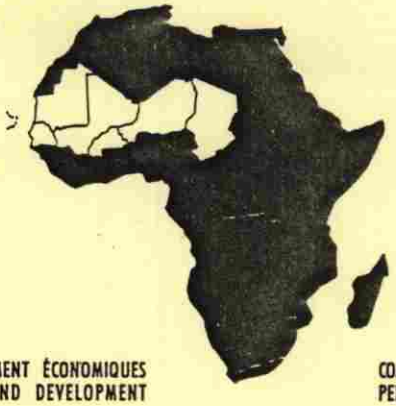

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POLICY ISSUES RAISED BY CHANGING FOOD PATTERNS IN THE SAHEL

by

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and
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COLLOQUE SUR LES POLITIQUES CEREALIERES DANS LES PAYS SAHELIENS

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POLICY ISSUES RAISED BY CHANGING FOOD PATTERNS IN THE SAHEL

Some very disturbing trends have emerged in the Sahel with respect to the production and consumption of the major food grains. Per capita consumption of the major cereals -- millet, sorghum, maize, rice and wheat -- have fallen 15 kg. per capita since the early 1960's. On the other hand, the share of rice and wheat, most of it imported, has risen substantially over the years. In the early 1960's, rice and wheat accounted for 13 percent of cereals consumption by weight. In the early 1980's, the figure was 22 percent. If present trends continue, it would be 45 percent by the year 2000. These trends have been supported by an 8 percent rate of growth of wheat imports and 6.6 percent rate of growth of rice imports since the 1960's, from a non-negligible base level at that time.

The purpose of this paper is to lay out these trends in some detail for West Africa, with special attention to the Sahelian countries. Some major policy problems arising from the trends are diagnosed. The options for dealing with them are discussed in the context of the economic issues the different options raise. This leads to a diagnosis of the specific pieces of knowledge policymakers must have at their disposition to minimize their risk in making choices in the areas imposed by the trends. Finally, we give some insights on the knowledge gaps drawing from our on-going

work in Burkina Faso in collaboration with the University of Ouagadougou and ICRISAT.

Changing Patterns of Production, Consumption and Imports

Examination of the data on country-by-country and on regional bases confirms the increasing importance of rice and wheat in food consumption patterns in the Sahel, and that this tendency is equally pronounced in West Africa as a whole. Table 1 shows that the share of rice and wheat in cereals food consumption went from 13 to 22 percent from the early 1960's to the early 1980's in the Sahel, whereas their share in cereals production was only 6 percent in the latter period. This growth in consumption share was true in every Sahelian country with especially high percentage increases in Cape Verde, Mauritania, Chad, and Niger. By the early 1980's, Gambia, Mauritania and Senegal derived the majority of their cereals consumption from rice and wheat. Gambia at that time was the only Sahelian country to derive more than a quarter of its cereals production from rice.

Conversely, Table 1 also shows that the usual Sahelian coarse grains -- millet, sorghum and maize -- once the preponderant source of calories in the region, have lost importance relative to rice and wheat since the early 1960's. However, outside Senegal, Mauritania and Gambia, they continue to be the most important source of food consumption.

Table 1: Evolution of the Relative Importance of Rice/Wheat and Coarse Grains 1961-1983
(percent)

Countries	Share of rice and wheat in total cereals food consumption		Share of rice and wheat in 1979/83 cereals production	Ratio of rice and wheat to coarse grains consumption		Ratio of Rice and Wheat[a] scientists to scientists working on millet, sorghum and maize, early 1980's
	1961/65	1979/83		1961/65	1979/83	
Burkina Faso	4	7	2	4	7	8
Cape Verde	16	40	0	20	68	n.a.
Chad	4	11	6	5	14	0
Gambia	44	57	35	87	145	50
Mali	12	20	11	15	27	17
Mauritania	18	66	21	21	200	n.a.
Niger	2	9	2	2	10	13
Senegal	45	52	12	85	111	133
Sahel	13	22	6	16	30	34[a]
West Africa	14	24	8	9	33	n.a.
Higher Income West Africa[c]	12	19	13	14	48	n.a.
Lower Income West Africa[c]	18	29	17	23	42	n.a.

