

**CEREALS DEMAND IN THE SAHEL AND POTENTIAL IMPACTS OF REGIONAL  
CEREALS PROTECTION**

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by

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## **SUMMARY**

Recent policy debate in the Sahel has focused on a regional protection zone for cereals. This paper discusses cross-country evidence of consumption patterns and the sensitivity of these to policy variables, and considers potential income-distribution and efficiency impacts of a rice tariff increase. A tariff would hurt the poor in the short-term because the poor depend to a large extent on rice as a "fast food", purchased from street-vendors. The trend toward rice consumption is a long-term, structural phenomenon, linked to urbanization, rather than to short-term price changes. Maize and millet/sorghum are substitutes in consumption, which should serve to encourage development of maize in the Guinean zone to help assure Sahel food security in drought years.

## **CEREALS DEMAND IN THE SAHEL AND POTENTIAL IMPACTS OF REGIONAL CEREALS PROTECTION**

### **1. INTRODUCTION**

Since the independence of the Sahel countries<sup>1</sup> three decades ago, their coarse grain agriculture has been declining. This is worrisome because three-quarters of the population grow "coarse grains" (millet, sorghum, and maize). Three-quarters of cultivated land is under these grains (Matlon, 1987). During the same period, imports of rice and wheat from Europe, Asia, and North America have been increasing at 10 percent per year (Gabas and Giri, 1987).

The result is that consumption per capita of coarse grains has decreased by 22 kgs. between 1960 and 1983, while that of rice and wheat has increased 16 kgs. (Delgado and Reardon, 1987). Moreover, almost all of the increase in rice and wheat consumption over the last decade in the Sahel was provided by imports. Imports of crop and livestock products comprised half of West Africa's current account deficit in 1989 (CILSS/Club du Sahel, 1990). This shift to imported cereals is occurring more rapidly in West Africa than in either Eastern or Southern Africa (Reardon and Pinckney, 1987).

Alarm over these trends led Sahel policymakers and donor representatives to meet in Nouakchott, Mauritania in 1979, and in Mindelo, Cape Verde, in 1986. In Mindelo, the Club du Sahel and CILSS made an appeal for a common tariff on rice imports to the Sahel (CILSS/Club du Sahel, 1987).

This appeal started a heated debate in the Sahel, Europe, and North America concerning whether this protection is desirable and practicable. The CILSS and the Club du Sahel held a seminar in Lomé, Togo, in November 1989. They changed the tone of the debate by inviting delegates from the 'humid coast' countries of West Africa. Over the prior decade, the focus of the policy debate had shifted from the Sahel's imports from outside West Africa, and hence a focus on protecting the Sahel agricultural economy from imports of Asian and American rice, to the means of increasing trade between West Africa 'humid coast' and Sahel countries, based on comparative advantage (CILSS/Club du Sahel, 1990).

While the Lomé seminar's published synthesis stated that protection is desirable to overcome "unfair competition" from outside the region, it also stressed the practical difficulties of controlling informal or illicit cross-border trade. In particular, reexports of rice and wheat imported by 'humid coast' countries, or even by coastal Sahel countries, have been entering through unofficial cross-border trade channels into Sahel markets, despite border controls. This was illustrated dramatically in the case of Nigeria, that officially stopped imports of rice in the mid-1980's. Several years later found the imported-rice consumption level restored to two-thirds of its previous level through, for example, illicit reexports of rice from Benin. (Spencer *et al.* 1989)

In March 1991, the ministers of agriculture of the CILSS states met in Dakar at the initiative of the Senegalese Minister of Agriculture, Cissokho, to provide political impetus to regional economic integration. The appeal for regional cereals protection was revived in the debate, as a method of spurring economic integration and intra-regional trade.<sup>2</sup>

However, the Lomé Seminar stressed the need to assess the demand-side effects of trade regime options (such as tariffs and devaluation) that would raise the price of imported cereals. These should take into account recent consumer survey evidence concerning Sahel cereals demand across income groups, and in urban and rural areas. This need has only been reinforced by the 'Cissokho Initiative'. Much of the

evidence is very recent, however, and has not been brought together in a comparative review, and its policy implications systematically discussed.

Hence, the objective of this article is to discuss the potential demand-side effects of Sahel regional cereals protection on consumer real incomes and on resource allocation. I do not argue for or against protection in principal, or say whether it should be adopted. The adoption of protection by nations is spurred by economic and political reasons e.g. to aid infant industry, to benefit key government clientele, etc. Domestically there are always winners and losers from protection, as there is from its absence. It is widely practiced across nations.

Hence, my specific purposes are: (a) to evaluate, by reviewing recent consumer survey results and literature on production-side constraints and potential, the economic assumptions behind a drive for cereals protection; (b) to alert policymakers to possible consequences on the income distribution and resource-allocation sides if protection is adopted; and (c) to suggest policy measures and research agendas that may help to mitigate negative consequences in the short run if protection is adopted, and to redress in the medium run the underlying problems that spurred the desire for protection in the first place, such as the insufficient demand for and supply of coarse grains.

The first part of the article discusses the demand-side. The second part discusses the supply-side. The third part discusses potential impacts of regional cereals protection. The article concludes with policy implications.

## 2. COMPOSITION AND DETERMINANTS OF SAHEL CEREALS DEMAND

This section proceeds as follows: (a) demand-side issues; (b) composition and determinants of cereal consumption in urban Sahel; (c) the same, but in rural Sahel; (d) the consequences of these patterns for Sahel cereal imports.

Before examining the evidence, it is important to note that there are several problems with the quality and quantity of data available: (i) the Sahel lacks national consumer surveys, and the national statistics are very unreliable (Gabas and Giri, 1987). Hence, policymakers and researchers have to rely on location-specific surveys that use relatively small samples, and that are scattered over time and space; (ii) these surveys do not usually accord in methods, nor even in product coverage.<sup>3</sup> I thus stress that the results reviewed only indicate tendencies, and there is a need for much more empirical research.

This discussion focuses on cereals because they constitute the bulk of the urban and rural diets in the Sahel. Examples from urban areas include: (i) in Mali regional capitals in 1985/86, cereals constituted on average 28 to 44 percent of the food budget and 61 to 84 percent of caloric intake (Rogers and Lowdermilk, 1988); (ii) in Dakar, cereals constituted 53 percent of the food budget (Paci, 1977); (iii) in Ouagadougou in 1984/85, cereals constituted 44 percent of the average household's food budget (Reardon, Thiombiano, and Delgado, 1988).

Cereals comprise an even higher share in the rural diet. Examples from rural areas include: (i) in three rural sites in Mali, cereals constituted 70 to 86 percent of food expenditures (Mondot and Labonne, 1982); (ii) in four zones in rural Senegal, cereals constituted 70 to 75 percent of food expenditures (Chevassus-Agnes and Ndiaye, 1980); (iii) in three rural zones of Burkina Faso cereals constituted 73 to 97 percent of caloric intake (Kennedy and Reardon, 1991).<sup>4</sup>

*(a) Demand-side Issues*

The main income-distribution or household welfare issue on the demand side is whether a tariff on imported cereals (mainly rice and wheat) would hurt the poor in the short run. The counterpart factual issue is whether the poor consume imported cereals, and whether their consumption is sensitive to changes in relative prices. Note that the poor could also be hurt by rice tariffs even if their consumption of rice was low if the richer consumers had a strong cross-elasticity of demand between imported cereals and domestic coarse grains, which would induce a price rise in the latter.

This issue concerns very much Sahel policymakers. (For example, when an increase in the rice price was announced in Senegal in 1988, the government encountered severe public reaction and rescinded the increase.)

The main efficiency or resource-allocation issue is whether price and trade regime policies can be used to turn consumers from imported to domestically produced cereals. The counterpart factual issue is whether a rice price increase would significantly decrease the quantity demanded of imported rice, and whether this would increase the quantity demanded of coarse grains. The latter would boost incomes of Sahel smallholders, which in turn might spur investment in agricultural productivity and "get agriculture moving".

A second efficiency issue is whether Sahel consumers are sensitive to the price of maize, relative to that of rice or to that of millet/sorghum. If they are, they would be willing to increase their consumption of maize when its relative price drops, due either to protection on rice imports, or to drought effects on millet/sorghum production in the Sahel. This is an important issue because maize appears to be a product of high production potential in zones of relatively good rainfall such as the Guinean zone in the southern belt of the Sahel.

