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A Comparative Structural Analysis**

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The Food Crisis in Africa : A Comparative Structural Analysis

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A large part of Africa is chronically affected by a severe food crisis which threatens the food security of many of her inhabitants. A peculiarity of this continent is that food production is not only a source of food but also a source of incomes for the numerous smallholder producers who form the most important group exposed to the risk of hunger. Therefore, growing food insecurity is generally associated with a crisis of food production. This paper is an attempt to analyze various structural factors which underly this production crisis. It is grounded on the hypothesis that these factors are far more constraining than the inadequate policy mixes which have received so much attention in the economic literature, and that their impact tends to impose serious handicaps on Africa compared to Asia and Latin America.

1) Africa's Food Crisis in Perspective

1. Food security and food self-sufficiency

There are two striking features or components in the so-called food crisis which faces many developing countries in Asia, Latin America and Africa : a rapidly increasing number of people who are chronically hungry or malnourished on the one hand, and a quickly rising dependence on food imports on the other hand. While the former problem - that concerned with food security - is especially acute in Asia and (sub-Saharan) Africa, the second problem - that concerned with food self-sufficiency - is typical of all the three continents. It is now a well-known fact that the two problems are not necessarily linked together. In other words, food self-sufficiency does not lead automatically to food security, and vice-versa. Indeed, food imports arise whenever domestic supply falls short of demand at the macro-level - the trend growth rate of domestic consumption exceeds that of domestic production -, whereas poverty and malnutrition have often to be traced back to a lack of purchasing power among certain vulnerable groups of the population [Sen 1981 ; Mellor and Desai 1985 ; Pacey and Payne 1985 ; World Bank 1986a]. Thus, it is not difficult to imagine situa-

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tions in which malnutrition would continue unabated although the rate of national food self-sufficiency increases. India and Chile are two cases in point. And it is equally easy to think of situations in which the opposite would occur - decreasing incidence of food hunger and rising dependence on food imports. The example of Taiwan suggests itself as a good illustration of this second possibility.

There is today a growing agreement among economists that the objective of food security should always be given precedence over that of food self-sufficiency. In other words, food security ought to be pursued even at the cost of increased food imports. A good point can however be made to the effect of qualifying the above statement. As a matter of fact, if the search for complete food self-sufficiency is a political objective hard to justify in welfare terms except in some peculiar circumstances, there are valid reasons for not letting food dependence develop too far. Uncertainties related to the world food market ; shortage of physical facilities to handle large volumes of food imports ; foreign exchange constraints ; high internal transport costs due to low population densities ; low import and capital intensiveness of domestic food production compared with alternative employment opportunities ; social, spatial and environmental considerations ; income distribution objectives ; all these factors may militate against a decrease in domestic production of staple foods, especially if this decrease is sharp, sudden or irreversible. The issue of irreversibility deserves to be emphasized since technical progress may cause radical shifts in the structure of comparative advantages and it is practically impossible to recreate a peasantry after having allowed its destruction. Of course, to the extent that the pursuit of food self-reliance threatens food security, the latter ought to be preserved by resorting to compensating measures (like state subsidies).

2. The context of Africa's food crisis

An important feature of many African countries is that the bulk of the food output is produced by small family-operated farms whose members form the largest group facing food insecurity. In sub-Saharan Africa, more than three-quarters of the population is engaged in smallholder food production [Delgado, Mellor and Blackie 1987, 5]. In the case of Africa, therefore, the objectives of food security and food self-sufficiency are potentially more compatible than in the countries of Asia and Latin America where the majority of people at risk are net food buyers. Thus, widespread increases in the productivity of agricultural smallholders are likely to lead to both improved food security and diminished dependence on food imports. Furthermore, insofar as such increases can be obtained without entailing a drop in the production of agricultural exportables, the balance-of-payments constraint will be eased, a consideration of the utmost

importance in most African countries ridden with serious problems of national economic management.

In a converse way, the more or less direct link between food security and food self-sufficiency in Africa tends to make the effects of a slowdown in food production more dramatic. This is precisely what has happened during the long period 1960-1984 when disappointing agricultural growth performances have been widely observed throughout most of the continent. Thus, the trend rate of growth of food output has not only been lower than that of consumption but, in addition, it turned out to be significantly less than the rate of population growth. During the years 1960-84, food output per head in sub-Saharan Africa has decreased at an alarming rate of about 1 percent per annum. The situation had even worsened during the years 1970-84, not only in sub-Saharan Africa but also in North Africa : food production in the whole of Africa then grew at only half the population growth rate. If a few countries did not conform to this general picture and could increase their food output per head during the period under consideration (e.g. the Ivory Coast, Malawi, Swaziland, Tunisia), the situation was worse still for the not-so-few countries in which total food output has actually declined or almost stagnated during the period 1970-84 [Mellor and Johnston 1984, 534-39 ; FAO 1985, 32-51 ; World Bank 1986a, 14 ; Eicher 1986b, 4 ; FAO 1986, Appendix I ; IFRI 1986, 123 ; Paulino 1987, 23-38].

In the specific context of Africa, a production crisis of this size could only result in growing food deprivation among the mass of rural small-scale producers and in increasing reliance on food imports. In 1985, about 100 million or roughly one-fourth of the African people were estimated to be hungry and malnourished [Eicher 1985, 84]. Too much importance should not be attached to this figure because the reliability of data on poverty in Africa is open to serious question and there is probably a tendency to overestimate it. However, and this is more relevant to our discussion, there are many hints that hunger and undernutrition have increased markedly in quite a number of African countries during the last decades. On the other hand, the food import bill of many African states has increased dramatically. In the mid-eighties food import expenditures represented 20 percent of total export earnings of Africa, compared to 16 percent in 1980 and much less in 1970 [FAO 1985, 58 and Marot 1987]. In the low-income countries, this proportion was even much higher. Food imports therefore contributed significantly to mounting balance-of-payments deficits and, *given the bleak prospects of both agricultural and nonagricultural export markets*, the drain on foreign exchange which resulted from decreasing food self-sufficiency was particularly harmful. It is also noteworthy that food output grew so slowly in sub-Saharan Africa from 1960-84 that per capita consumption fell despite high growth rates in imports. In other words, had the staple

food imports not increased dramatically⁽¹⁾, the per capita consumption of food items would have sunk to intolerable levels [Mellor and Johnston 1984, 538 and FAO 1985, 32-34].

In Asia and Latin America, the "food crisis" took a different shape. In these two continents, indeed, agricultural growth has usually been quite remarkable during the last two decades (averaging 3 percent per year), and the production of staple food has increased at a higher rate than the population. Nonetheless, with the notable exception of India (and of China during some periods of time), the growth of output has been slower than that of consumption because of regular and significant increases in per capita food consumption. In sharp contrast to the situation observed in Africa, the rapid growth of net food imports has made such increases possible in many Asian and Latin American countries⁽²⁾. Provided that the rural masses have an equitable share in the agricultural growth occurring in these countries, there is much reason to expect the rising food imports to be accompanied by a reduction in poverty and malnutrition, at least in the countryside. If this is not the case, attention must obviously be directed to distributive considerations to find the villain of the piece.

Since in Africa food production is not only a source of food but also the main source of incomes for the majority of people facing food insecurity, it is impossible to understand the causes of rising chronic poverty and undernutrition (as well as of increasing food dependence) unless we get a good grasp of the factors responsible for the disappointing growth records of local food production during the last decades. It is the main contention of this paper that a number of structural factors and constraints act as supply bottlenecks that tend to limit the long-term opportunities for agricultural growth in Africa far more seriously than the inappropriate policy mixes on which economists have focused most of their attention. Furthermore, the hypothesis will be advanced that these structural factors are generally more constraining in Africa than in Asia and Latin America, so that the former continent suffers from a real handicap in exploiting its agricultural growth potential. It is suggested that the relatively slow growth of African agriculture during the last three decades compared to the performances achieved by the other two continents must be to a large extent ascribed to this structural handicap.

