which underlies the theories arguing for protection of agricultural production in the Sahel. On one hand, this option has been criticized for not guaranteeing food security because it (a) focuses uniquely on national cereal availability, (b) ignores the fact that countries are at the mercy of an unstable climate and (c) is economically costly compared with other less autocratic alternatives. These critics point to a host of factors that decrease the competitiveness of Sahelian agriculture: weak productivity of available production technologies; structural, institutional and political hindrances that interfere with a farmer's ability to respond to price changes; expansion of imported rice and wheat consumption often encouraged by factors other than prices. These points of view must be qualified, however, because other studies point out the existence of institutional and technological options (improved varieties, adapted fertilizers, improved technologies, etc.) that would make it possible to efficiently and significantly increase the productivity of both rainfed and irrigated cereal production. It has also been shown that farmers are indeed responsive to prices when making production decisions, provided that appropriate measures exist to ensure effective demand for their marketable surplus. These measures imply a key role for research and investment in processing technologies which adapt local cereals to consumer preferences.

A second salient point touched upon in this review concerns the implicit dichotomy in the perception of farmers as a homogeneous group of producers and sellers of grain products and consumers as urban buyers of these products. The results of available studies contradict this myth. They show that even in structurally surplus countries like Zimbabwe, a large number of agricultural families are actually net buyers of grain. This highlights the dilemma of the dual role of prices. While farmers who produce a marketable surplus benefit from policies aimed at increasing producer prices, deficit farmers suffer the same fate as urban consumers who pay higher prices for the grain they buy on the market. Thus, attempts to increase cereal production through producer price support policies can, in the short run, compromise food security for a large proportion of consumers (including deficit farmers) if not accompanied by compensatory measures that bolster consumer incomes.

Thirdly, it appears that the development of a farmer's productive capacity (and his or her ensuing ability to respond to prices) must necessarily pass through a process of capital formation at the farm level. This implies that even the attainment of self-sufficiency in grain products (cereals in particular) requires a strategy based on inducing and increasing farmer incomes. At the national level, this type of strategy cannot be isolated or limited to a single category of enterprises or production activities. Different zones within a country possess different resources. Thus, depending on the zone, cash crops (like cotton), animal husbandry or certain non-agricultural activities might present the best prospects for exploiting available resources. Also, fiscal, financial and commercial policies in favor of developing lasting investment capacities for diversified activities could, paradoxically, be among the most efficient alternatives for achieving food self-sufficiency.

A review of the issues concerning the role and importance of foreign trade in food security strategies is delineated along three major lines. The debates the option of protecting Sahelian cereal production and markets from outside competition. This debate emanates from the propensity of Sahelian states to pursue objectives of food self-sufficiency and brings into direct confrontation proponents who argue for either protectionism or free trade for the Sahelian agricultural sector. Arguments for protection include (a) fear that dependency will put countries at the mercy of the policies of export countries; (b) concern about foreign

currency receipts and commercial balances; belief that exporting country dumping policies constitute unfair competition; (c) fear that insecure supplies will result given the instability and volatility of the world market (the world rice market in particular); uneasiness about increasing extraversion of food consumption habits.

Challenging those who call for protection of emerging agriculture in the Sahel are those who argue that the current lack of competitiveness of Sahelian agriculture could cause food insecurity under protectionist policies. Weak competitiveness is rooted not only in those factors already described but also in the inherent distortion of national policies related to fiscal and monetary domains (various taxes, over-valuation of local currencies) that serve as disincentives to investment in the agricultural sector. If the diagnosis of the ills seems to reinforce itself in one sense or another, recommendations concerning the appropriate path to follow to remedy the ills are also open to attack. This is especially true since the results of available studies on comparative advantage do not benefit from any degree of consensus. In addition, the high prices and commercial fixity of local cereals result in high opportunity costs for labor, which in turn implies that, in the absence of a substantial increase in the productivity of local cereals, the management of policies as incontestable as the devaluation of the exchange rate for the CFA franc will undoubtedly encounter enormous difficulties.

In the second place, the option for liberalization of intra-regional trade within the Sahelian or the West African zone benefits from a general consensus. It is generally recognized that significant informal trade flows have existed for many years and continue to exist in West Africa despite efforts to isolate national markets. These exchanges are supported by the evolving strategies of unified international commercial networks that operate in the de facto fringe zones of national peripheries. A thorough examination shows, however, that the current level of trade is far from meeting the estimated intra-regional commercial potential. Secondly, the current situation does not favor development of local agricultural production. This is because, rather than being based on real comparative advantage, cross-border flows are oriented towards exploiting disparities between the national economic policies of different countries (fiscal, monetary, etc.). Consequently, the harmonization of these policies and the appropriate measures needed to make marketing of agricultural products in the Sahel more attractive (i.e., investments to reduce the costs of transport, processing and conditioning of cereals) are key factors in a strategy of trade development based on economic advantages: stimulation of production at reduced costs in the most needy zones, stabilization of global supply and improvement of supply by ensuring a wider circulation of products. Strengthening regional integration does not obviate the need to maintain a certain guarded openness to extra-regional imports. Such a policy is necessary to absorb the residual food supply instability that will undoubtedly persist even if regional integration of domestic grain supply succeeds.