*(b) Nature of cereal demand in the urban sahel*

From 1965 to 1983, the Sahel population doubled, but the urban population more than quintupled. The average share of the urban population was 12 percent in 1965, and 22 percent in 1983 (Gabas and Giri, 1987). While it may not be possible to maintain this pace of urbanization, it is clear that urban consumption patterns have had and will have increasing impact on diets and imports.

The Table summarizes findings concerning the composition of cereal consumption from recent household consumer surveys in Burkina Faso, Gambia, Mali, Niger, and Senegal. Results are discussed below.

*(i) The share of rice and wheat in the urban diet*

The Table shows that imported rice and wheat are consumed mainly in urban areas in most of the Sahel. Moreover, the share is high not only in Sahel coastal urban areas, but also in urban areas far inland.

Which urban groups consume rice and wheat? During the colonial period and in the first decade thereafter, they were consumed by a tiny minority, and were luxury foods (Gabas and Giri, 1987; Coussy, Hugon, and Sudrie, 1991). This image persisted into recent years in the form of the "conventional wisdom" that it is still mainly the richer consumers that eat imported cereals.

Recent consumer survey results contradict this notion. In general, they show that rice is very important in the diet of the urban Sahelian, particularly in the poorest income tercile. The Table shows that the

share of rice in urban cereal expenditure ranges from 37 to 66 percent, with an average of 52 percent. Unless otherwise stated, the expenditure or budget shares reported in the article are product shares of total expenditure in cash terms (the sum of the imputed value of own-consumption plus transfers plus purchases). Note that these figures come from surveys done in both good and poor harvest-years.<sup>5</sup>

By contrast, wheat products (bread, noodles) are far less popular than rice. The average share of wheat products in cereal expenditures varies from 7 to 17 percent. Wheat products are primarily breakfast foods for families (usually eaten by a subset of the household), but are mainstays (along with rice) for bachelors. (Reardon, Thiombiano, and Delgado, 1988)

In the surveys where income was measured, and thus stratification by income was possible, poorest tercile consumers were found to dedicate at least as great a share of their cereal budget to rice, as did the richest tercile consumers. But the richest tercile consumers dedicate a much greater share of their cereal budget to wheat products, compared to the poorest tercile.<sup>6</sup>

*(ii) Price versus non-price factors as causes of increased rice consumption*

What are the reasons for the importance of rice in the urban Sahel diet? The causes, according to what I perceive as "conventional wisdom" in policy debates, are: (a) the relative cheapness of imported rice (due to the decline in coarse grain production and relatively cheap and available rice imports); and (b) the desire of Sahel consumers to emulate "Western" consumption habits (Hirsch, 1987; Coussy, Hugon, and Sudrie, 1991). The first is evaluated below in the light of available evidence. The second is very subjective, and difficult to evaluate empirically.

First, in general there does not appear to be a significant correlation between a given year's shortfall in coarse grain production in a given Sahel country and its imports of rice or wheat. For instance, for Burkina Faso, Reardon, Delgado, and Thiombiano (forthcoming) regressed rice and wheat imports (1970 to 1986) against an index of self-sufficiency in coarse grains (current year and lagged), population, share of population living in urban areas, and world price of rice in real terms. Only the urban share of population (degree of urbanization) had a significant (positive) effect. Lombard (1988) also found that Senegal's rice imports over the last two decades were not significantly correlated with domestic cereal production.

Second, recent consumer surveys do not support the notion that Sahel rice consumption is driven by price. This judgement is mainly based on the only three household-level studies and one country-level study that provide consumer price elasticities for the Sahel. The household studies include: Savadogo (1986) (the Purdue University study), and Reardon, Thiombiano, and Delgado (1988) (the IFPRI/CEDRES<sup>7</sup> study), both for Ouagadougou, and Rogers and Lowdermilk (1988) (the Tufts University/DNSI<sup>8</sup> study) of Bamako and secondary Malian cities. The country study is that of Delgado (1989) for a group of Sahel countries.

Each household study covers only one year (although the set covers good and poor harvest-years). Thus, the household-level database is still thin (few studies and small samples) and the results need to be interpreted and generalized with caution, serving as a starting point and stimulation for much more needed empirical work.

The first household panel study, that of Savadogo (1986), was based on the Purdue University survey in Ouagadougou in 1982/83, with a sample of 65 households. He found a negative cross-price elasticity (-1.1) between rice (grain-form only, excluding prepared-rice purchases) and wheat on the one hand, and

all coarse grains (combined) on the other hand. He concluded that this negative elasticity was due to lack of variability of the rice price over the study period. Only the own-price effects on rice consumption were significant, however, and these were relatively high (-2) (although, again, difficult to interpret because of the low variability in the rice price).

The second household panel study, Reardon, Delgado, and Thiombiano (forthcoming) used data from the IFPRI/CEDRES survey in Ouagadougou in 1984/85, with a sample of 125 households. They found that own-price elasticities for rice expenditures were not significant. Cross-price elasticities between rice (grain-form and prepared-form purchases) and millet/sorghum, and between rice and maize, were negative and significant (-1.7 for maize/rice, and -3.2 for rice/millet-sorghum). Hence, when the rice price rises, the quantity demanded of coarse grains falls, and when the coarse grain price increases, rice expenditure falls. This may be due to real income (purchasing power) effects of changes in basic staples prices. On the other hand, the cross price elasticity of rice and non-cereal foods is positive and significant. (They are substitutes.) By contrast, they found that the cross-price elasticity between wheat products and coarse grains was not significant.

The third household panel study was that of Rogers and Lowdermilk (1988) who used data from a survey conducted in 1985/86 by the DNSI in seven regional capitals in Mali, with a sample of 576 households. They found that rice (grain-form only, excluding prepared-rice purchases) expenditure had a negative and significant, but inelastic, own-price elasticity (-.68), as did millet/sorghum (-.53). Yet they found that the price of rice did not significantly influence millet/sorghum expenditure. Nor did the price of millet/sorghum significantly influence rice expenditure.

The country-level panel study was that of Delgado (1989). He used country-level data from five countries (Burkina Faso, Cote d'Ivoire, Mali, Niger, and Senegal). He regressed the share of rice in national cereals consumption for the period 1966 to 1986, against the relative price of rice to millet, the GDP per capita, and the share of urban population in total population (degree of urbanization).<sup>9</sup> In all countries but Senegal, the price effect was not significant. By contrast, the degree of urbanization was strongly significant and positive in Burkina and Mali. On balance the most important regressor was "urbanization", and the results from this study concur with the household-level studies concerning the weak significance of the rice price on rice consumption.<sup>10</sup> The regression results reviewed above suggest a hypothesis that urbanization is the predominant factor causing the shift to rice in the Sahel. With urbanization comes changes in employment patterns of the poor, increasing the opportunity cost of women's time, and increasing transport and other transaction cost constraints on households' activities. These factors make rice, and in particular "fast-food" or street-vendor rice, very attractive to poor consumers. This is shown below.

### *(iii) Importance of purchases of prepared-rice dishes from street-vendors*

The success of rice in street-vendor sales of prepared foods appears to be an important factor in the increase in importance of rice in the urban Sahel. On the supply side, Sherman, Shapiro, and Gilbert (1987) found that street-vendors prefer rice to coarse grains because it is cheaper to prepare.

On the demand side, I know of only one panel survey in the urban Sahel that systematically recorded household purchases of prepared dishes from street-vendors, that of IFPRI/CEDRES. Reardon, Thiombiano, and Delgado (1988) showed the importance of purchases of prepared rice from street-vendors in overall rice purchases in Ouagadougou, especially for the poorest tercile. 50 percent of the poorest tercile's rice expenditure went to prepared rice dishes from street-vendors, versus only 10 percent

for the richest tercile. This finding concurs with those of rapid-reconnaissance surveys cited by Bricas and Sauvinet (1989) that show the importance of street-vendor food in Niamey, Bamako, and Dakar.