This being said, it would be mistaken to neglect the consumption or demand aspects which have recently been shown to play a crucial role in the food crises of both Asia and Latin America [Mellor and Johnston 1984 ; Yotopoulos 1985 ; FAO 1985]. As a matter of fact, some demand-related factors have a direct or indirect effect on the smallholders' incentives to produce as well as on the quality of their main productive resource (land). Thus, at least in some areas, rapid population growth creates land pressure

with the result that increasingly marginal lands are brought into cultivation and that the fertility of existing lands is reduced due to environmental degradation. On the other hand, drastic shifts in consumption patterns towards import-intensive food baskets tend to lower the prices of traditional, locally produced, staple foods. Moreover, the rising food import bill following from the above two phenomena - rapid population growth and changes in food consumption patterns - may also constrain agricultural growth insofar as the scarcity of foreign exchange sharply limits the governments' ability to finance imports of modern inputs (fuel, fertilizers, sacks and bags, ...), capital goods (farm implements, irrigation equipment,...) and, perhaps, incentive consumption goods needed to increase agricultural production.

Note that it would be wrong to infer from the above diagnosis that equity issues are nonexistent in Africa. In the course of the analysis of some structural growth-inhibiting factors, it will in fact be shown that in Africa like in Asia and Latin America, there are powerful forces at work that tend to make for discriminatory access to scarce productive resources and for inequitable distribution of growth benefits.

In Section II below, the role of demand factors in Africa's food crisis will be examined. Section III will be devoted to a discussion of the "price-focused" doctrine which ascribes this crisis to distortions of the operations of the market by inadequate agricultural policies. Section IV will form the core of the paper since it will analyze in some detail the main structural constraints that inhibit agricultural development in Africa. In Section V, the central results of this study will be summarized.

A final remark is in order. It could be objected that during the years 1986-87, food production has increased notably in a group of sub-Saharan countries and that in some of them (e.g. Mali, Sudan, Zimbabwe), increases were such as to lead to sizeable grain surpluses. Given that these were generally good years from a climatic viewpoint, it would be premature to conclude that the downward production trend observed during the last decades has come to an end. Repeated observations and an extension of these positive production performances to many more countries (after all, the three afore-mentioned countries have a relatively good agricultural growth potential) would be needed before one could safely say that the structural thesis put forward in this paper is not supported by recent empirical evidence.

II) The Role of Demand Factors

1. Changes in consumption patterns

To account for the quickly rising *per capita* demand for cereals in many Asian and Latin American countries during the last decades, one must be able to explain why the elasticity of demand with respect to income has taken on much higher values than could perhaps be expected on the basis of Engel's law. The answer has to be found in the increased use of cereal as livestock feed [FAO 1985, 43]. It is "the voracious appetite of middle-class consumers for animal protein" that has determined a change in total grain demand significantly over and above the effect of population growth [Yotopoulos 1985, 476]. Underlying this disproportionate impact of the (mainly urban) demand for animal protein is a well-known mechanism: the low conversion efficiency of primary (plant) calories to secondary (livestock product) calories. It works in such a way that even a relatively small increase in per capita income, or a moderate shift in consumption patterns towards animal protein diets, or a moderate increase in the size of the (urban) middle classes, can lead to a sizable increase in indirect cereal consumption, that is in indirect demand for feed use. The income elasticities of demand for feed are actually so high that "the weighted income elasticity of demand for cereals may well rise to a value larger than the initial value of the elasticity for food use alone" [Mellor and Johnston 1984, 541].

The relationship between the above phenomenon and the food crisis is particularly evident in the case of the trade component. Indeed, since economic growth - especially so when most of the income gains accrue to middle classes or when they enable more people to graduate into these classes - gives rise to a rapid increase in consumption of livestock products, the ensuing growth of aggregate demand for foodgrain is likely to outpace that of domestic production, except if the latter increases very fast also. Food imports will then be called for to fill this mounting gap. There may also be a causal link between booming indirect cereal consumption and the incidence of poverty and hunger if food use is crowded out when feed use increases. In other words, as people compete with people for the indirect versus direct consumption of cereals, the distribution of purchasing power between the rich and the poor becomes an important determinant of access to available food supplies [Yotopoulos 1985, 476-79]. Note that this human struggle for cereals may take place on a national scale if the domestic food market is sheltered from the forces of international competition. If not, it arises at the world level in which case it is the huge demand of developed countries for feed that is the main claimant on world supplies of cereals.

How does Africa fit in with the above pattern ? The declining trend

of per capita cereal consumption in this continent could create the impression that the Food-Feed competition is not at work there. This would be a hasty conclusion, however. As a matter of fact, during the period 1966-80, use of major food crops for animal feed expanded at more than 3 percent a year, implying that per capita feed use in Africa increased with an income elasticity close to one [Paulino 1987, 31 ; Yotopoulos 1985, 469]⁽³⁾. Between 1974-75 and 1982-83, the share of livestock products in total agricultural output increased by as much as 17.6 percent in Africa and that of meat in particular by 13.8 percent, as against average rates of change of 8.8 and 9.4 percent, respectively, for the whole developing world [FAO 1985, Table 1-19, 51]. In order to accommodate this increase in consumption of livestock products in conditions of declining per capita supplies of cereals, the direct consumption of cereals, presumably by the lower income classes, had to be reduced to a much larger extent than would have been necessary if animal protein diets did not expand among the urban classes. In the words of Yotopoulos, "a shortfall in per capita supply is not necessarily shared equally by proportional decreases in food and feed" [Yotopoulos 1985, 469-70].

What needs to be stressed is that in the case of Africa the crowding-out effect does not work itself out through an upward pressure on food prices as is apparently suggested by Yotopoulos. On the contrary, a persistent claim made by so many authors and reports about African agriculture is that consumer food prices have been kept at artificially low levels, due to overvaluation of exchange rates, subsidies, international food aid, ... [see, e.g. : CILSS 1979, 119-22 ; World Bank 1981, chap. 5 and 1986b, 87-94 ; IFRI 1986, 143-46 ; FAO 1986, Annex I, chap. 3 ; Giri 1983, 243-46 and 1986, 66-72 ; Bates 1981 ; Rose 1985]. In Latin America and Asia, many poor people are net buyers of food (urban low income-classes and landless or near landless rural workers) and, as a result, the Food-Feed competition may affect them directly to the extent that it leads to rising prices on the local food markets. In large parts of sub-Saharan Africa, however, most poor households are net food sellers who suffer from the "negative pricing policies" followed by their government [Eicher 1984, 463]. By contrast, enriched urban middle classes can all the more easily shift to animal protein diets as the cost of feed is artificially low. In Nigeria, for example, because of a huge overvaluation of the national currency, the prices of U.S. imported maize and wheat - both of which can be fed to animals (particularly to chicken) - were much lower than local costs at the mill gate during the early eighties. Thus, in 1983, the price of imported maize was about 315 dollars per ton compared with 1,200 dollars for local maize delivered in Lagos [Giri 1986, 76-77 ; Andrae and Beckman 1986 ; FAO 1986, Main Report, chap. 1, para. 1.6].

If there is a crowding-out effect arising from Food-Feed competition

in Africa, it is definitely not a market-engineered effect operating through a price increase, but rather a government-engineered effect operating through a price decrease. Indeed, in the face of mounting craze of urban middle-income classes for livestock products, the government would be impelled to cheapen the foodgrains - for example, by letting the national currency appreciate in real terms - to the detriment of domestic producers who thereby get impoverished.