Thirdly, because of its growing importance and humanitarian nature, food aid has come to play a vital role in the food security strategies and policies of Sahelian countries. Yet many of these countries are concerned about their growing dependence on food aid and about the potentially disruptive effects that food aid can have on national markets, local cereal production and consumption preferences of consumers. Thus, in the spirit of the new Sahelian Food Aid Charter, current efforts are moving towards transforming food aid into an instrument of development by giving priority to purchases of local products, exploring the possibility of triangular transactions and improving the targeting of subsidized or free food distributions. Past attempts in this direction have shown certain difficulties that need to be overcome before new efforts can possibly succeed. In the case of triangular operations, stumbling blocks remain concerning the availability and reliability of basic information,

institutional, technical and logistical problems with mobilizing local products, and the ungainliness and rigidity of administrative procedures which, taken together, significantly influence donors' perception of the financial opportunity costs of emergency operations. Policies aimed at targeting subsidized food distributions are, for their part, confronted by the difficulty of limiting the economic effects of these operations. These difficulties stem from significant information gaps about indicators (income, patrimony, nature of demand, geographic situation, etc.) that could serve as criteria for identifying and selecting recipients.

Attention given to national food marketing systems has focused on the imperfections of cereal marketing boards and their presumably negative effects on incentives for cereal production and consumer access to food. The consensus of studies in this area is that cereal marketing boards suffered two faults. On the one hand, they were disastrously managed and, on the other hand, they were charged with pursuing conflicting goals of assuring fair producer prices while maintaining consumer purchasing power. This strategy resulted in huge budget deficits and prevented the market from correctly allocating resources.

Rather than eliminate the cereal boards because of their failure to accomplish multiple and often incompatible missions, attempts were made to reform them. Cereal boards were forced to abandon financially unsustainable activities (price stabilization in particular) and transfer commercial activities such as the collection, transport, storage, and distribution of cereals to the private sector. They, in turn took on new, public-oriented responsibilities (managing national security stocks, food aid, market information, technical training of private operators, mediation of access to financing, etc.). In this context, it is crucial that different market participants have adequate information, which points to the need to reinforce the capacity of cereal marketing boards' information systems in their efforts to collect, manage and analyze data.

Reforms in favor of liberalizing trade have been initiated to reestablish the allocative role of prices. Yet attempts to measure the effectiveness of these reforms have been limited. This is partially due to a lack of reliable production and marketing data necessary for any empirical analysis of the reforms. Analyses of certain indicators of the degree of spatial integration of markets (price margins and correlation coefficients) have, however, provided a certain amount of information on the effectiveness of price signals. They show that the efficiency of transmitting price signals depends on the accessibility and spatial and temporal regularity of staple product supplies. Simulation modeling using model farm enterprise budgets also provides insights into the different constraints (technological, land tenure related, etc.) that interfere with price signals (higher prices), thereby triggering a noticeable increase in production (especially of cereals). In addition to simulation exercises, more traditional tools, like specification and estimation of peasant supply functions, provide information on the effectiveness of price signals. This approach has helped explain the sometimes atypical behavior of certain groups of farmers to price signals. Independent of the approach used, it is now clear that future attempts to measure market efficiency of markets in the allocation of resources need to look not only at the factors that determine the willingness of farmers to respond to prices (technological, institutional and monetary constraints) but also at those that affect their capacity to respond.

Studies on the efficiency of markets in the distribution of products, like cereals, generally confirm that recent liberalization and marketing reforms improve consumer food supply by increasing the competition, transparency and fluidity of private merchant transactions.

At the same time, however, certain factors (such as poor self-financing capacity, restrained access to bank credit, cloistering of information, and inadequate infrastructure) have hindered the development of competitive food markets and led to situations where merchants concentrate their market power and collude with others. It is thus imperative that research be directed towards identifying the necessary conditions for putting into place the legal foundations (rights, privileges and responsibilities) conducive to the efficient functioning of different components of the food system.