The urban poor buy prepared rice from street-vendors apparently because these workers and petty merchants are often far from home at midday, and need to buy a cheap and tasty meal near the worksite. The richer consumers usually can return home to eat rice or coarse grain home-cooked dishes. Moreover, the large share of street-vendor rice in the poor's diet appears to be a major reason for the relative insensitivity of their expenditure on rice to changes in the price of rice.

An interesting issue is the effect of the relatively recent institution of 'journée continue' in some Sahel countries. This is where formal sector employees (mainly in the upper tercile of consumers), stay at work from morning through mid-afternoon, usually with a snack period at noon, and then return home, presumably to eat a more substantial lunch or another snack (possibly a portion of the household's lunch saved for the worker). There is no hard evidence on this effect that I know. A hypothesis is that it actually increases prepared rice or bread purchases from street vendors; in casual observation I see employees going to the rice stalls during the noon snack period to tide them over to a late-afternoon snack or dinner. But the opposite is possible, and this needs to be explored.

Furthermore, at home, the lower processing and cooking costs of rice appear to spur its consumption (Thiombiano, 1985; Sautier *et al.*, 1989). Processing time is an influential factor where the opportunity cost of women's time is increasing (due to their increasing involvement in the hired-labor market and in self-employment away-from-home). The latter leads to substitution toward "convenience foods" -- prepared cereal dishes eaten at street-vendor stalls, and processed or easy-to-prepare cereals like rice and wheat eaten in the home. This sort of substitution has been occurring for decades in Latin America and Asia, and has been widely researched in those places (Byerlee, 1983; Senauer, Sahn, and Alderman, 1986). It appears to be a newer and much less researched topic in Sub-Saharan Africa.

In sum, the switch to rice consumption in West Africa appears to be driven by long-run structural factors, i.e. employment patterns and transaction costs, based on urbanization in infrastructure-poor settings. The switch appears not to be mainly based on short-run factors such as harvest shortfalls or price dips. Rice consumption thus tends to persist in the face of relative increases in the rice price caused for example by bumper coarse grain harvests (such as in 1985). It then might also persist in the face of price increases due to regional rice protection.

#### *(iv) Millet/sorghum versus maize in urban diets*

Millet and sorghum are generally less important than rice in the urban diet, but their relative shares differ substantially by city and year.<sup>11</sup> On the other hand, millet/sorghum's share exceeds that of maize. Maize's average share of cereal budgets does not exceed 16 percent in any Sahel city.

Yet maize appears to be attractive to urban consumers in the late dry season and rainy season, when its price is low relative to the prices of millet and sorghum. I know of only one study in the urban Sahel that shows the cross-price elasticity of millet/sorghum and maize; Reardon, Thiombiano and Delgado (1988) found for Ouagadougou that the cross-price elasticity of millet/sorghum expenditure with respect to the maize price was significant and positive (.6). Hence, they are substitutes and consumers are sensitive to their relative price. This result is intuitively appealing because in many typical Sahel dishes (*e.g.* *toh*), coarse grains are easily substitutable (Sautier *et al.*, 1989).

Sautier *et al.* (1989) are optimistic concerning the progress and prospects for large increases in direct consumption of maize flour and grits, especially by urban consumers. But, given current processing technologies used in the Sahel and current costs of production and processing, there are three sets of constraints on maize demand to overcome, and upon which research should urgently be brought to bear.

First, large commercial feed producers tend to prefer imported maize because it is often cheaper (because of high domestic transport and production costs of maize) and more reliably available than domestic maize (Martin, 1988).

Second, currently maize is processed into flour or grits either by (a) small plate mills, or (b) hammer mills, or (c) by hand pounding, or (d) by industrial mills. (a), plate mills, require that maize be run through the mill twice, which occasions more time and cost for maize than for millet and sorghum. (b), hammer mills, allow maize milling without dehulling but the ensuing product might be more coarse than the quality consumers want. Moreover, these mills are not yet widely adopted. (c), hand pounding, is more arduous for maize than for millet or sorghum. (d), industrial milling, is unlikely to be economically viable in the short run unless the transport and outlet (market scale) conditions are better and the procurement price is lower (for the Mali case, see Holtzman, *et al.*, 1991). On balance, the adoption of hammer mills and dry abrasive-disk dehullers would spur the development of the processed maize sector significantly (Holtzman, *et al.* 1991)

Third, even if transport and processing constraints are overcome, there are serious issues of adaptation of types of processed maize (with different characteristics of cost, taste, appearance, and distribution) to the various strata of consumers. Knowledge of the constraints and potentials of prospective market niches is in short supply at present and should be a research priority. This research has produced interesting insights in Southern Africa (*e.g.* see Jayne and Chisvo, 1991).

### *(c) Nature of cereal demand in the rural sahel*

#### *(i) Rice/wheat versus coarse grains in the rural diet*

The Table shows very little rice and wheat consumption in rural areas in the Sahel. In both poor and good harvest years, coarse grains generally dominate. The exceptions to this rule (where rice is an important item) are in three types of areas: (i) coastal Sahel areas (Senegal and Gambia), especially in zones that are highly monetized or semi-urban, and particularly where households produce cash crops or have substantial off-farm activity (*e.g.* northern Peanut Basin of Senegal; see Benoît-Cattin (1987); throughout the Peanut Basin and Tambacounda: see Kelly, Reardon, and McNeilly (1991)); (ii) rice-growing areas (*e.g.* Casamance in Senegal, riverain areas of the Gambia, Segou area of Mali); (iii) drought areas receiving food aid (often of wheat and sometimes rice or coarse grains) (for Burkina, see Reardon and Matlon (1989); for Senegal, see Josserand and Ross (1982)).

#### *(ii) Importance of purchased coarse grains in the rural diet*

The traditional view or "conventional wisdom" is that, except in a few pockets of 'cash cropping', Sahel peasants are 'autarkic', subsistence farmers. This implies that they depend on their smallholdings for food entitlement and purchase very little food (Kowal and Kassam, 1978; CILSS/Club du Sahel, 1981; Giri, 1983; OECD, 1988). But recent survey evidence shows that although rural Sahel households mainly consume coarse grains, that does not mean that they consume only their own production, and hence are shielded from the market and its price fluctuations.

Rather, purchased food composes a substantial share of rural diets. Examples: (i) Dione (1989) found in 1985/86 in rural Mali that 39 percent of sample households were net buyers; (ii) Goetz (1990) found in 1986/87 in southeastern Senegal that 30 percent were net buyers; (iii) Kelly *et al.* (1990) found in 1988/89 for Senegal that 75 percent of caloric intake came from purchased grain in the Sahelian zone, and 20 percent in the Sudanian zone; (iv) Reardon and Mercado-Peters (1991) found for Burkina that the share of net cereals/pulses buyers among sample households was 80, 60, and 70 percent in the Sahelian, Sudanian, and Guinean zones, respectively, averaged one-four years (1981-1985); in no zone in any year did the share fall below half; (v) Reardon and Matlon (1989) found in 1984/85 for Burkina that 43 percent of caloric intake came from purchased grain in the Sahelian zone, and 37 percent in the Sudanian zone; (vi) Ouedraogo (1983), for 1978/79 in Eastern Burkina also found evidence of substantial but variable purchases of grain by households in Eastern Burkina; (vii) Hopkins and Reardon (1989) found for 1984/85 in Western Niger that purchases of grain were very substantial in drought years in the Sahelian and Sudanian zones.

The implication is that price policy affects real incomes from the demand side and not just the supply side. The Sahel farm policy debate is usually confined to the latter (Weber *et al.*, 1988). Moreover, the importance of grain purchases for Sahel household food security appears to be based on households' long-term income and production strategies, as well as on short-term constraints (e.g. drought) on own-cropping. The local importance of cash cropping, as well as the general importance of non-farm activity, appear to be key determinants of the importance of purchased grain in the rural diet (Reardon, 1990).

### *(iii) Rural Maize Consumption*

Maize consumption is in general not yet substantial, but it is important in certain zones, at certain times: (i) in maize production zones (e.g. Kayes in Mali (see Dione, 1989) or Tambacounda in Senegal (see Goetz, 1990); (ii) in zones where it is "imported" into the zone from higher potential zones, especially in drought years (e.g. in the Sahelian and Sudanian zones of Burkina Faso in the drought year 1984/85 (see Reardon and Matlon, 1989), and in Northwestern Niger, during drought years (see Hopkins and Reardon, 1989).