Now, it is important to realize that so far the bulk of African imports of cereals are intended for direct consumption. The fastly growing food import bills of many African states are less the outcome of increasing adoption of animal protein diets in the cities than of massive displacement of local staples or local food grades by foreign foods or grades. This substitution effect is partly the result of the low prices of imported foods (thanks to foreign food aid, currency overvaluation, and depressed world prices following overproduction in developed countries) and of blatant distortions in the marketing and transport systems, and partly the outcome of radical changes in consumer preferences.

Concerning the price effect, it is interesting to notice that in 1982 "while the international price of rice was three times that of sorghum, in West Africa it was rarely more than twice as much and sometimes only the same" [World Bank 1986b, 92]. As for the price of wheat flour, it was about the same as that of maize in Nigeria and the Ivory Coast while the ratio of the former to the latter was much higher in the international market [ibidem]. But the macroeconomic and price policies of African governments are not always responsible for odd price ratios between 'superior' imported foods and traditional staples. Thus, during the years 1983-84, the retail price of millet grown locally exceeded that of rice (mostly imported) in the free market of Dakar [Berg et al. 1986, Figure 9, 55], as a result of a marked fall in the international price of rice in the world market. Turning to the marketing and transport systems, the main point to emphasize is that these systems have been built up during the colonial period to facilitate the export-import trade rather than to move local produce from the countryside to the urban markets. Finally, changes in consumer tastes have been induced by various forces among which we may note : rapid rates of urbanization ; the international demonstration effect of what many urban dwellers in Africa consider as superior goods (US quality of maize in Nigeria, short broken rice in Sahelian countries, white bread and skimmed milk all over large parts of the continent, Italian tomato sauce with chemical ingredients in Senegal, ...) ; the aggressive advertising campaigns of transnational food corporations ; and, last but not least, the existence of various intrinsic advantages of foreign over local foods (low perishability, low time-intensiveness of the required culinary preparations, especially so when foreign foods can be consumed in attractive and convenient

processed forms, like wheat in the form of bread).

The importance of trend changes in African food consumption patterns and their dramatic impact on food imports can be illustrated by reference to West Africa. Here, per capita consumption of wheat products and rice grew at an average annual rate of 8.5 and 2.8 percent, respectively, between 1966-70 and 1976-80. By contrast, consumption of traditional foods locally grown has either barely increased (by 0.27 percent for maize) or declined (by 1.5 percent for millet and 1.7 percent for sorghum) [World Bank 1986b, 92]. In the Sahelian region only, demand for rice has increased by more than 8 percent a year during the period 1976-82 whereas domestic production has hardly expanded. As a consequence, Sahelian countries today produce only half of the quantities of rice they consume. The situation is worse still with regard to wheat and wheat products. Consumption has grown at the high rate of 11 percent per year, although local wheat production is practically nonexistent. No wonder then that these countries produce only 5 percent of the wheat they consume [Giri 1983, 77-78]. Moreover, Giri noted that "the demand for bread does not spring any more only from the urban classes which have more or less adopted european modes of consumption, but also from low income urban classes and even from rural populations ... Thus, in the valley of the Senegal river, the traditional breakfast composed of millet couscous and vegetables has largely given way to an 'europeanized' meal with soluble coffee, concentrated milk or milk powder, and bread" [ibidem, 78]. This is confirmed by a consumption survey conducted during the late seventies in Dakar (the capital city of Senegal) and in two small towns of the interior of the country (Louga and Linguère). Indeed, this study has come to the conclusion that (1°) rice and bread absorbed almost 90 percent of the total household budget devoted to cereal consumption⁽⁴⁾, and (2°) this proportion did not vary significantly across various income classes [CILSS 1979, 245].

In the Ivory Coast - one of the few sub-Saharan countries which recorded a rise in its per capita food output during the last decades - around 15 percent of the total import bill are spent on food items. The import content of domestic cereal consumption exceeds 1/3 while that of consumption on meat, fish and milk products is higher than 1/2. On the whole, food imports have grown at a much higher rate than domestic food production, per capita food imports have increased rapidly, and the import content of aggregate food consumption has risen significantly. Cereals and cereal-based products (almost exclusively wheat and rice) represented 27 percent of the country's food imports on an average for the years 1978-80, which was much less than the share of meat and milk products (38 percent), but much more than the share of other product categories (12.5 percent for fish and fish derivatives and 10 percent for beverage and

tobacco). Finally, it has been estimated that half the food expenditures by urban dwellers were spent on imported items in the early eighties [Haubert and Frelin 1985, 21-22].

The following table compares the respective rates of increase in the imports of various food products during the sixties and the seventies for the whole of sub-Saharan Africa.

TABLE 1 : Average yearly rates of growth of imports of various food products in sub-Saharan Africa during the period 1961-84 (in volume)

	1961-63 to 1969-71	1970-71 to 1983-84
Cereals	9.0 %	9.7 %
wheat	12.9	9.6
rice	4.9	10.4
maize	8.7	12.6
Milk products	7.2	7.9
Sugar	2.5	5.0
Meat	1.3	11.1
Animal and vegetable oil	11.5	13.0(*)

(*) This estimate is for the period 1969-71 to 1977-79.

Source : Adapted from World Bank, *Accelerated Development in sub-Saharan Africa : An Agenda for Action*, Washington, 1981, Table 5.3 and FAO, *Production Yearbook and Trade Yearbook, 1975, 1985*, Rome.

The following trends emerge from an analysis of food imports into Africa during the last decades :

- rising per capita food imports ;
- preponderant share of cereals in total food imports (contrary to what was observed in the case of the Ivory Coast) ;
- near-complete dominance of grain imports by three cereals (wheat - almost 50 percent ; rice - almost 30 percent ; and maize - almost 20

percent) ;

- rising import-content of domestic food consumption, particularly so in the case of grain, milk products, meat and edible oils⁽⁵⁾ ;

- heavy concentration of consumption of imported foods in urban areas : thus, in 1980, 90 percent of imported cereals were consumed in the cities [FAO 1986, Main Report, chap. 4, para. 16].

To sum up, many African countries have been subject to profound changes in their food consumption patterns during the last two decades. As could be expected, these changes have been especially rapid and marked in big cities : it is probably not fortuitous that by and large countries which have recorded the highest growth rates of food imports during the seventies are also those which urbanized at the most accelerated pace [see FAO 1985, 109]. However, the new consumption patterns are gradually spreading to small towns and to rural areas. Therefore, low production performances, and even declining yields per unit area, in the case of traditional staples (millet, sorghum, yams, cassava, white maize, beans, plantain bananas,...) are not necessarily due entirely to supply factors, but may also arise partly from increasingly demand-constrained markets. It is no doubt true that these consumption shifts have been induced, at least in part, by policy-determined factors - like the price policies and the outward-looking strategy of economic development pursued by many African states. But the real question lies in whether they are or have become irreversible, in the sense that they have led African consumers to modify their taste configurations for good.

In other words, can one reasonably expect that drastic measures aimed at reversing the "faulty" policies - like heavy taxation or strict rationing of 'superior' imported foods - will bring consumer preferences back to their initial mapping position ? I think we must realistically assume that changes in consumer tastes such as have occurred in Africa are not reversible, especially so for urban dwellers who have been accustomed to the new foods for rather long periods of time. As a consequence, in the numerous African countries where foreign foods cannot be produced locally, or could be produced only at prohibitively high costs, the governments will continue to be under heavy pressure to subsidize their production or their consumption. Evidently, such subsidies are an intolerable drain on these countries' limited resources and their rates of economic growth thereby get reduced. In fact, even if the governments could withstand the pressures from the urban consumers, economic growth performances could still be impaired. This would occur if the demand for 'superior' foods is price-inelastic so that it would be maintained at the cost of depressed rates of household savings, were the government to raise food prices drastically.