Sources: FAO data compiled by IFPRI's Food Data Evaluation Program for the 1984 Supply Utilization Accounts Tape (Rome: FAO, 1986). The breakdown of agricutural scientists by commodity and country is from Oram (1986). "n.a." is "not available".

Notes: (a) Wheat scientists includes scientists working on barley, as reported by Oram.
(b) Excludes Mauritania and Cape Verde
(c) Higher income countries are defined in terms of 1980 per capita GNP being greater than US$325 in 1977 dollars. They include Cameroon, Ghana, Ivory Coast, Liberia, Nigeria, and Senegal. All other West African countries are included in the lower income group.

Finally, an examination of the allocation of scientific manpower to agricultural research by commodity shows that these allocations in the early 1980's were roughly proportional to consumption patterns at that time, with the exception of Gambia.

Examination of annual per capita growth rates by commodity in Table 2 confirms that the rate of growth of consumption of rice is outstripping the rates of growth of production, except in Mauritania. For the Sahel as a whole, the per capita growth of rice consumption exceeds that of production by 3.6 percent. This implies that if sustained for the next twenty years, the absolute gap between per capita production and consumption of rice in the Sahel will double relative to the 1979/83 gap of 13 kg/capita. If wheat consumption per capita grows at only 4 percent per capita per annum over the same period, which Table 2 shows is less than the historical rate of growth since independence, 45 percent of cereal consumption in the Sahel will come from rice and wheat by soon after the year 2000. While these rates of growth probably cannot -- and probably should not -- be sustained for the next fifteen years, they illustrate the urgency of addressing the situation.

Table 3 illustrates the same proposition in a more direct manner. From the early 1960's to the early 1980's, Sahelians ate 11 kg. per capita per annum more rice and wheat and 26 kg. per capita less millet, sorghum, and maize. This illustrates the most serious problem of all, namely that per capita consumption of the five major

Table 2: Annual Growth in Per Capita Production and Consumption of Major Cerals 1961/65 to 1979/83 (percent)

Countries	Wheat	Rice (husked)		Maize		Millet		Sorghum	
	Consumption only	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption
Burkina Faso	5.6	-1.5	1.9	-1.7	-0.6	-0.3	0.2	-0.4	-0.2
Cape Verde	6.4	a	8.6	-10.1	0.3	a	a	a	a
Chad	4.9	-0.8	1.2	3.2	3.6	-4.9	-4.1	b	b
Gambia	6.6	-2.0	0.6	16.1	14.7	-3.6	-3.1	b	b
Mali	5.0	-2.6	1.0	-3.6	-1.4	-1.4	-1.9	b	b
Mauritania	8.2	14.3	7.5	-1.6	-1.6	-8.7	-5.8	b	b
Niger	11.9	4.3	8.3	5.1	5.4	-0.3	0.4	-1.6	-1.2
Senegal	2.9	-3.5	0.1	0.6	-1.1	-2.4	-1.0	b	-0.2
Sahel	5.6	-2.0	1.6	-1.6	-0.5	-1.8	-1.6	-1.1	-0.6
West Africa	7.7	2.4	4.5	-0.8	0.4	-2.2	-1.7	-3.3	-2.3
Higher Income West Africa	8.2	2.8	4.4	-0.6	0.4	-2.4	-1.5	-4.0	-2.9
Lower Income West Africa	5.7	-0.4	1.7	-1.1	-0.3	-1.6	-1.5	-1.0	-0.5

Notes: (a) not available
(b) Due to the way data is reported to FAO, sorghum is reported jointly with millet under the latter.

Source: Compiled by IFPRI's Food Data Evaluation Program from the FAO 1984 Supply Utilization Accounts Tape (Rome: FAO, 1986). Consumption is meant to include direct consumption of cereals for food. Growth rates are compounded between the mid-points of five-year average.