Nevertheless, maize consumption and production have made important progress over the last decade in Mali, Burkina Faso, and Senegal, starting from a small base (Sautier *et al.*, 1989). The production-side reasons for this are discussed in part 3. But on the demand side, maize appears to be attractive in the rural Sahel for two reasons: (i) its price is lower than millet and sorghum in most zones, especially during drought years (Reardon, Delgado, and Matlon, 1987; Hopkins and Reardon, 1989); (ii) it is usually available in drought years in the Sahelian and Sudanian zones from regions with better rainfall such as the Guinean zone in the southern belt of the Sahel which suffers much less from periodic drought than do northerly zones that produce mainly millet and sorghum (Sherman, Shapiro, and Gilbert, 1987).

### *(d) Consequences of demand patterns for imports by the Sahel*

The Sahel produces almost no wheat, very little rice, and modest amounts of maize. But, as seen above, the Sahel consumer is attracted to these cereals (especially in the cities, and at certain times and places in the rural areas) and this spurs imports. Broad characteristics of the origin and nature of imports are examined in this section, as these would affect the impacts of regional cereals protection.

Rice and wheat constitute the great majority of Sahel commercial cereal imports for human consumption from the world market. These imports are mainly direct, formal commercial imports of rice from Asia and the U.S., and wheat from Europe. Relatively small amounts of red sorghum, maize, and wheat are

imported in drought years as food aid (non-commercial imports). Wheat and maize are also imported for feed and food processing industries. Almost no rice or wheat is imported from the rest of Africa except via reexport (e.g. rice imported by Togo or Benin is reexported unofficially to the inland Sahel).

Hence, most of the rice trade among West African countries is reexport of rice imported from the world market. Egg and Igue (1987) and Egg (1988) stress the importance of unofficial (officially unrecorded and illicit) grain trade among West African 'humid coast' and Sahel countries.<sup>12</sup> But unofficial flows are still relatively minor. Although about 20 percent of total imports are from cross-border (unofficial) trade, this is only about 1 percent of total grain consumption-by-disappearance.<sup>13</sup>

Millet and sorghum trade is more sporadic and apparently less important. These are usually exported from the 'humid coast', mainly to the Sahelian and Sudanian zones of the Sahel in years following poor harvests in the Sahel (e.g. Nigeria-Niger; see Egg and Igue (1987)). Moreover, in years following good harvests in the Guinean zone of the Sahel, millet and sorghum are exported to more arid zones. For example, in 1976, Mali exported 35,000 tons to Niger, Senegal, and the Gambia (Burfisher and Messaien, 1987; Sherman, Shapiro, and Gilbert, 1987).

Official or 'formal' imports of maize mainly consist either of food aid or commercial imports by food processors (for breweries and feed for commercial poultry operations). Maize import prices are usually well below domestic maize prices in most years, which is an incentive for processors use of imported maize (Martin, 1988). Maize for human direct consumption also flows to the Sahel from the 'humid coast,' mainly via 'informal' cross-border trade. These flows appear to be more important than informal cross-border trade in millet and sorghum. They also appear to have been available in the Sahelian and Sudanian zones of the Sahel in drought years before arrivals of donor food aid of maize came. For example, substantial flows of grain (especially maize) from Ghana and northern Togo into Burkina Faso in 1984/5 were recorded by CRED (Sherman, Shapiro, and Gilbert, 1987).

Nevertheless, maize and sorghum exports from the 'humid coast' to the Sahel are plagued by high transaction costs (e.g. transport border controls and poor roads) (Egg and Igue, 1987; Delgado 1989).

Moreover, as with sorghum, within the Sahel maize moves from the Guinean zone to the Sudanian and Sahelian zones (Burfisher and Missaien, 1987; Sherman, Shapiro, and Gilbert, 1987; Egg and Igue, 1987).

### 3. SUPPLY-SIDE: CONSTRAINTS AND POTENTIAL

#### *(a) Do rice imports reduce incentives to coarse grain producers?*

How have rice imports in the last decades affected domestic coarse grain prices? Would regional cereals protection or devaluation substantially affect domestic coarse grains prices? I know of no empirical study of coarse grain price determination in the Sahel, and hence no hard evidence on these issues. By extension there is a lack of evidence concerning the relative importance of rice imports as opposed to poor hard and soft infrastructure (hence high transaction costs) and food aid on incentives to coarse grain producers. This research deserves high priority; without it, analysis of policy's effects on consumers and producers suffers from baseless speculation on the nature of a key link.

The usual argument is that the secular decline in the price of imported rice has spurred rice consumption in the Sahel, and wooed consumers away from coarse grains, thus depressing incentives to domestic coarse grain producers (CILSS/Club du Sahel, 1990). But Berg (1979) points out that coarse grain prices

rose steadily over the 1960's and 1970's, while rice imports rose. Did high labor costs of Sahel coarse grain production, coupled with drought, raise these prices from the cost side with relatively little impact of rice imports on coarse grain prices? Or was the increase in coarse grain prices driven by the demand side, with cheap rice imports raising purchasing power and thus raising demand for coarse grains, the supply of which did not respond sufficiently given production constraints? The demand-side evidence presented above and the supply-side evidence presented below suggests a combination of these explanations. But satisfactory resolution of this issue is currently blocked by the gap in knowledge about cereals price determination. Given that lack, I focus below on a brief review of longer-term constraints and potential on the supply side.

### *(b) Supply-side issues and data constraints*

Given an increase in rice prices following protection, and assuming (for convenience of discussion here, but blindly, given the lack of hard evidence) that this would also spur substantial increase in coarse grain prices, the key supply-side issue becomes whether domestic output of these cereals could and would respond.

Before examining the evidence on this issue, I again stress the severe data constraints. There has been very little study of supply response in the Sahel, either in the aggregate or by crop, mainly due to data limitations. Most of the extant studies use linear optimization models based on representative farm budgets (e.g. Martin, 1968; others are reviewed in Eicher and Baker, 1982).

Given space limitations, below I present a 'review of reviews' of research concerning the potential for and constraints to increases in the production of rice and wheat, as well as coarse grains (millet/sorghum and maize). The section is ordered by crop.

### *(c) Potential for and constraints to domestic output increases, by crop*

#### *(i) Wheat*

Morris and Longmire (1987) reviewed evidence concerning wheat output potential in West Africa. They found that climate severely limits it in the medium and perhaps the long run. Production conditions are relatively favorable in the 'humid coast' but even there is little grown and poor prospects for increase; wheat shipment from these zones to consumers in coastal cities is plagued by high transport costs.

#### *(ii) Rice*

Pearson, Stryker, and Humphreys (1981) and Spencer and Nyanteng (1987) reviewed evidence concerning the prospects for substantial increases in rice output in the 'humid coast' and in the Sahel. Pearson, Stryker and Humphreys found that domestic production of rice and its shipment to urban consumers was more costly than imports in most production areas, except for Mali (in flooded areas along the Niger river), Sierra Leone, and parts of Senegal. But they found for the Dakar market, most techniques in most Senegalese production areas generated negative 'social profits'. Conditions have evolved since their study, but there has been no comparable Sahel-wide update study.<sup>14</sup>

Three major problems make for dim medium-term prospects for rice production in the Sahel, probably even if incentives to its production increase:

(i) There are few areas where rice can be produced without substantial additional investment in irrigation (Martin, 1988). Some studies suggest that it is technically possible to increase substantially large-scale irrigation. But most economic analyses are far more pessimistic, despite large donor investments in irrigation and irrigate crops since 1975 (Eicher, 1986; Matlon, 1990).<sup>15</sup>

(ii) There is insufficient research in yield-increasing and cost-reducing technologies. The current reductions in agricultural research budgets in the region compound this problem (Spencer and Nyanteng, 1987).

(iii) Transport costs are quite high between rice-growing and major rice-consuming areas, reducing the competitiveness of domestic rice.<sup>16</sup>

To redress these problems would require important public and private investments in irrigation, transport, and research. But Martin (1988) is pessimistic that even with substantial investments would rice output increase sufficiently to meet even modest official import-substitution goals in, for example, Senegal.