In these circumstances, reduction of rural poverty and improvement of food security would be best attained through measures of agricultural self-reliance aiming concurrently at protecting traditional local food producers from cheap imports and enhancing the attractiveness of traditional staples. The latter could be achieved through a variety of measures, like the development of more efficient transport and marketing systems ; improvements in the quality of traditional foods (better packing, easier storage, new and faster methods of preparation,...) ; and the enlargement of their possible uses (e.g. the use of cassava as animal feed, the production of bread from a mixture of wheat and millet or even from millet alone ; the invention of new food items using root and tuber crops as ingredients ; use of sorghum, maize or millet together with wheat to make pasta ; production of couscous from pre-cooked millet ; production of sorghum or millet semolina ; ...)⁽⁶⁾.

2. Fast population growth

Even assuming a constant structure of food consumption with no marked shift towards foreign foodstuffs, African agriculture would still be confronted with the dramatic challenge arising from historically unprecedented rates of population growth. Africa is in fact the only region of the world where population growth actually accelerated during the seventies and the early eighties. The annual population growth rate in Africa was 2.1 percent in the mid-1950s, 2.7 percent in the late 1970s, and as much as 3 percent during the years 1980-85 (as against 2.2 percent in Asia and 2.3 percent in Latin America). Moreover, Africa's population growth rate is projected to continue to increase throughout the late eighties and the early nineties until it levels off at about 3.1 percent by 1995. By that time, population will grow at 1.9 and 2 percent per year in Asia and in Latin America, respectively [FAO 1986, Annex I, chap. 2, para. 2.5 and Eicher 1984, 457].

What is particularly alarming in the case of Africa's demographic trends is precisely that her population growth will level off at an astronomically high rate (more than 3 percent), and that this levelling off process will itself last during a rather long period of time. Indeed, for a variety of complex factors which have made for a pro-fertility cultural environment and have created a kind of political indifference to population growth problems (due to a myth of Africa as being a land-surplus continent), there is not much hope that fertility levels will be reduced in the coming years [Eicher 1984, 458 and 1986c, 244-45]. The situation is especially confounding for more than one-third of African people living in nine countries where population will grow at an average yearly rate equal to or higher than 3.5 percent during the years 1980-2000 (Kenya, Tanzania, Zimbabwe, Botswana, Rwanda, Libya, Uganda, Nigeria and Zambia). A

number of African countries will reach or have already reached a maximum rate of population growth exceeding the 4 percent threshold (Kenya - 4.3 percent ; Zimbabwe and the Ivory Coast - 4.2 percent ; Uganda and Libya - 4.1 percent). Most African countries, however, will have annual population growth rates in the range 2.5 - 3.5 percent up to the year 2000. Their maximum rate of growth will typically oscillate around 3.1 - 3.3 percent, with the exceptions of the Ivory Coast (see supra), Senegal (3.6 percent) and Malawi (3.5 percent) [FAO 1986, Annex I, Table 2.1].

Whatever the reasons accounting for these almost hallucinating trends, the point is that for several decades to come Africa's land, pasture and forestry resources will be subjected to heavy pressure and the well-known threats to her ecological equilibria will go on increasing. Just to give an example, the aggregate population of Sahelian countries is expected to increase from 31 to 120 millions inhabitants between 1985 and 2025 [Pennisi 1986, 55]. Only to feed her growing population at the present level of per capita food consumption, Africa would thus need to increase her food production at a rate of, say, 3.2 percent per year during several decades in succession. This is of course an impossible challenge for her to meet. It is therefore not surprising that in order to reach the conclusion that more than half the African countries could increase or stabilize their rates of food self-sufficiency during the next 25 years, FAO had to make extremely strong assumptions [FAO 1986, Main Report, chap. 2]. Now, if we leave aside the problem of food self-reliance to focus our attention on the issue of poverty alleviation, the following must be said : even assuming a high rate of job creation in (import-substituting) nonagricultural activities (which will not go without profound reforms in the management of African economies, and in the way they are exposed to international market forces), Africa will need to step up food production, at least in the short and medium term, in order to provide her fastly growing workforce with new incomes and more rewarding employment opportunities. Given that world markets for non food agricultural products are much depressed, too much hope ought not to be placed on the expansion of exportable non food production.

There is yet another demographic trend that must be borne in mind while analyzing the agricultural situation in Africa : this is the steady decline in the share of total labour force engaged in agricultural activities. Thus, between 1960 and 1984, the farm labour force has increased at an annual rate much lower than the rate of population growth and the rate of growth of the total labour force [Johnston 1986, 156 ; Paulino 1987, 25-26]. By contrast, the percentage of the population living in urban areas increased from 18.4 to 28.9 percent between 1960 and 1980 [FAO 1985, 86]. In Soudano-sahelian Africa, urban population has expanded 3.5 times as fast as rural population and, in humid Central Africa, 5.5 times as much [FAO 1986, Main Report, chap. 1, para. 1.15].

Insofar as it helps to mitigate the absolute increase of the farming population and, thereby, to bring down the population pressure on land, the declining share of agriculture in the total labour force might seem to be a welcome trend. However, per capita domestic food supplies will be maintained only if there is a sufficient increase in (per capita) agricultural labour productivity to make up for the relative decline of the farm labour force. In quite a number of African countries, however, this condition is not likely to be satisfied and high rates of urbanization may well result in diminishing per capita food output. The reason for this becomes apparent when it is realized that farm labour is not homogeneous and that rural outmigration modifies the characteristics of the average worker remaining in agriculture. Indeed, it is a common feature of many African countries that internal migration streams are overwhelmingly dominated by single (young) men. Stories of entire villages deserted by their most productive male members are not rare in Africa, particularly so in countries where hard conditions prevail in the countryside (like in arid or semi-arid areas) or where attractive employment opportunities exist outside the agricultural sector (like in the oil-producing countries during the 1970s)⁽⁷⁾. That the departure of many young male adult members from the village workforce - where and when it occurs - may seriously hinder agricultural growth is evident from the fact that heavy agricultural tasks are consequently neglected, which is bound to affect the productivity of both the land and other labour efforts. Of course, ordinary effects of labour shortages are also to be feared. Since in Africa demand for agricultural labour is highly seasonal due to single-season rainfall patterns, a labour force comprising women, children and aged men and sufficient to carry out the ordinary farm works throughout the year will be inadequate for the peak season [Mellor and Delgado 1987, 2 ; Delgado and Ranade 1987, 124-28]. Moreover, "in the African farming systems seasonal labour shortages are a far more limiting factor in increasing productivity than in Asia, especially in view of the low level of African agricultural technology" [Lele 1984, 445].

It is true that the above effects could be offset or neutralized if, as suggested by some authors [e.g. Collier and Lal 1981 ; Hyden 1986, 57], migrant workers choose to invest part of their nonagricultural incomes in their home village with a view to introducing new technical configurations (of a labour-saving and/or land-augmenting type) in the family farm. But this poses the problem of the availability of new proven technical packages adapted to the needs of African smallholders. Since these new packages do not generally exist, remittances tend to be spent on consumption purposes, with priority being often given to the purchase of imported foods [Mathieu 1987, Vol. 1, 33-39].

There are in fact two conditions under which the afore-described situation would probably not be a cause of great concern for many African

leaders : (1°) a sufficient number of *sustainable* income-earning opportunities exist outside the agricultural sector to absorb the rural migrants *productively*, and (2°) the intersectoral transfer of labour does not result in a tightening of the balance-of-payments constraint (which supposes that increased food imports are offset by new export opportunities). The situation of oil-exporting countries during the seventies came close to satisfying these conditions but, unfortunately, the world economic crisis put an abrupt end to their growing prosperity. Income-earning opportunities in the oil-producing sector did not turn to be sustainable and countries like Nigeria, Gabon and the Ivory Coast were precipitated in a deadlock characterized by a sudden drop of their oil export receipts and by a rapid increase in their food import bill.