The final section of this review looked at questions of food consumption and nutrition and revealed two essential facts. First, studies that look at the structure, determinants and shifts of consumption suffer from the same weaknesses that limit the usefulness of their results. They rarely go beyond the apparent observation that cereals dominate food consumption patterns in the Sahel and that imported cereals (especially rice and wheat) are capturing a growing share of final demand. Without accepted estimates of the different elasticities of demand, the relative importance of prices, income and other variables in explaining the structure and dynamics of consumer preferences is open to debate. This issue is made even more complex by the realization that consumer preferences are based on a host of attributes characteristic of meals, rather than just the type of cereal that is the staple of the meal. More research is needed to better judge and predict the impact of policies (for example, the impact of changes in relative prices on effective demand for staple food products.)

This review highlights the fact that food consumption and nutritional well-being are not necessarily synonymous. The few economic studies of nutritional problems so far done show that even knowledge of a household's food self-sufficiency level and its degree of access to food products does not guarantee an adequate understanding of the family's or individual's nutritional status. These studies stress that analyses of under- and malnutrition need to look not only at availability and access to food but at the availability of and access to other factors (primary health care, hygiene and basic and nutritional education) that are equally important. Consequently, studies of food security must transcend the narrow confines of traditionally defined food consumption concepts to link the well-being of target groups in the population with the economic policies under examination.

## **7.2. Suggestions for an Agenda of Complementary Research**

Though only an overview, the above review allows one to take stock of the extent and diversity of past and current studies on the multiple facets of food problems faced by Sahelian populations. In spite of this diversity, the overview reveals major shortfalls in the scientific knowledge available to adequately inform and enlighten the formulation, monitoring, evaluation and continual adjustments of policies affecting food security in the countries of the Sahel. Certain of these principal weaknesses that stem from either the respective studies' particular perspective or level of coverage stimulate the following suggestions concerning an agenda of priority questions that need to be addressed in complementary studies.

### ***(a) Priority targeting of populations at risk of food insecurity***

The definitions given to food security in the framework of this review emphasize the need for access for all to adequate and stable nutritional well-being. However, the stumbling blocks faced by research on food security are based on the very food insecurity of populations. This insecurity is reflected in under-nutrition (hunger and famine) and acute or

chronic malnutrition affecting different segments or groups of populations. Just as the victims of famines come from different socioeconomic strata, the problems of hunger and malnutrition selectively affect specific types of individuals. Yet, with the exception of those studies more directly related to nutrition, most of the studies examined in this review look only broadly at the populations targeted for investigation. The feasibility and extent of their recommendations is thus limited, making it difficult to evaluate the impact of policy prescriptions on improving the food security of vulnerable populations.

This perspective could appear somewhat narrow if one takes the view that research efforts should address curative as well as preventative aspects of food insecurity. It is evident that, given limited available resources, even preventative efforts cannot succeed unless priorities are established in the choice of the target clientele. It is thus imperative that additional studies be conceived, to the largest possible degree, around the following basic objectives:

- (i) identifying, at an acceptable level of precision and disaggregation, categories of populations (zones, families, individuals) at risk of food insecurity based on specific basic indicators of nutritional status;
- (ii) determining the nature (chronic or acute) and causes (inadequate access to factors of production, insecurity of employment, limited adaptation of product income, etc.) of food insecurity within these population groups;
- (iii) stratifying populations according to a risk classification scheme that ranks populations according to the causes of their insecurity;
- (iv) determining the relationship between the causes of food insecurity, on the one hand, and the relevant factors of economic policies, institutions and technology, on the other hand; and
- (v) evaluating the impact of technological changes and institutional reforms and policies on the principal causes of food insecurity and the resulting recommendations for improvement measures.

Empirical evaluations of the relative effectiveness of the different mechanisms of targeting food aid and other direct measures of assistance to vulnerable populations are strongly recommended provided they utilize the conceptual framework outlined above. These measures of direct assistance constitute what Drèze and Sen (1989) call an assistance-based security strategy that can be characterized by a discriminatory use of resources and biased redistribution of public services in favor of the poor. Examples from many developing countries (Chile, China, Costa Rica, Cuba, Jamaica, and Sri Lanka) prove that such a strategy has the advantage of permitting rapid and noticeable improvement in food and nutritional security of vulnerable populations. This rapid improvement occurs without having to be preceded by a period of significant and sustained economic growth.

***(b) Technology, comparative advantage and food security***

This review exposes the importance currently attached to questions of food self-sufficiency and protection of agriculture in the Sahelian countries, especially with respect to basic grain products. The economic justification for increased food self-sufficiency is based on the current or potential comparative advantage of local agricultural production. It seems,

however, that most research specialists on Sahelian food problems do not agree about the results of available studies of comparative advantage. The current differences in points of view stem from divergent ideas on scenarios that should be taken into account in analyses and the essential determinants of comparative advantage.