### *(iii) Millet and Sorghum*

Matlon (1990) showed that millet and sorghum output in West Africa semi-arid tropics (WASAT) has grown at about 2 percent a year over the last 25 years (1 percent less than population growth). He found that almost all of this growth has been from increasing area under the two crops, and almost none from yield increases. Sorghum yields have even fallen and millet's have stagnated. Matlon ascribed the poor yield performance to: (i) low rainfall, beginning in the 1960's; (ii) decreases in fallow periods, and cultivation of marginal areas; and (iii) lack of sufficient growth in use of non-labor inputs to offset land degradation.

Degradation and excessive population density (in the Sahelian and Sudanian zones, which are home to 84 percent of the rural population) have nearly eliminated the frontier for acreage increases in these zones. This contradicts the traditional image of the West African semi-arid tropics as a region of land surplus. Yet, Matlon points out that considerable under-exploited arable land exists in the Guinean zone (now home to 16 percent of the rural population), the potential of which he considers to be relatively high. Migration to this zone is increasing (Lallement, 1990). But there are still sociopolitical, physical, and financial constraints to this migration. Immigration would shift out the supply curve in a 'one-shot' rather than sustained manner unless "farming systems in higher potential receiving areas were radically improved to assure a process of sustainable intensification." (Matlon, p. 10.)

Matlon's conclusions are threefold: (i) demographic and ecological factors will push up unit costs of production in the medium term; (ii) the prospects in the medium to long run are poor for substantial increases in millet and sorghum production in the Sahelian and Sudanian zones; (iii) the prospects for productivity gains are highest in the Guinean zone. But progress will be slow and will need to be based on decreases in factor costs and improvements in technologies. The latter will probably first be in the crops which respond more quickly and profitably to intensification (maize, cotton, and upland rice).

### *(iv) Maize*

Morris and Longmire (1987) examined the prospects and constraints to maize production by agroecological zone in West Africa. They found that the Guinean zone in the WASAT has a higher potential than either the humid lowland forest (because the Guinean zone is drier and sunnier) or the Sudanian zone (because the Guinean has better rainfall). But they conclude:

"...despite the considerable production potential of the Guinea Savannah, local maize is still not competitive with imported maize in coastal cities, given current production costs, high inland transport rates, and low world maize prices. Productivity increases leading to lower production costs, as well as infrastructural investments leading to reduced transport margins, will be necessary to make maize produced in the Guinea Savannah competitive with imports in the coastal cities, where demand is concentrated (Longmire and Morris, 1987).

**(v) Aggregate domestic cereals output**

The upshot of the above review is that the prospects are dim for substantial, sustained increases in millet and sorghum production in the Sahel in the short to medium run. The prospects are much better in the Guinean zone, for all coarse grains, but especially for maize<sup>17</sup>.

The aggregate supply response to a substantial increase in incentives to cereal producers will depend on factors that are not easily or rapidly changeable, such as factor and transport costs, infrastructure, and technology. (Delgado and Mellor, 1984; Matlon and Spencer, 1984). It seems doubtful that, without changes in those factors, the supply curve will shift out due merely due to increased coarse grain prices. Yet this appears to be the assumption made by those who are optimistic that regional cereals protection would have a strong short to medium run effect on coarse grain supply via its effect on incentives. But, as noted above, coarse grain prices have increased on average (though with great inter-year variation) relative to rice prices over the last few decades, and yet aggregate coarse grain supply has stagnated.

**(d) An Aside: If there is a breakthrough in coarse grains production, are market outlets adequate to absorb the output increases?**

But even if coarse grain output increased substantially, say as a response to incentives or to technological breakthroughs, are domestic demand outlets (Sahel urban consumers, livestock sector, and food processing industries) adequate to absorb a large surplus? Or do adequate export markets exist, either in the 'humid coast' countries or outside West Africa? Note that without these outlets to absorb the excess, there could be precipitous farmgate price declines with a large increase in output, such as happened in the Sahel in 1985/86. This could undermine the initial incentive for farmers to invest in increasing coarse grain productivity.

In terms of Sahel markets, it appears from the discussion in part 2 that the current capacity is relatively low for increased absorption in urban areas, where one presumes the increase would have to come. This depends on increasing capacity to process coarse grains to serve as inputs into the urban 'fast food' sector, or as inputs into the poultry feed production sector. Both of these will require substantial private and public investment and adequate policies to promote it. (Sautier *et al.*, 1989; Delgado, 1991) Even if investment and policy are in place it appears that the increase in absorptive capacity would only be realizable in the medium run.

Moreover, coarse grain exports from the Sahel, are not very significant, and the prospects appear poor in the medium run for three reasons:

(i) The dynamic growth in staples demand in the 'humid coast' countries is not in millet and sorghum, but in rice, cassava, and maize. The latter can be produced in both the humid and the savannah regions of the 'humid coast'. Although 'humid coast' rice production is lagging behind consumption, cassava and maize production are expanding rapidly to meet demand. Most of the coastal countries are promoting "buy local" programs for these products. Moreover, Sahel coarse grains are usually more expensive than

coastal maize, and prospects are poor for a reversal of this (Courade, 1989; Requier-Desjardins, 1989; Spencer *et al.*, 1989; Matlon, 1990; Delgado, 1991).

(ii) Crop output fluctuates more drastically in the Sahel than in the 'humid coast' countries. It appears from the (thin) evidence reviewed above, in drought years the 'humid coast' countries export cereal to the Sahel, but the inverse does not appear to occur on a substantial scale in good harvest years in the Sahel, when the prices of millet and sorghum drop precipitously. This lowers farm income, and could reduce incentives to investment in productivity as well as in land conservation, which further diminishes the dynamism of coarse grain production.

(iii) As noted above, the cost of transporting Sahel coarse grains to coastal markets is quite high.

#### 4. POTENTIAL DEMAND-SIDE IMPACTS OF PROTECTION

Protection of the Sahel cereal economy, whether by tariff or quantitative restriction on imports of rice and wheat, would (as a direct effect) raise rice and wheat consumer prices, thus potentially affecting demand for them. It would also have a number of indirect effects, such as affecting coarse grain prices and potentially, demand for them.

In this section the potential demand-side effects on consumer real incomes and on resource allocation (product mix in the consumption basket) are discussed. The points are based on the evidence presented above. I can only infer general directions of effects rather than offer precise quantitative estimates because the data base is still too weak to support the latter. But given that the policy debate is raging and decisions are being made while we researchers are still researching, it is best to marshal all evidence, be it only indicative and generative of hypothesis, and to apply it with caution.

In rough and arbitrary terms, I mean by 'short run' as 'in the next five years', and by 'medium run', as five to ten, and by the 'long run', beyond 10.

##### *(i) Direct effects on the welfare of urban consumers*

The most evident effect of rice protection, and the one supported by the most hard evidence, is that at least in the short run, an increase in the rice price would have negative effects on the real incomes of the poorest tercile of urban consumers. This is because the poorest tercile spends a much greater share of its income on rice as compared to the richest tercile. Moreover, the poorest tercile's expenditure on rice appears to be less sensitive to the rice price, partly due to ingrained habits of purchasing rice from street-vendors (this at least as a hypothesis, based on the single study noted above), which in turn is related to their employment patterns.

What would be the magnitude of the effect? Suppose (from the Burkina study figures) that 50 percent of the poorest tercile's cereal budget goes to rice, and 50 percent of the food budget to cereals, and 60 percent of the household's overall budget to food. That means that 15 percent of income is spent on rice. A 50 percent tariff *ceteris paribus* would increase the share to 22 percent. The increase in the share (of 7 percent) is equivalent to the share in total expenditure of transport or fuel. By contrast, the richest tercile only spends 7 percent of its total expenditure on rice, so the effect of the tariff would only affect 3 percent of its total expenditure. Recall that the latter is thrice the size of that of the poorest tercile. Hence, although the absolute real income effect is greater for the richest tercile, the relative real income effect is twice greater for the poorest tercile. It is the relative effect that is most worrisome because the poorest tercile is so close to bare survival.

By contrast, wheat protection would have more effect on the richest tercile, whose expenditure on wheat products far exceeds that of the poorest tercile. An increase in its price would not have regressive effects. Doing the same calculations for the Burkina case as in the last paragraph, one finds that the increase in share of total expenditure implied by a 50 percent tariff is only 1 percent for the poor and 1.5 percent for the rich.