III) The Role of Supply Factors : Price- versus Structure-focused Analysis

1. The dominant view

Since the early eighties and the publication of the famous so-called Berg report [World Bank 1981], it has become fashionable to locate the most important impediment to agricultural growth in sub-Saharan Africa in "the nature of incentives offered to producers" and in "the actions of those who distort the operations of the market" [Bates 1981, 1-2]. Crucial determinants of the present food crisis in Africa are seen to be lying in inefficient marketing state monopolies, inadequate distribution of modern agricultural inputs, neglect of agricultural investment in smallholder production and misguided pricing policies. But it is clearly the latter problem - often seen in conjunction with the first one - which has been given most emphasis in many recent publications, particularly those issued by international organizations [CILSS 1979 ; World Bank 1981 and 1986b ; IFRI 1986 ; Berg et al. 1986 (on behalf of CILSS and OCDE)]. For example, the World Bank has estimated that in a number of African countries effective tax rates - representing the combined effects of currency overvaluation, formal taxation, official pricing policies and inefficient marketing arrangements - have been such as to reduce the real incomes of agricultural producers below half of the real value of their production as measured by world market prices [World Bank 1981, 55-56 ; see also World Bank 1986b, chap. 4, 61-84 ; Giri 1986, 68-69 ; Lele 1984, 441 ; Coquery-Vidrovitch 1985, 162-63 ; Bates 1981 ; FAO 1986, Annex I, chap. 3, paras 3.4-3.7 ; Aboyade 1987, 241-52 ; Oyejide 1987, 257-73].

Heavy effective taxation of agricultural producers is not confined to export crops only, but is also found to be largely prevalent in the case of

staple foods. In Mali, for example, an in-depth study of a large irrigated rice production scheme in 1979/80 has revealed that it costed farmers 83 Malian francs to produce a kilo of rice, but that the government paid them only 60 Malian francs [study quoted by Eicher 1984, 463]. Another study conducted in the same country reached the conclusion that unit production costs of the two main traditional staples, millet and sorghum, were also higher than official producer prices [Kébé 1982].

Another way of assessing the underpricing of agricultural commodities in many African countries is by comparing real official producer prices not with international prices or unit production costs but with current prices ruling in local parallel markets or in neighbouring countries. To refer again to the case of Mali, unofficial market prices for millet, sorghum, maize and rice were three to five times as high as official prices in the late seventies [Coquery-Vidrovitch 1985, 162-63 ; Gueymard 1985, 226 - note 6 ; Berg et al. 1986, 57]⁽⁸⁾. The World Bank arrived at similar price discrepancies for Tanzania during the same period [World Bank 1986b, 75]. Even if Mali and Tanzania are extreme cases, there is enough empirical evidence to show that there are often substantial differences - from 100 to 200 percent according to FAO [1986, Main Report, chap. 4, para. 4.8 ; see also Anson-Meyer 1985, 277] - between official and unofficial or black market prices.

Two central ideas actually emerge from the dominant price-focused analysis of Africa's food crisis. The first idea follows from a rather straightforward interpretation of the above facts : African small farmers are subject to genuine extortion on the part of the state. This extortion reflects itself in negative pricing and taxation policies devised "to pump the economic surplus out of agriculture" [Eicher 1984, 463 ; see also Bienen 1987]. The outcome of these exploitative state interferences with the market forces is alarming since low food crop prices have discouraged expansion of production for the market and have acted as a disincentive for investment in agriculture. By imposing heavy effective tax rates on export crops, African states have deprived many farmers - among whom most African poor are recruited - of an important complementary source of monetary income while at the same time denying themselves the possibility to earn scarce foreign exchange. Note incidentally that the tradition of placing relentless fiscal pressure upon the peasant sector was firmly established from the beginning of the colonial state when it was said to produce the same kind of "demoralization, disaffection and disengagement" as is currently deplored nowadays [Young 1986, 44].

Some authors, rejecting the idea that state agents act irrationally, have tried to explain why African states follow such suicidal or self-defeating strategies of blatant discrimination against farmers [Bates

1981 ; Hart 1982 ; Commins, Lofchie and Payne 1986]. Bates has grounded his attempt at understanding African political economy on the assumption that the state essentially tries "to respond to the political demands it perceives to be important to satisfy in order to retain power" [Colclough 1985, 35]. Basically, his sociopolitical theorization belongs to the 'rural-urban divide' or 'urban-bias' paradigm explored by M. Lipton with special reference to India [Lipton 1977]. The main clientele of most African states are considered to be urban residents (state employees, capitalist employers, merchants, members of the army, organized workers) who operate effectively as an interest group to influence state policies in urban-biased directions. Although Bates' analysis commends itself for its rigour and clarity, and although it offers numerous useful insights into the mechanisms of political patronage in Africa, it can be criticized on several grounds. First, it takes too much for granted that African state policies are systematically and unambiguously biased against agriculturists, a point to which I shall soon return. Second, it often seems to imply that the urban bias is engineered exclusively through state intervention in otherwise unbiased market processes [Toye 1987, 129]. And, third, the whole demonstration of Bates rests primarily on the assumption that the policy choices made by African governments are relatively unaffected by external factors, like the current world economic crisis, the role of foreign investors, of aid donors and of international agencies [Bienefeld 1986, 7-9]. This assumption is all the more unsatisfactory as growing public deficits in many African countries are to a large extent the outcome of external forces, a situation which is not likely to change so long as a substantial part of the governments' revenues comes from import and export taxes.

Hart has taken a somewhat different approach to the problem. His pivotal hypothesis is that modern states in Africa cannot be viable and achieve their historical objective of transforming the economy unless they can assure that reliable revenues flow into their treasury. As a result, most of their efforts tend to concentrate upon undertaking large-scale projects oriented towards cash crops (state farms, irrigation schemes, settlement and land reclamation projects) and upon controlling agricultural trade through parastatals or publicly sponsored cooperatives which are susceptible of providing the public exchequer with regular and sizable proceeds at least administrative costs⁽⁹⁾. And there is a priori no reason to expect that undertakings which are most profitable from the treasury's standpoint (allowing for administrative costs and political feasibility considerations) are also the most socially efficient [Hart 1982, mainly chap. 4]. Given that "the State is not monolithic and does not form a homogeneous bloc directed principally towards exploiting the peasants" [Gentil 1986, 212], perhaps one of the greatest advantages of Hart's hypothesis is that it does not simplistically assume that all state actions are by necessity anti-rural or anti-agriculture. His main point is indeed that

treasury considerations can prompt African States to encourage projects or to take steps - including easy acceptance of unscreened foreign aid - that can inhibit agricultural growth. Nowhere does he suggest that governments in Africa consciously neglect or purposefully and systematically exploit the agricultural sector.

This being said, one can rather easily agree with both Bates and Hart that it is not satisfactory to treat all state actions as "bad" policies, obvious mistakes or irrational interventions. However, it is no doubt as simplistic an attitude to take the opposite extreme view and to assume that they all form parts of a coherent strategy which would obey the functional exigencies of a rational, single purpose-minded, administration or government. In many instances, it is as fruitful an hypothesis to consider that state policies can be unpredictably inconsistent or badly planned⁽¹⁰⁾, because of various reasons, like imperfect information, misperception about state interests, or inner conflicts between the government and the state bureaucracy, between different Ministries or departments, ... As S. Berry has aptly noted, it is only when Ministries of agriculture, rural development agencies, parastatals, and so forth, are assumed to "act consistently and cooperatively in pursuit of single, well-defined sets of goals" that a theory of the state of the type proposed by Bates (and Hart) can be taken seriously [Berry 1984, 65-66 ; see also Bienen 1987, 298].