Table 3: Change in per capita Consumption of Major Cereals as Food in West Africa, 1961-1983
(kg/person)

Countries	Wheat	Rice	Maize	Millet/Sorghum
Burkina Faso	2.1	2.2	-1.7	-1.1
Cape Verde	19.4	21.5	4.1	-
Chad	1.8	1.3	2.3	-72.8
Gambia	9.3	7.0	9.9	-30.0
Mali	2.5	3.5	-3.3	-35.4
Mauritania	26.6	24.7	-0.7	-47.8
Niger	4.7	7.0	1.40	-1.8
Senegal	6.3	1.3	-2.2	-9.9
Sahel	5.2	5.8	-0.8	-25.6
West Africa	7.4	9.1	0.8	-21.7
Higher Income West Africa	4.4	7.2	-0.8	-17.6
Lower Income West Africa	8.4	10.4	1.3	-22.1

Source: FAO data compiled by IFPRI's Food Data Evaluation Program from the 1984 Supply Utilization Accounts Tape (FAO: Rome, 1986). Net changes were calculated using the difference between two 5 year averages of areal consumption: 1961-5 and 1979-83.

cereals -- the preponderant source of calories in the Sahel -- has fallen by 15 kg. over the same period.

Unfortunately, neither wheat nor rice production could keep up with these changes in consumption patterns over the period. Wheat production in the Sahel poses well-known problems and in the foreseeable future is not expected to be able to match the magnitude of consumption increases observed in the past, or even come near it. Rice production, which is much more widespread, is still of minor importance in the Sahel. Table 4 shows that although nearly half of the growth in cereals production that occurred in West Africa from the late 1960's to the early 1980's is attributable to rice, the corresponding figure for the Sahel was only 3 percent. The share of rice in increments to cereals output was in fact negative over the 23 year period in Mali and Senegal.

The inevitable corollary of the gap between rice and wheat consumption and production from the early 1960's to the early 1980's is a high rate of growth of imports. While rice and wheat were imported into the Sahel in the earlier period (just over 300,000 metric tons per annum on average), the region was typically self-sufficient in the coarse grains which at the time meant more or less self-sufficient in food. The early 1980's were a time of overall food deficits, leading therefore to a high calculated rate of growth of overall cereal imports, from a small base in the early 1960's. Table 5 shows this to be nearly 22 percent per annum for the major coarse grains, yet this was only 5 percent of consumption of these cereals in 1979/83. More seriously, wheat and rice imports grew at

Table 4: Commodity Shares of Absolute Change in Production of Four Major Cereals 1961/65 to 1979/83
(percent)

Countries	Total Change Production All Cereals Over Entire Period	Rice (husked) Share	Maize Share	Millet/Sorghum Share
Burkina Faso	28	1	1	98
Cape Verde	-79	-	-100	-
Chad	-31	2	5	-93
Gambia	-0.6	3	49	-48
Mali	9.5	-9	-16	75
Mauritania	-57	11	1	-88
Niger	40	4	2	94
Senegal	15	-5	31	64
Sahel	13	3	6	91
West Africa	16	47	40	13
Higher Income West Africa	20	48	47	-4
Lower Income West Africa	18	32	14	54

Source: FAO data compiled by IFPRI's Food Data Evaluation Program from the 1984 Supply Utilization Accounts Tape (FAO: Rome, 1986). The total change in production is the net result of increases and decreases in production of all cereals. Commodity shares are computed as the difference for the commodity in question of 1979 to 1983 production and 1961 to 1965 production, divided by the absolute differences for the four major cereals, expressed in percent.

Table 5: Net Cereals Imports in West Africa
(percent)

Countries	Wheat		Rice		Coarse Grains a/	
	Share of 1979/83 Consumption[b]	1961/65-1979/83 Annual Growth Rate	Share of 1979/83 Consumption[b]	1961/65 1979/83 Annual Growth Rate	Share of 1979/83 Consumption[b]	1961/65-1979/83 Annual Growth Rate
Burkina Faso	124	8.8	56	12.1	2.1	23.7
Cape Verde	114	9.2	109	11.7	133	9.0
Chad	78	8.1	12	16.7	1	0
Gambia	95	8.5	63	6.5	13	61.5
Mali	103	9.2	32	0	4	0
Mauritania	125	12.4	89	9.6	77	4.0
Niger	101	16	64	18.2	0	-13.5
Senegal	127	5.2	85	4.2	11	8.0
Sahel	117	8.0	67	6.6	5	21.6
West Africa	119	12.2	56	10.2	5	14.5
Lower Income West Africa	114	8.9	36	9.9	4	0
Higher Income West Africa	119	12.0	57	9.5	5	12.0

Source: Compiled by IFPRI's Food Data Evaluation Program from the FAO 1984 Supply Utilization Accounts Tape (Rome: FAO, 1986). Growth rates are compounded between mid-points of five-year averages.