*(ii) Demand-side substitution effects influence coarse grain prices, which in turn affect the welfare of rural households as producers*

Supply-side welfare effects on coarse grains producers will be determined by the way in which the increase in the rice tariff affects coarse grain prices. This, in turn, will be determined in part by the substitution choices of (mainly) urban consumers who now consume the bulk of rice imports in most Sahel countries. The latter's real purchasing power is also reduced by rice price hike, and this will also affect coarse grain purchases.

In the short run, the drop in real income and the current general dearth of 'fast food' and easily processable alternatives to prepared rice, protection might well lead to a drop in urban demand for coarse grains (or at least no substantial shift toward them). This point is supported by the negative cross price elasticities found in the two Burkina household studies cited above; the Mali study showed no significant cross price elasticities, so it at least does not contradict the point. This is only indicative, however, as the database is still too small to be confident of this point.

In the medium to longer run, the pressure from consumers for acceptable 'fast foods' made from coarse grains may put pressure on this sector to generate product and distribution channel innovations and cut costs. Increased output will create economies of scale. But the processing and street-vendor sectors' response depends on their capacity of this sector to innovate and to expand, which in turn depends on technology, import capacity, policy, and entrepreneurial and management skill. If this occurs, consumers may shift away from rice and wheat to these coarse grain products.

Even if one takes the 'leap of faith' that a rice tariff would push consumers to substitute toward coarse grains (an assumption that runs contrary to empirical evidence), given output this would cause coarse grain prices to rise, then in principal this would increase the agricultural incomes of net sellers of coarse grains. It is not clear what effect there would be on non-cropping incomes (it could decrease them by increasing labor costs and direct input costs and dampening demand by the net buyers of coarse grains). Moreover, in the medium run the prospects are dim (as discussed above) for substantial sustained increases in aggregate coarse grain production so that the initial price increase would be dampened in the second round by the price effects of output increases, as predicted by Schultz (1978) for the case in which structural constraints (such as inadequate public and private investments in infrastructure and technology) have been overcome. They have not been overcome in the Sahel.

*(iii) Demand-side effects on rural households*

Continuing with our (counter-factual) assumption that a rice price tariff would cause coarse grain prices to rise (via its encouragement of consumers to substitute to coarse grains), it is plausible that there would then be indirect negative effects in rural areas. Recalling the very high share of net buyers of coarse grains in the rural Sahel, a coarse grain price increase would reduce real incomes of this group. For example, recall from the Burkina study discussed above that 75 percent of the samples in the Sahelian and Sudanian zones were net buyers of coarse grains. Given that 85 percent of the rural Burkina population is in these zones, then 65 percent of the population in those zones are net buyers.

For an idea of the magnitude of real income effects that are possible with increased coarse grain prices, note that in the Sahelian zone 60 percent of the cereal diet of the net buyers came from purchases of coarse grains over 1981-5 (Reardon and Mercado-Peters 1991).

On the other hand, rice and wheat tariffs would have minor effects on most rural households except in the zones where there is substantial consumption of rice. For example, in the northern Peanut Basin of Senegal in 1988/89, about 40 percent of the cereal diet was composed of rice (Kelly *et al.*, 1990). Given that the cereal budget is a higher share of the food budget and the latter a higher share of the overall household budget, we can expect real income effects of rice tariffs to be even greater in such rural zones than in Sahel cities. The number of farmers helped by the rice tariff on the supply side would be confined to the few and small rice-producing pockets in the region (less than 5 percent of cultivated area).

Rather, a case can be made that lower coarse grain prices would help rural Sahel incomes in three ways: (i) by spurring non-farm employment (by lowering labor costs, relaxing the wage good constraint (Lele and Mellor, 1981); (ii) by decreasing input costs to livestock husbandry in the long run (cheap grain may spur adoption of feedlot enterprise) (Delgado, 1991; Holtzman *et al.* 1991); (iii) by raising real income of net buyers (Reardon, Matlon, and Delgado, 1987; Weber *et al.*, 1988).<sup>18</sup>

*(iv) The positive welfare effects of increases in maize production and free trade in maize*

The strong possibility of large increases in the medium-long run in maize production in the Guinean zone, as well as the good chance of recurrent drought in the Sudanian and Sahelian zones (where almost no maize is produced), suggest that maize will stay cheaper than millet and sorghum for the next decade or more. As it appears (although based on only one study) that consumer expenditure is sensitive to the price differentials among coarse grains, the attractiveness of maize for consumers and processors will probably increase. Whether this redounds to the benefit of domestic producers or maize imports depends on lowering costs of maize production, transport, and market transaction costs. It also depends on increasing the availability and lowering the cost of processed maize (such as maize couscous) to consumers.

The increase in demand for maize will favor imports of maize from outside West Africa, from the West African 'humid coast', and the Guinean zone in the Sahel. There is a policy dilemma. Cheap maize imports from the 'humid coast' boost real incomes of consumers in the Sudanian and Sahelian zone consumers in drought years. But these also compete with Guinean zone maize. The most useful policy sequence may be to encourage imports from the 'humid coast' while focusing on the reduction of domestic production constraints.

On the other hand, in the short to medium run, administrative or transaction cost constraints on export of maize from the 'humid coast' to the Sahel obviates potential consumer gains in real income in the Sahel. They also increase Sahel price instability (Badiane 1989) and consumption insecurity (McIntire, 1981). McIntire and Badiane argue the inverse: increasing trade will decrease price and consumption instability.

*(v) An aside on the issue of using protection to decrease price instability: the case of variable levies*

Above the argument was mentioned that increased trade with the 'humid coast' and by extension, with the rest of the world, would decrease price and consumption instability in the Sahel. That argument does not support protection. There is a very different argument that variable levies can help to stabilize Sahel prices and that this will favor grain market development within the Sahel. A variable levy is "a tax or

subsidy on imports to restrict domestic grain price variability to a level consistent with consumption targets" (page 9, McIntire, 1981).

McIntire used a simulation model for Sahel countries and found that in principal these levies would lead to price and consumption stabilization, conditioned on the provision of foreign exchange assistance from donors. Beside the issue of whether such assistance is available or dependable, he points out that the social welfare losses occasioned by these levies would be borne by grain consumers. He also points out that trade restriction without this assistance would raise instability of prices; to counter this large buffer stocks would be needed.

Craven and Tuluy (1981) examined the variable levy experience over the 1960's and 1970's in Senegal and found that it was incompletely successful in stabilizing prices and that the subsidy payments dominated the tariff revenues over the period, leading to a net fiscal drain.

Coelo (1989) examined the nascent experience of Mali in the 1980's with a variable levy on rice. He found that with sharp price fluctuations in the world market, tariff manipulations were difficult because of the danger of fraud and rigidity of legislative and statutory systems.

On balance the evidence on the practicability and usefulness of national variable levies is ambiguous, with the specific outcome dependent on fiscal resources and donor support. Administratively it appears to be difficult and costly. More empirical research is needed to examine this option.

## 5. CONCLUSIONS AND POLICY IMPLICATIONS

Arguments for regional rice and wheat protection in the Sahel appear to be based on four assumptions: (1) The rice price increase would drive down consumption of rice. (2) This would not hurt the poorest consumers, as it is assumed conventionally that it is the richer consumers that eat rice and wheat. (3) The ensuing shift of consumption to coarse grains would raise their prices, raising rural producers incomes. (4) Higher production returns would call forth substantial increases in coarse grain output that would, in the second round, dampen prices and thus redress any damage to consumer welfare from the first price shock.

This article raised doubts about assumptions (1), (2), and (4). It pointed out that there is insufficient information to evaluate assumption (3). The essence of the findings is that there is little evidence that the short-run benefits of a rice or wheat tariff to coarse grain producers will outweigh the negative impact on poor consumers. Four specific points comprise the gist of the picture painted:

(1) Rice is very important in the diet of most consumers in the urban Sahel and in certain rural areas. Rice is even more important in relative terms to the poorest tercile of consumers than to the richest tercile in urban areas, which contradicts the conventional image of rice as a luxury food. The poorest tercile consumes a relatively high proportion of its rice as prepared-dishes bought from street-vendors. The working poor want relatively cheap tasty dishes available near their worksites at noon. This role is currently filled mainly by rice, and will continue to be in the short to medium run. They are also attracted to it because preparation costs are relatively low in terms of time, which is attractive to the women whose opportunity cost of time is increasing with growing participation extra-compound activities. The factors driving these preferences are related to ongoing changes in employment structure, lifestyles, etc. that are tied to urbanization itself.