The second central idea underlying the price-focused analysis of the eighties is that Africa's agricultural woes are essentially due to misguided, although possibly explainable, government policies. This is taken to imply that Africa's agricultural and other problems are largely resolvable by a domestic realignment of policy measures. Basically, the policy changes advocated are all measures aimed at privatizing the economy, "getting prices right", and facilitating responsiveness to market signals. It is explicitly assumed that African farmers are highly price-responsive and that a decrease in effective tax rates charged on them will pay high dividends in terms of enhanced agricultural production and investment.

To amend the "faulty" or inadequate pricing policies by eliminating the most glaring price distortions and to call into question many anti-market prejudices which are so common in Africa are certainly necessary steps to be taken in many countries belonging to that continent. To that extent, the price-focused analysis of the African food crisis has undoubtedly done a good job. In fact, during the last years and often under the combined pressures of the International Monetary Fund and the World Bank, many African governments have adopted corrective measures aimed at liberalizing agricultural trade and granting more remunerative prices to agricultural producers, particularly in the case of food crops [see, for example : CILLS 1979, 147 ; Gueymard 1985, 228-35 ; Berg et al. 1986 ;

FAO 1986, Main Report, chap. 4, para. 3 and chap. 5, para. 39 ; Giri 1986, 74-75 ; Mellor and Delgado 1987, 4 ; Colclough 1985, 32]⁽¹¹⁾. Nevertheless, the above interpretation of Africa's predicament is also dangerously misleading insofar as it conveys the idea that food imbalances will be essentially redressed and much rural poverty will be alleviated simply by restoring the market signals and giving the farmers their dues. As one author aptly remarked : "... whilst prices are important, they are only *one* element in the process of eliciting a desirable pattern of production and distribution" [Colclough 1985, 30]. More pointedly, what needs to be emphasized is that "the lack of technology, not the lack of farmer motivation, is the major brake on expanded food, livestock and export crop production" [Eicher 1986a, 26]. Hard realities must be faced squarely : "Africa's agrarian crisis is complex and it has been building up for several decades. Neither simplistic statements about external forces nor calls for open market, export-led growth, and increased foreign aid are the answers" [Eicher 1985, 98].

2. The deficiencies of a price-focused approach

The dominant, price-focused, thesis on the African food crisis must therefore be seriously qualified and placed in a different and much larger perspective if it is to play a useful role. In the present section, without getting involved in a detailed argument which would take us too far, I would like to make a number of precise points and to give a few warnings which are important in the context of our whole discussion.

Empirical doubts

From an empirical viewpoint, the price-focused approach to the African food crisis suffers from several weaknesses which may undermine its credibility. *First*, it is not quite clear eventually whether the prices of staples have been too low during, say, the last 10 years. As has been pointed out above, significant price adjustments took place in many African countries during the seventies which seem to have substantially helped to correct past distortions and to alleviate the tax burden on food producers. Thus, in a report published by CILSS (Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel), E. Berg himself, the main author of the famous World Bank's report on sub-Saharan Africa (1981) confessed that : "... up to a certain point, 'distortions' prevail that lower the prices [of cereals], and international aid seems to bear heavy responsibility in this situation. But, according to other criteria, it is not clear that official cereal prices ruling [in Sahelian countries] in 1977 were too low" [CILSS 1979, 147 ; in the same vein, see Colclough 1985, 32]. Empirical evidence therefore appears to be much more mixed than what many statements or writings on 'peasants' exploitation' in Africa suggest or assert confidently.

The truth is that the implicit taxation of African smallholders varies significantly by country, by crop and by period, so that broad generalizations must always be received with a good dose of scepticism.

Second, it must be realized that there are simply no satisfactory reference prices against which African domestic food prices can be measured to test whether they are too low and to what extent. In particular, there is no way in which we can contend that exchange rates (whether official, or 'black', or 'grey') and world food prices are equilibrium prices. Regarding the latter, what must be emphasized is that international food prices are determined in residual markets, the demand and supply of which may represent only a minor share of world total supply and demand. World prices could only become reliable efficiency signals if agricultural markets in the developed countries were no more sheltered vis-a-vis the international forces of competition, a situation which is not likely to arise, and perhaps rightfully so.

Third, even admitting that important price distortions continue to prevail which get reflected in significant differences between official and black market prices, a basic difficulty remains which emerges from the well-documented following fact : in many cases the major part of staple food smallholder production is not actually disposed of through the official channel. Thus, FAO estimates that only 5-25 percent of domestic cereal output in most African countries is marketed via state trade organizations, the remainder being sold off in parallel markets [FAO 1986, Main Report, chap. 4, para. 4.8 ; see also Gueymard 1985, 226]. The latter markets are not necessarily illegal since it may be a lack of circulating capital in the hands of the official marketing boards that prevents them from purchasing all the output offered for sale by the farmers. In other words, due to a shortage of liquidity, many such boards operating in the field of staple food production are unable to exercise effectively the monopsonistic power granted them by the state. This being said, it must be admitted that, more generally, "it is extremely difficult to enforce monopsony for commodities that are primarily consumed in mass domestic markets" [Leonard 1986, 187]. But, then, if this is so, one cannot expect that an upward adjustment in official producer prices will enhance *total* production. The only result it can yield is an increase in the quantities brought for sale in the open, official, markets to the detriment of the sales transactions in parallel trade networks⁽¹²⁾. As has been actually observed in a number of cases, a rise of official food prices may thus create acute shortages in local or domestic markets [Berry 1984, 72].

Fourth, while insisting on the price-responsiveness of African farmers, too many authors do not carefully distinguish between aggregate supply response on the one hand, and supply response to changes in the

prices of particular commodities on the other hand. In fact, they often provide evidence of high price-elasticities of output for specific, single, crops and then jump to the conclusion that more appropriate pricing policies will automatically boost overall production. This conceptual confusion is all the more serious as empirical findings concerning supply responses to price changes are not likely to converge whether we consider total production or production of particular commodities. While there is, for Africa as for other developing regions, a good deal of evidence pointing to elastic supply functions for a wide variety of smallholder cash crops, much less is known about food production supply responses to movements in intersectoral terms of trade [Helleiner 1975, 36-41]. However, recent evidence available for Asia [Herd 1970 ; Krishna 1984], for a large sample of 58 Third World countries [Binswanger et al. 1985], and for a small sample of 9 African countries [Bond 1983] all converge to show that under conditions of technologically unchanging traditional agriculture aggregate short-term supply elasticities tend to be positive but low - in the range of 0.0 to 0.2.

According to J. Mellor, if aggregate supply responses are low in modern agricultures, they are likely to be even lower in traditional agricultures "because of the lesser use of purchased inputs and the lesser opportunity for transfer of labour resources to and from productive use in other sectors of the economy" [Mellor 1968, 24]. There is thus good reason to believe that the same situation obtains presently in African smallholder agriculture, especially in view of its low level of technical sophistication. Moreover, given the absence of specialized capital in African smallholder agriculture as well as the above-noted lack of alternative opportunities for land and labour use, long-term supply elasticities are not likely to be significantly higher than short-term elasticities. It is noticeable that the results obtained by Bond [1983] - although they must admittedly be treated with caution due to the low reliability of the statistical material used - do not show significant differences between these two elasticities for all but one country in the sample. In the case of Africa, therefore, little weight ought to be attached to the World Bank's argument according to which "estimates of aggregate farm output responses have typically been of a short-term nature and have failed to reflect the fact that changes in prices have a long-term effect on the intersectoral flow of resources" [World Bank 1986b, 69].