Note: (a) Maize, millet and sorghums for present purposes.
(b) Imports divided by consumption; consumption is understood here as direct consumption for food. Percentages may exceed 100 due to net stock changes, spoilage after import, and non-food uses such as brewing or animal feed.

8 and 6.6 percent, respectively, over the same period, from an already appreciable base. Given the trends in consumption and production patterns, it is clear that Sahelian policymakers will either need to plan substantial allocation of foreign exchange to import these grains in the future, or will have to be dependent on food aid shipments of those commodities, or will have to do something to limit the gaps between production and consumption. The relatively higher growth rates for imports of rice and wheat in the higher income countries of West Africa suggest that economic success in the Sahel would tend to aggravate these patterns.

Policy Problems Related to these Patterns

These patterns raise four main sets of policy problems for Sahelian policymakers:

1. Per capita cereal availability is declining over time. This raises the issue of how to raise domestic production and marketed sales significantly to offset this trend.
2. Significant portions of the urban and rural populations are living at or below the bare adequacy level with regard to food consumption. The welfare of these groups is probably very sensitive to food availability and cereal price policy.
3. Rice and wheat imports are rising rapidly over time, adding importantly to balance of payment problems. On the other hand, these imports are to some extent compensating for per capita stagnation in domestic grain production.

4. While food aid is sought to bridge gaps in bad years, there are fears that it is tending to reduce incentives to local producers. The commodity composition of food aid may also be influencing change in consumption patterns.

Some Options and Issues in Dealing with these Problems

There are three immediate and one long-run option for dealing with these problems as a whole. They are inter-related. The long-run option still requires immediate action. However, each option is risky; success will depend on correct implementation of a set of very specific actions. Each option could backfire, with serious welfare and political results.

1. Raise food prices to encourage food producers (either via higher administered prices or free market prices).

   Issues: Coarse grains prices have in fact risen quite high relative to world price levels in the past few years in the Sahel (Delgado, 1985). On the other hand, rice and wheat prices have become notably cheaper over time relative to coarse grains (Delgado and Miller). Thus encouraging production increases through price increases for coarse grains means pushing Sahelian prices further above world prices with all that implies for welfare. Pushing rice prices above their current position close to world prices will also reduce urban consumer welfare but might encourage production and consumer shirts to coarse grains. If

producers do not react to higher prices, it will reduce consumers' real income, without increasing supply. Furthermore, it can be shown that the effect of raising rice prices on millet consumption is much greater than the effect of raising millet prices on rice consumption; the exact proportions depends on which income groups consume the two cereals (Delgado, 1985). The effects of raising rice prices on rice consumption is a key policy variable that is not well-known in the Sahel, as recent experience in Senegal demonstrates. A 30 percent rise in the rice price in January 1985 cut rice consumption for a short while, until it returned to trend values.

2. <u>Imports could be restricted and/or rice consumer subsidies could be cut.</u>

Issues: First, imports are picking up where domestic production left off; cutting imports would leave this gap unfilled. Second, cutting rice subsidies could backfire in several ways. if rice demand is not very responsive to price signals as suggested above, this might not sufficiently reduce rice demand to solve balance of payments problems. Moreover, if rice is demanded by both the rich and poor, this policy could be costly in terms of the welfare of the poor, as may well be the case in Senegal.

3. Reduce food aid.

Issues: It could be that the poorest rural and urban populations are very dependent on food aid to reach nutritional adequacy in bad years. Their labor productivity and their chances of helping themselves to survive those years may depend on timely deliveries of aid. However, the increased supply may force prices down, discouraging farmers who do not depend on aid, and thus putting off a sustained solution to the food problem.