(2) Price does not appear to be driving consumption substitution toward rice. From the thin econometric evidence available, it appears that raising the rice price will either dampen or not significantly affect demand for coarse grains while not decreasing demand for rice.

Together, (1) and (2) imply that at least in the short run to medium run (i.e. before coarse grain processing 'takes off' so that sufficiently varied and cheap processed and prepared coarse grains are available to consumers), rice price increases, induced by protection or devaluation or other measures, will hurt the poorest tercile disproportionately, and reduce the real incomes of all consumers, especially in urban areas but also in some rural areas.

(3) There is a dearth of empirical evidence on whether changes in the price of imported rice or wheat would significantly affect the prices of domestic coarse grains. The thin evidence that exists even points to rice price increases leading to a decrease in coarse grain prices (via dampening of coarse grain demand) in the short run. But there are two things about the coarse grain sector, on which we have hard evidence, that are relevant here. First, there are a lot of net buyers of coarse grains in rural areas. Second, coarse grain producers face structural difficulties (production constraints, marketing transaction costs, etc.) on the supply side that constrain aggregate supply response to price changes in the short to medium run.

Hence, even if one supposes that rice price increases would lead to an increase in coarse grain prices, the greater incentives would not lead to sustained substantial increases in coarse grain output in the short to medium run. That would mean that in the second round prices would not be dampened. This also means that there would be a decrease in real incomes of rural net buyers. producers (spurred, say, by regional cereals protection), in the short to medium

(4) It is important to distinguish maize from the other two coarse grains, millet and sorghum in the policy and technology debates. Maize appears to have higher production potential with the appropriate structural supports. Consumers, at least in some areas, appear to be willing to switch from millet/sorghum to maize when the relative price of the latter drops in certain seasons; in those areas taste does not appear to be a barrier.

Four policy and research implications are suggested by these conclusions. My assumption is that Sahel governments, based on historically-revealed preferences in the domain of political economy, feel that they cannot politically afford to hurt urban real incomes, but want their domestic coarse grain sectors to grow. The essence of the suggestions is to work on the coarse grain subsectors, from production to consumption, making these grains cheaper and more attractive for consumption in an urbanizing, infrastructure-poor setting, rather than trying to suppress substitution toward rice and wheat by pulling price or quota policy levers. Without the former, the latter will either be ineffectual and will hurt poor consumers in the short run. My point is not to exclude or to support the latter, but to suggest a more effective sequence whether or not protection is inevitable for regional or national political reasons.

(1) Whether or not protection is adopted, policy and research need to work to increase technological and economic capacity to process coarse grains. Lowering milling costs through import or production of more appropriate mills, and providing credit for the expansion of the milling industry is a key priority. Researching consumer acceptability and developing processed coarse grain products that are attractive both to housewives and street-vendors is key.

(2) Many Sahel consumers like to eat maize and like its low cost. It appears to have the greatest potential of the coarse grains for substantial output increases. A subsector approach needs to be taken to promote

its development, so that output does not soar only to meet constraints of high transport costs, or transport of maize does not improve only to have consumers find that it is not processed in a form they like. I favor a combination of 'policy-led intensification' (Lele and Stone, 1989) in the maize subsector of the Guinean zone, coupled with public investment and private investment tax credits in transport and milling/processing.

(3) If protection or another policy with similar effects on rice prices (e.g. devaluation) is taken, in the short-medium run, before the coarse grain processing industry increases its capacity and efficiency, the poorest tercile of consumers will suffer disproportionately. Policymakers may want to create compensatory mechanisms to offset this effect and the related dampening of demand for coarse grains by that group. This would doubtless be quite costly. Raising the minimum wage in the formal sector (SMIG) is an option, but most consumers in the lowest tercile are not employed in the formal sector. Helping them face steeper staple prices would require other approaches. That may be difficult to do only with domestic resources, given severe budget constraints, so outside help would be necessary.

(4) Badiane (1989) finds that the potential for intra-regional exchange among 'humid coast' and Sahel countries, and even among Sahel countries, is much higher than the current level of trade. High transaction costs and national policies contribute to this gap. Changing these will reduce the gap between realized and potential, which in turn will decrease price instability and increase food security in the region. He argues that both extra-regional and intra-regional trade will have this effect, and focusing on encouraging the latter will in the long run raise producer incomes and investment and help the coarse grain sector to become more competitive.

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TABLE: SURVEY RESULTS FOR CEREAL CONSUMPTION IN THE SAHEL

This table presents expenditure or budget shares which are product shares of total expenditure in cash terms (the sum of the imputed value of own-consumption plus transfers plus purchases)

Percentages, rounded to nearest percent

	Rice	Millet	Sorghum	Maize	Wheat	Other	Total
<b>BURKINA FASO</b>							
Ouagadougou (a) (1984/5)							
overall sample	41	16	12	15	17	**	100
poorest terc.	45	17	15	15	9	**	100
richest terc.	35	13	8	12	32	**	100
-----							
Ouagadougou (b) (1982/3)							
overall sample	52	6	31	4	7	**	100
poorest terc.	55	8	33	1	3	**	100
richest terc.	52	3	20	5	20	**	100
-----							
Rural Burkina (c) (1984/5)							
Sahelian zone	1	47	29	21	1	**	100
Sudanian zone	0	11	72	16	1	**	100
Guinean zone	6	22	57	14	1	**	100
<b>GAMBIA</b>							
Rural Gambia (d) (1985/6)							
Overall sample (1985/6)	75	23****	*****	3	**	**	100
<b>MALI</b>							
Bamako (e) (1985/6)							
overall	57	19	*	1	17	6	100
poorest quar.	55	20	1	*	16	8	100
richest quar.	54	21	1	0	19	5	100
-----							
Other Cities (e) (1985/6)							
Overall (range)	55-62	2-27	*-25	*-4	7-19	3-16	100
-----							
Rural Mali (f)							
Bougouni	8	83****	****	6	**	3	100
Kayes	4	21****	****	74	**	1	100
-----							

Table, continued

	Rice	Millet	Sorghum	Maize	Wheat	Other	Total
<b><u>NIGER</u></b>							
Niamey (g) 1988/9***		55	36	2	16	*	** 100
-----							
Rural Niger 1988/9 (g)							
Tillabery	17	70	15	*	*	**	100
Diffa	1	53	16	24	5	**	100
<b><u>SENEGAL</u></b>							
Dakar (h) (1983)	66	31	**	3	**	**	100
-----							
Other urban: Diourbel (j)	37	48****	****	*	13	**	100
-----							
Rural Senegal:							
Mid-Casamance (i)	87	8****	****	5	*	**	100
rural Kaolack (j)	11	78****	****	8	3	**	100
Sahelian zone (k)	48	26	0	4	*	**	100
Sudanian zone (k)	15	74	*	*	*	**	100

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\* less than 0.5 percent

\*\* a category not reported by authors of studies

\*\*\* figures only given in shares of cereal budget in physical terms

\*\*\*\* millet and sorghum reported together

Sources:Burkina:

- (a) Ouagadougou: IFPRI/CEDRES study, 1984/5, in Reardon, Thiombiano, and Delgado (1988), p. 5.5; percentages in money expenditures. Includes street-vendor food, such as prepared rice. 118 households.
- (b) Ouagadougou: Purdue University, 1982/3, in Savadogo and Brandt. Does not include processed food, except bread, and street-vendor food such as prepared rice. 65 households.
- (c) Rural Burkina: IFPRI/ICRISAT study, 1984/5, chapter by Reardon and Matlon in Kennedy et al. (1988), p.68. 150 households in 3 agroecological zones.