Fifth, in many cases it is not clear from the evidence adduced in support of the price-focused thesis to what extent an expansion (depression) of production is due to an increase (decrease) in the price of output. Thus, Eicher has drawn our attention to the fact that the decline in agricultural exports from numerous African countries over the past 10-15 years is not necessarily or entirely to be attributed to misguided pricing

policies as is commonly suggested. It increasingly appears that "some of this decline might be a function of the deteriorating genetic resource base for perennial crops such as coffee, cocoa, coconut palm and oil palm" [Eicher 1986a, 13]. In the other way around, it would be mistaken to give the entire credit of output growth to rising producer prices when the latter have obviously been only a part of a whole package of reforms including technology, institutions and agricultural policies. For example, in the case of Zimbabwe - often presented as a perfect illustration of the adequacy of price policy to stimulate agricultural production - we are warned that "the favorable production response is more complex than higher prices and good weather : ... farmers were able to respond to higher prices because they had access to well-functioning input and output markets, an extension system that has given increasing attention to smallholders in recent years, and one of the strongest agricultural research services in Africa" [Eicher 1985, 92-93 and 1986c, 261].

As Helleiner has rightly emphasized, "what one seeks to understand is the effect of alterations in various packages of influences". As a consequence, the efforts devoted to the establishment of the price responsiveness of smallholders in African agriculture - that is the efforts which consist of selecting only one out of a myriad of influences and of measuring its separate impact on output with the help of the *ceteris paribus* assumption - are bound to be rather sterile and "probably already reached a point of rapidly diminishing returns" [Helleiner 1975, 43-44]. As for Schäfer, who can certainly not be accused of underrating the role of prices, he admits that "agricultural production evidently reacts more strongly to certain types of government activity in rural areas (road building, establishment of markets, degree of literacy) than to price increases" [Schäfer 1987, 132].

Theoretical caveats

The price-focused doctrine is not exempt from theoretical weaknesses either. *In the first place*, the presumption that African governments are to be held responsible for a wrong setting of the prices is hardly satisfactory. Indeed, as S. Berry has rightly emphasized, "in criticizing African governments for reducing incentives to agricultural producers, economists often implicitly compare the existing situation to one in which state intervention is non-existent" [Berry 1984, 73]. To the extent that agricultural markets are not reasonably competitive and can never be so - because a competitive environment is essentially hazardous and therefore tends to breed market controls - such an assumption is unrealistic. In other words, "the choice facing African governments is often not one of controlled prices versus competitive ones, but of trying to regulate prices themselves or letting someone else take control" [ibidem]. In this respect, it is interesting to notice that when West African markets work well it is apparently more

because they are controlled by well-organized kinship or community-based networks than because they are "reasonably competitive" [ibidem, 72].

Second, the analytical basis from which positive aggregate supply responses to price changes can be derived is far from being as strong as one would have wished. In actual fact, it is only in the simple case of complete specialization or pure commercial farming - the entire output of the peasant family is marketed at a given exchange ratio to buy an outside consumer good - that positive price elasticities of agricultural supply can be obtained with unambiguous and rather plausible analytical conditions [Agarwal 1983, 49-50 and Appendix I]. In the case of partial specialization or semisubsistence family farming - when only a part of the produce is marketed, the rest being consumed by the peasant family itself - no such clear-cut results can be arrived at, except if we are ready to make very special assumptions [ibidem, 50-51 ; Sen 1966, 436-37 ; Nakajima 1970]. This theoretical indeterminacy obtains whether we consider a model with a single product or with two products (plus leisure), and whether supply refers to output or to marketable surplus. In fact, as soon as we leave the standard and convenient world of pure commercial farms or agricultural *firms*, we are confronted with much more complex income and substitution effects. Take the income effect : an increase in the real income of a peasant family following a rise in the output price may not only induce it to consume more leisure (and, therefore, to work less), but also to consume more of the good produced and, other things being equal, to reduce its marketed surplus. Substitution effects go of course in the opposite direction : at a given real income, the peasant family would respond to a rise in the output price by increasing its work efforts, and by modifying its consumption basket so as to substitute the outside consumer good to the self-produced one (if at all they are substitutable, which is not to be taken for granted). From these considerations, it is apparent that the food marketable surplus will increase as a result of a favorable movement of the intersectoral terms of trade only if the structure of the peasant's preference between leisure, the agricultural self-produced good and the manufactured outside good is sufficiently skewed in favour of the latter. Note also that because of the role played by leisure the price-elasticity of the food market supply might be negative even in the case food is an inferior good [Maniquet 1987].

Economic theory does not therefore provide the upholders of the price-focused doctrine with the kind of decisive analytical proof they often give the impression to have in the back of their minds. Indeed, there can be no doubt that the situation of most African smallholders is much closer to the model of the semisubsistence farm - that is the model which leads to the most ambiguous analytical results - than to the model of complete specialization. This caveat should not be dismissed lightly on the ground

that since theory does not offer precise guidelines, we can forget about it. As a matter of fact, a good observer of the African scene has recently noted that a rise of income or output may prompt the smallholder in Africa not to increase his marketed surplus and to accelerate his capital accumulation, but to set apart for his own consumption a larger part of his produce and perhaps to shift to the production and consumption of a "superior" crop (e.g. rice instead of millet) [Coquery-Vidrovitch 1985, 158]. For another thing, historical accounts of the experiences of both USSR and China teach us that raising food producer prices may be a counterproductive strategy. This happens because the peasants, when they start from a very low level of living, tend to respond to an increase in their real income by retaining a larger proportion of what they produce. Attempts at bettering the standard of living of the mass of individual peasant families may thus result in a decrease in the food marketed surplus, a difficulty which does not arise with estate capitalist or collective farming. Here is a very vexed dilemma of which the Communist leaders of the USSR and China were well aware and which gave rise to hot debates within the Communist Party's structures [Kemp 1983, chaps 3 and 5].

The experiences of the USSR and China apparently also confirm the hypothesis advanced by T.R. Malthus and J.S. Mill [see Platteau 1978, Vol. 2, 431-40, and 1987] according to which the best way to induce the peasants to part with more of their produce lies in increasing the output and the range of consumer goods at prices which they are willing to pay [Kemp 1983, 55]. In this case, note that dynamic changes usually occur in the preference functions of the peasants and that a comparative-static framework of analysis is no longer adequate to analyze the effects of changes in output prices. However, by deciding to step up the output of consumer goods or to allocate more foreign exchange to the import of such goods, the government is only replacing one development dilemma by another. In fact, it chooses to slow down the pace of capital accumulation and economic growth in order to increase food market deliveries.

Finally, reverting to a comparative-static framework, it is worth stressing that the impact of agricultural price increases on agricultural production and market sales may be seriously affected by phenomena of rationing of consumption incentive goods. In the extreme case where the shortage of these goods is so acute that the marginal utility of money is zero, agricultural market supply would be completely price-inelastic even if farmers have a strong aversion for leisure. In the context of some poor countries of sub-Saharan Africa, this assumption is not as implausible as it might appear at first sight. In Guinea Bissau, for example, the dramatic collapse of agricultural exports (mainly oilseeds) and marketed surplus of food crops (mainly rice) in the late 1970s and the early 1980s was to a large extent the result of the reluctance of the peasantry to produce any

surplus for the market in a context of severe scarcity of consumption goods⁽¹³⁾. The only regions in which Guinean farmers or fishermen continued to produce marketed surpluses were located along the northern border and off the Atlantic coast, that is in areas where a contraband trade had developed with the Senegalese which was difficult to check by the Guinean authorities. The same kind of acute scarcity of consumption goods prevails in other African countries as well (Ghana, Mozambique, Sierra Leone, Tchad, Benin, Tanzania, Zaire, ...). In Mozambique, it resulted in food marketed surpluses being so low in the beginning of the eighties that many state employees had to take to part-time agricultural occupations to be able to meet their subsistence needs. In countries which have no domestic industrial base and where most consumer goods must therefore be imported, a vicious circle is at work when they are subject to tight balance-of-payments constraints. Indeed, since there is not enough foreign exchange and not enough consumer goods offered for sale in the local markets, peasants are not interested in producing export crops or food crops above their own subsistence needs. As a consequence, the government will have to import more food to feed the urban dwellers at a time when its export revenues are at a low level. Its foreign exchange deficit deepens and the macroeconomic situation continues to deteriorate. The above process is a rather accurate description of what actually happened in countries like Guinea Bissau and Mozambique in the late seventies and the early eighties.