In addition, to reduce ambiguities of comparative advantage, future studies that look at this issue should:

- (i) systematically catalog and evaluate the technologies presumed to be productive for different agricultural enterprises in general and, more specifically, for cereals; and
- (ii) determine the minimum socioeconomic and institutional conditions required for wide diffusion and adoption by farmers of the technologies judged the most productive and profitable both socially and financially.

In this respect, more extensive efforts should be made to adapt and apply crop budget simulation models by zone, farm-type or production technology. The model developed by the Senegal Agricultural Research Institute (ISRA) could serve as a point of inspiration for a more efficient exploitation of the varied information about crop budgets that could be used to analyze the anticipated effects of current or planned policies on food security.

In this same vein, more studies should investigate the changing demand structure for principal staple products. This is vital because the willingness and capacity of national food systems to effectively produce and transform different products for market depends on the structure of effective demand. On the other hand, further studies must focus on the instability that characterizes all food systems in the subregion by looking at the effects of this instability on families, countries and the subregion as a whole. At the macroeconomic level, the major issue facing countries today is how to determine a formula for stabilizing food markets to protect consumer food security and support the investment of producers, food processors and merchants in the food subsectors.

***(c) Accounting for insecurity risks induced by dependence on outside sources of supply***

Another salient point brought out in this review concerns the reticence of Sahelian states to open their national markets to outside sources of food supply. This reticence, which concerns predominantly cereals, stems from the perceived risks of a strong dependence that would expose the populations of the subregion to the policies of export countries and aid donors. It is important to note, however, that the arguments favoring such a position are very theoretical. No real empirical evidence is available to substantiate either the existence or magnitude of these risks. A priority of future studies will thus be to identify and quantify the risks of insecurity linked to the instability of access to available outside food sources.

***(d) Legal foundations of the domestic marketing systems and mechanisms***

As efforts of reform and structural adjustment move the countries of the Sahel closer to adopting market economies, certain pressing questions need to be addressed about the legal foundations of the structure and functioning of food production and distribution systems.

This means transcending basic observations concerning the organization, functioning and performance of markets to look more directly at the economic consequences of legal, institutional and administrative foundations that underlie the system of rewards and sanctions, which in turn determine the behavior of the different market participants (producers, merchants, consumers). The great importance accorded to this issue is justified by the fact that it is the legal foundations that (1) determine the gamut of opportunities that are open to the different participants in the food subsectors, (2) form the perception of the opportunities available to the different categories of professionals and (3) influence the effective capacity of individuals to exploit their perceived opportunities.

Future studies of marketing at the national level and trade at the regional level should thus give greater attention to the identification of conditions necessary for effective implementation of minimal legal conditions necessary for the efficient functioning of a market economy undergoing liberalization. Particular emphasis is especially needed to clearly redefine the role of cereal boards and delineate the respective roles of private versus public sectors. States need to formulate and initiate measures and mechanisms that will stimulate and uphold private initiatives and, at the same time, assure socially equitable distribution of the benefits and costs that result from those initiatives.

**(e) *The overall strategy of agricultural development and food security***

The discussions of availability and accessibility of food products all lead to the conclusion that it is imperative to approach food security problems and solutions in a global manner and to integrate ongoing research when tackling these issues. To the degree that food insecurity problems are generally tied to inadequate incomes of populations that still practice quasi-subsistence agriculture, increasing farmer incomes becomes a condition *sine quo non* for simultaneously improving the availability of food and right of access to food. With this in mind, research efforts need to go beyond looking only at agricultural problems in isolation. They need to concentrate on questions of capital formation and self-sustaining investment that will help develop a strong and lasting Sahelian agriculture. Also, future research needs to be instrumental in developing policies that focus on those diversification activities capable of sustaining such a process. This calls for more explicit consideration of interactions and synergies such as those between:

- (i) productivity of rainfed grain crops, comparative advantage and specialization of farmers in high-value enterprises,
- (ii) the performance of markets and development/adoption of more productive agricultural technologies;
- (iii) cash crops, grain crops, livestock and non-agricultural activities for financing the required investments in infrastructure, production and marketing technologies, etc..

Above all, the effectiveness of research depends on the availability of selective yet reliable information. Without reliable data, even sophisticated and rigorous analyses will provide erroneous conclusions and recommendations. In this vein, improvements in data collection, management and analysis capabilities of information systems (cereal market information systems, especially) need to be given top priority in both the short and long run. The information provided by these systems is indispensable for more accurately analyzing the impact of food security and agricultural policies.

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