Gambia:

- (d) Rural Gambia: IFPRI/PPMU-MA study, 1985/6, p. 78 in von Braun, Puetz, and Webb (1989)

Mali:

- (e) Tufts/DNSI/AID study, Bamako, 1985/6 (3 rounds), in Rogers and Lowdermilk (1988), p.32. M.B. Did not enumerate purchases of street vendor foods such as prepared rice dishes. 255 households. Percentages in money expenditures.
- (e) Other Malian cities include Koulikoro, Sikasso, Segou, Mopti, Tombouctou, Gao, Kayes
- (f) Mondot, B.J., 1980

Niger:

- (g) 1988/9; Italian Cooperation/CILSS/MA of Niger; 527 households in Niamey, and 145 in the rural sites; July 1988 - February 1989; in Giucci and Maffioli, 1990.

Senegal:

- (h) Dakar study, June 1977 - March 1978, 75 households, in Ross, C.G. (1980)
- (i) in Jolly, C.M. and Diop, O., "La filiere de commercialisation cerealiere en basse et moyenne Casamance. Document de travail BAME 85-6, ISRA/BAME, Senegal, 1985.
- (j) in Chevassus-Agnes, S., and Ndiaye, M. "Enquete de consommation alimentaire de l'ORANA de 1977 a 1979, methodologie, resultats. Mimeo, Seminaire sur l'etat nutritionnel de la population rurale du Sahel, Dakar, 1980.
- (k) IFPRI/ISRA study, Sahelian zone (Sagatta), 36 households, 3 villages, and Sudanian zone (Niakhar), 35 households, 3 villages, 1988/89, 1 year, 24 rounds, Kelly et al. (1990).

## ENDNOTES

1. The "Sahel" here is considered as the West African political grouping of countries in the CILSS (Burkina Faso, Cape Verde, Chad, the Gambia, Guinea Bissau, Mali, Mauritania, Niger, and Senegal). The Sahel comprises both inland and coastal areas. It generally comprises semi-arid agroecological zones. It comprised 36 million people in 1985.

In the text, the term 'humid coast' is used to denote the rest of West Africa i.e. the coastal states that contain substantial areas of humid and semi-humid agroecological zones (e.g. Ghana, Cote d'Ivoire) (although the latter also contain a northern semi-arid fringe).

2. See "Background document" ("Travaux préparatoires") December 1990, Montpellier; and "Communiqué Finale", Conférence des ministres de l'agriculture d'Afrique de l'ouest et du centre, Dakar, March 1991.

3. For example, some surveys use direct observation of consumption, others use long recalls with only a few visits to the sample households, and others use short recalls with frequent visits to households. Different methods can produce very different quantitative answers to the same question (see the discussion in Reardon and Thiombiano, 1985, for the case of Burkina). Differences in product coverage can also produce divergences in results: for example, only a few of the surveys followed expenditures on "street vendor" foods, yet these were found to be a substantial part of the poor's diet by the surveys that did follow them (e.g. see Reardon, Thiombiano, and Delgado, 1988). Hence, it is hazardous to compare survey results, and there is a very great need for more dialogue among researchers concerning the appropriate survey methodology in the West African setting.

4. But Bricas and Sauvinet (1989) contend that the debate about trends in demand patterns in the Sahel focuses too narrowly on cereals, and that more attention should be paid to what they perceive as a trend toward diversification toward non-cereal foods in the diet. They reviewed evidence of non-cereals consumption in the Sahel and found that urban consumers eat more meat and oil and there is a greater tendency for new dishes to enter the urban diet, and for these dishes to include tubers and roots, pulses, and vegetables.

The growing tendency toward inclusion of variety in the urban diet will probably affect demand patterns in the next few decades in the Sahel. These non-cereal foods are mainly 'home goods', however, and are not yet the object of the appeal for protectionism. Thus, keeping in mind the qualification that non-cereal foods are still minor but are growing in importance, especially in the urban areas, we focus below on cereal demand patterns.

5. Comparisons among the studies are difficult because of differences in product coverage. The 1982/3 Burkina study by Purdue did not enumerate some processed food purchases in the home, and did not enumerate purchases of prepared food (especially rice) from street vendors. The 1985/6 Mali survey (analyzed by Tufts) also did not do the latter. Yet the 1984/5 Ouagadougou study by IFPRI/CEDRES enumerated both types of purchases and found them to be of substantial importance.

6. An aside is necessary here concerning urban poverty. Ghai and Radwan (1983) contend that African poverty is concentrated in rural areas. The dearth of household income data make this issue hard to explore in the Sahel. Yet recent survey evidence points to substantial urban poverty. For example, Reardon, Delgado, and Thiombiano

(forthcoming), found that half the households in their urban Burkina sample had total per capita expenditures lower than the GNP per capita, and that the two poorest deciles earned less than the average rural household income in the Sahelian and Guinean zones of Burkina (the northern and southern belts).

7. IFPRI is International Food Policy Research Institute; CEDRES is Centre de recherches économiques et sociales, University of Ouagadougou.

8. DNSI is the Direction Nationale de la Statistique et de l'Informatique.

9. The regress and included only official imports of rice (thus excluding informal or illicit cross-border imports of reexported rice via humid coastal countries).

10. The rate of urbanization is highly collinear with time, which could be a proxy for a number of other variables, such as changing tastes, rising fuel costs, etc. A disaggregation of this variable to sort out these effects would be useful.

11. Again, even for the coarse grains, product coverage differs greatly over studies, making comparison difficult. For example, in the 1982/3 Ouagadougou study by Purdue, purchases of millet gruel from street vendors were not enumerated, while they were in the 1984/5 Ouagadougou study by IFPRI/CEDRES (in which they were found to constitute a substantial share of millet consumption).

12. Reexports of rice among 'humid coast' countries have also been quite important, reinforcing CILSS/Club du Sahel's (1990) point (cited in the introduction here) that quantitative restrictions on imports to a given country are difficult because of porous borders. Following is a case in point.

Consumption of rice and wheat was increasing in the 'humid coast' countries over the last three decades; this has coincided with a shift from domestically-produced rice to imported rice in the diet. Rice imports -- either directly or via reexports from other coastal countries -- increased despite quantitative import restrictions in some cases. For example, Nigeria banned imports of maize, rice, and wheat starting in the mid-1980's. The increased prices of domestic maize led to a stunning supply response which largely replaced maize imports. but the domestic production of rice did not respond in like manner; inter-country price differentials, porous borders, and strong demand in Nigerian urban areas led to large cross-border flows (smuggling) of rice and wheat products from Benin. In late 1988 it was necessary for the Nigerian government to launch a costly police campaign against the smuggling. (Courade, 1988; Requier-Desjardins 1989; Spencer *et al.* 1989)

13. Note that only examples of 'informal' exports and imports of rice/wheat or coarse grains are discussed in this section because there are yet no official, systematic data collection efforts to follow the informal flows either between Sahel and humid coast, or between Sahel countries, or between zones in a given Sahel country; researchers and policymakers have to rely on the pathbreaking but still location and year-specific work of INRA, University of Benin, CRED, IFPRI, IRAM, MSU *et al.*

14. There will soon be results of a study by Associates for International Resources and Development on domestic resource costs of Sahel rice production. The preliminary results show that in a number of countries, domestically-produced rice is competitive with

imported rice in interior markets (such as Bamako), but nowhere is such rice competitive with imports in major Sahel port cities (such as Dakar).

15. 28 percent of foreign assistance to the Sahel went to these ends during the decade 1975-85; see de Lattre (1987).

16. For example, Delgado (1989a) calculated that although the Senegalese 1987 farmgate price for rice-grain (140 FCFA/kg.) was not too much greater than the rice-grain import price (100 FCFA/kg.), and less than the consumer price (160 FCFA/kg.), the cost-price of the domestically-produced grain-rice totaled 240 FCFA/kg. by the time it reached Dakar from the farm (60 FCFA/kg. transport cost, and another 20 percent for marketing margin). The tariff rate would have to be 250 percent to render domestic rice competitive under these circumstances.

17. Martin (1988) used a linear programming model of cereal supply response in Senegal. He found that when all cereal prices were increased, the aggregate supply response was low, but that most of the increase was in maize.

18. But administratively lowering coarse grain prices (if it were possible) would hurt the net sellers, the dynamic farmers. Rather, it would be better to reduce grain prices through cost-side measures. An agenda for these is laid out in Matlon (1990), and is beyond our scope here.