4. Boost rice production significantly.

Issues: While there is a wide consensus that cereals production needs to be significantly increased in the Sahel, it is clear that increases in coarse grains production alone will not substitute for rice and wheat imports. In fact, success in moving coarse grains production forward would probably give such a strong income stimulus to Sahelian economies that rice and wheat imports would increase rather than decrease. The efficiency of increasing wheat production in the Sahel is questionable. The conventional wisdom on rice -- which is perhaps overly dependent on one study (Pearson et al.), is that Sahelian rice is not likely to be able to compete efficiently with Asian imports in areas with good transportation infrastructure to seaports. In effect, it would worsen the balance of payments to attempt to feed areas such as Dakar with domestically produced rice, rather

than improve it. On the other hand, a scenario that foresees 45 percent of Sahelian cereals consumption coming from rice and wheat in the year 2000 suggests that the economics of rice production and distribution in West Africa may favor increased policy attention here. In particular, since research results on cutting per unit production costs take time, it is worth asking if the allocation of scientific manpower to basic rice research in the Sahel is sufficient. The congruence between means and needs might well be focused on future needs.

Knowledge Issues Raised by the Options

It is clear that policy decisions concerning any of the previous options involve a high degree of risk of costly mistakes. Yet the trends imply that something must be done. It is also clear that the risk element in policymaking here stems largely from lack of specific, relevant knowledge as to the likely effects of specific policy interventions. In particular, we can identify four main sets of knowledge issues, the resolution of which are central to reducing risk and increasing the efficiency of policy decisions with respect to the options identified.

SET I. Effects on market prices of changes in the quantity (level and composition) available of cereals due to government and donor decisions concerning cereal imports, food aid, crop research, and commodity-specific infrastructure.

a) What is the impact of food aid and imports on grain prices? Do they push down domestic coarse grain prices, reducing the incentive to produce them?

b) If research were successful in raising sorghum yields, what would be the impact on sorghum market prices? If this leads to a price decline, would it counteract the original positive effect of research on food availability and farm welfare?

c) Given various scenarios for the success of research and infrastructure investment in cutting rice production costs, under which conditions with respect to the demand and supply of specific food grains would Sahelian rice be competitive with Asian imports?

SET II. Effects of changes in market prices on the production and net sales of millet, sorghum, maize and domestic rice:

a) If millet and sorghum prices rose, would production respond substantially?

b) Would such an increase cause a large effect in net sales of these grains? Under what conditions?

c) Are the output and sales of local rice very responsive to rice prices?

d) Are the larger producers more responsive to price changes than the smaller?

SET III. Effects of changes in incomes and market prices on consumption of cereals.

a) Are there rural groups who depend substantially on food aid to make ends meet? What characterizes these groups?

b) In the urban areas, is it only the richer groups that consume imported rice and wheat, or are these items also substantially consumed by the poorer groups?

c) How responsive are the consumption demands of the richer and poorer groups to changes in the prices of imported rice and wheat versus domestically produced millet and sorghum? How sensitive are they overall? Are rice and sorghum complements or substitutes?

SET IV. Implications of individual findings under the three previous sets when taken together for the impact of specific interventions on: equity, growth of demand and supply for specific foods, the balance of trade, and government budgets (levels and allocations).

a) Which are the groups whose level of welfare suffers the most when rice and wheat prices rise? When millet and sorghum prices rise? How much are they affected, and how might they best be compensated or protected?

b) What will the demand for rice and wheat look like over the next 20 years, given different scenarios about population growth, urbanization, income growth and distribution, etc.?

c) What would be the effects on Sahelian government budgets and balances of payments?

d) What implications does this have for allocations among production policies such as the commodity composition of agricultural research and rural infrastructure investment?

A Study to Address these Issues in Burkina Faso

Although the above knowledge issues have widespread applicability to the Sahelian countries, specific answers tend to be scarce in the region. The authors are currently involved in a major study at IFPRI, undertaken in collaboration with the University of Ouagadougou and ICRISAT, to provide answers to these knowledge issues in Burkina Faso. An intensive two-year data collection effort at the household level has just ended, involving 150 rural households in 6 locations across the country and 125 households in Ouagadougou. Senior collaborators from the University of Ouagadougou and ICRISAT spent time working on the data at IFPRI this past summer, in addition to time spent at their home institutions.

Answers to Sets I and IV above require prior positions concerning Sets II and III. Set II is primarily concerned with the effects on producer behavior of relative price changes. While we intend with our collaborators to address these issues, delays in processing the data do not permit answer here, and thus preclude answers to Sets I and IV.

Analysis to date under our project has focused on Set III, concerned with who eats which cereals and the responsiveness of cereals consumption to prices and incomes. Painstaking survey work in Ouagadougou in 1984/85 suggests that urban people of all income

groups purchase prepared rice much more frequently than had been assumed earlier. Up to 35 percent of the sample frequently consumed prepared rice outside the household, typically at noon. This tendency was just as high among the urban poor as the middle class, perhaps because of the greater difficulty involved in returning home for a noonday meal. Other work by the University of Ouagadougou suggests that 10 to 17 percent of household food budgets are spent on rice in Ouagadougou, including the budgets of poorer families (Thiombiano, et al.)

The implication of these findings is that indiscriminate raising of the rice price through market intervention will probably have a severe impact on the real incomes of the urban poor, in addition to a proportionately lower impact on those of the urban middle class. Our work has not proceeded to the point yet where we can speculate on the impact of relative price changes on urban consumption. However, Savadogo estimates that the responsiveness of rice and wheat consumption to price changes is very high for all income groups (elasticities of the order of 2), although the data available to him was from a non-random small sample and did not include information on pasta or on food purchased outside the home.

Our work with ICRISAT in rural areas, based on surveys from September 1984 to September 1985, suggests that the rural poor in both the North and Center of the country were either at or below the FAO recommended level of caloric intake per adult equivalent, depending on season (Reardon and Matlon). Furthermore, in some seasons food aid and gifts accounted for an important part of

caloric intake of the poor. For example, among those households in the poorest tercile of the Northern sample that had not migrated away in the 1985 rainy season, average daily caloric intake per adult equivalent was less than 90 percent of recommended norms, with 17 percent of that being supplied by food aid. In the poorest tercile of the Mossi plateau sample at the same time, the average caloric intake per adult equivalent was less than 80 percent of norms, with 8 percent of that being supplied by food aid. Food aid operations appear to account for the difference in nutritional intake between the two areas, in addition to the fact that out-migration prior to the rainy season was substantially higher in the North. The common policy perception at the time appears to have been that the effects of the drought were more severe in the North, hence food aid operations were more important in that region.

These examples serve to make the point that arbitrary decisions to limit food aid or raise prices can have major welfare effects in both urban and rural areas. In other respects as well, policy needs to base on a view of impacts that is disaggregated by income group, season and location. Another dimension currently being explored is the importance of separating effects within households; for example, whether special attention needs to be paid to pre-school children. Eventually, analysis will focus on the impact of various policy options on disaggregated groups of producers, and then on the overall structure of supply and demand.

Such research is lengthy, but once done provides a baseline for decisionmaking far into the future. While it is not inexpensive in terms of financial resources and qualified researchers, it is essential if policymakers wish to have a better understanding of likely impacts of various decisions. There are no shortcuts in this respect.

REFERENCES

Delgado, C. "The Influence of Relative Prices on the Substitution of Imported for Domestic Cereals in West Africa: Survey of the Evidence". Paper presented at the workshop on: "The Changing Role of Coarse Grains in SAT West Africa", CEDRES/IFPRI/ICRISAT/CIRAD/CIRES/ISRA: Ouagadougou, June 25-27, 1985.

Delgado, C. and C. Miller. "Changing Food Patterns in West Africa: Implications for Policy Research", Food Policy. Vol. 10(1), Feb. 1985.

Food and Agricultural Organization of the United Nations (FAO), Food Supply Utilization Accounts Tape 1983 (Rome: FAO, 1986).

Pearson, S., J. Stryker, and C. Humphreys. Rice in West Africa (Stanford, CA.: Stanford University Press, 1981).

Reardon, T. and P. Matlon. "Seasonality of Calorie Intake in Rural Burkina Faso". Paper presented at the IFPRI/FAO/AID Workshop on Seasonal Causes of Household Food Insecurity: Policy Implications and Research Needs. Annapolis, MD. Dec. 10-13, 1985.

Savadogo, Kimseyinga. "An Analysis of the Economic and Sociodemographic Determinants of Household Food Consumption in Ouagadougou, Burkina Faso". Unpublished Ph.D. thesis, Purdue University, May 1986.

Thiombiano, T., L. Koulidiati, and C. Some. Systèmes Alimentaires à Ouagadougou. Centre d'Etudes de Documentation, de Recherches Economique et Sociale, Université de Ouagadougou: Colloque UNRISD/CEDRES, Ouagadougou, Burkina Faso, 30 may-1er juin 1984.