The real African challenge and the role of technical change

To put the price-focused doctrine in the right critical perspective, one has only to remember the real challenge that Africa will have to face up to during the coming decades. In the words of C. Eicher : "Agricultural production must be doubled from the 1970-84 average of 1.8 percent to the 3.6 to 4.0 range in order to match the annual growth in food demand arising from population growth (3.2 percent) and increase in per capita incomes" [Eicher 1986b, 36]. Even if we make the absurd assumption that a price hike can succeed in doubling the rate of growth of agricultural output in the short term, it is plainly evident that no amount of price policy will ever succeed in sustaining such a high rate of agricultural growth over a period of several decades. On the best assumptions, raising real prices of agricultural goods may enhance their output and, hopefully, their marketed surplus, but this will be essentially a once-for-all effect which is not likely to lead to the continuous increases Africa desperately requires for a long time to come. Mellor and Delgado have actually warned that in most African countries, such once-for-all effects have already been largely exhausted : "further increases in food prices where they have been already rising rapidly are less critical than often is supposed" [Mellor and Delgado 1987, 4]. And another author has emphasized that "if there is no moderni-

sation policy making it possible to increase yields, supply can be relatively inelastic in spite of an increase in real prices" [Morrisson 1985, 71].

It can even be argued that, *in the absence of technical change*, increased real prices could cause a decline of agricultural production *in the long run*. In the circumstances negative long-term price elasticities of agricultural supplies would result from an overexploitation of fixed land resources. In the short term, the cultivators would assumedly respond to a price rise by putting more land into cultivation. If this extension takes place through a shortening of the fallow period, the fertility of the land would gradually decline and, after a certain time, the initial increase of output on the fallow lands would be erased by a fall in the average land productivity in the area around.

To get out of this trap, either large investments beyond the scope of smallholders will have to be undertaken to reclaim or rehabilitate uncultivated lands, or land-augmenting technical progress will be needed. If labour is scarce, and/or if rural standards of living are to be lifted, technical change will also have to enhance labour productivity. *Continuous* upward shifts of agricultural production functions must therefore be generated in Africa for her agriculture to be able to meet the challenge before her : price policy considerations will be secondary to this crucial requirement. In fact, as the experience of India during the period 1975-76 to 1983-84 shows, agricultural production and investment may well increase rapidly *in spite of* internal terms of trade turning against the agricultural sector [Tyagi 1987, 30-36]. For this situation to occur, all what is needed is that "productivity rises at a rate faster than the rate by which the terms of trade move against the agricultural sector" [ibidem, 34]. This can happen when rapid technical advances are being made, or when past progress is spreading out to new areas⁽¹⁴⁾. Neither of these two conditions were satisfied in India between 1952-53 and 1963-64 and, as a consequence, adverse movements of net barter terms of trade during this period resulted in slow growth of agricultural production and investment.

Now, to contend that agricultural production may increase despite adverse movements of intersectoral terms of trade does not imply that agricultural prices should not be raised. A reasonable position would apparently be to argue that to ensure adequate food supplies under conditions of rapid population growth, what is needed is a balanced package of technical change and incentive prices [Krishna 1984 ; Timmer 1986]. There are two serious arguments in favour of policy interventions to raise food prices. First, higher prices may be expected to accelerate agricultural growth by facilitating investment and setting in motion autonomous processes of change. Second, higher prices can be defended on equity grounds since they would have the effect of increasing the real

incomes of the smallholder producers among whom most poor people in Africa are recruited. However, there are problems with both arguments which tend to make them much less effective than they appear at first sight. For one thing, because of the *relatively* egalitarian structure of agricultural holdings in Africa (compared to Asia and Latin America), returns to agriculture are generally low and "accumulation is difficult in the absence of specific policy interventions to this end" [Delgado, Mellor and Blackie 1987, 6]. For another thing, it must be borne in mind that the effect of agricultural price increases on the producers' real incomes is proportional to their net sales. As a consequence, a price reform is likely to favour comparatively rich farmers while leaving the real situation of poor, quasi-subsistence, smallholders almost unaffected. There is yet another consideration that may run against raising food prices. This is the classical argument of D. Ricardo according to which rising prices for wage goods tend to slow down nonagricultural growth by causing upward pressure on money wages. Because of the (presumed) ensuing erosion of industrial profit margins, both the incentive and the ability to invest would be dampened, the former because the returns on industrial investments are reduced and the latter because the pool of profits is narrowed [Mellor 1968, 27].

A few question marks on the presumed fiscal oppression of agriculture

It is a proposition currently encountered in both the orthodox and the Marxian literature that African farmers are squeezed by the state. All the blames for the stagnation of agricultural production are then laid upon the price and fiscal policies pursued by most African governments. What deserves to be pointed out, however, is that the evidence adduced in support of this thesis is usually far from satisfactory. In particular, evidence of heavy tax burden on agriculture is no convincing proof that this sector is discriminated against. Indeed, as U. Lele has reminded us, "given agriculture's importance in the GNP, it is natural that the agricultural sector should constitute the major source of government revenues and that governments should control internal agricultural trade to generate revenues" [Lele 1985, 164]. A balanced picture of the fiscal treatment of agriculture can be obtained only if we have a rather precise idea of the direction of the intersectoral public capital flows.

In actual fact, when we look at the overall balance between receipts from direct and indirect taxes and government expenditures in agriculture, we do not find that the agricultural sector has been systematically overtaxed in Africa [Faucher and Schneider 1985, 61 ; Morrisson 1985, 72]. S. Berry probably comes close to the truth when she writes that "postcolonial governments have vacillated between extracting surplus from farmers and subsidizing them" [Berry 1984, 80]. Nevertheless, it must be admitted

that in the above judgments or calculations, no account has been taken of invisible resource transfers, particularly those which are achieved through movements of the internal terms of trade. Furthermore, estimates of total intersectoral capital flows (whether on public or private account, or both) are not available for Africa. Now, even if reliable estimates existed pointing to systematic net resource transfers from agriculture to the other sectors of the economy, there would still remain the problem of determining the normative criterion on the basis of which such transfers could be regarded as inappropriate or socially inefficient. The question cannot be avoided since "surplus extraction from agriculture is clearly not always contrary to the interests of the society, nor even to the long-term interests of the peasantry" [Bienefeld 1986, 7].

To discuss this issue is clearly beyond the scope of this paper. Suffice it to say here that a more or less general feeling is that "far fewer resources are plowed back into agriculture by most African countries than would seem justified" [Lele 1984, 440]. Such a feeling is usually grounded on comparisons of the shares of agriculture in the national budgets as between Africa and Asia. Thus, for example, it appears that independent African states have commonly invested only 5 to 12 percent of their public development expenditure on agriculture while India's public sector expenditures on agriculture ranged from 23 to 27 percent over a considerable span of thirty-two years (1951 to 1983). Estimates of roughly the same order obtain for Malaysia over the years 1971-85 [Eicher 1986b, 38-39 ; see also Eicher and Mangwiro 1986, 17-21 ; Lele 1984, 440 ; FAO 1986, Appendix I, chap. 3, para. 10-13 ; Lipton 1987, Table 16.1, 214-16]. In fact, increasing the net flow of resources to agriculture can be justified on the grounds that, for reasons that will be explained later, agricultural technology development in Africa will be a costly process. Moreover, such an increase could help build up the basis from which sizeable net transfers of resources from agriculture to other sectors will be possible in the future [see Mellor 1984]. In the short and medium run, however, it will prove very difficult to give effect to this policy reorientation because the international environment is highly detrimental to the interests of Africa [Colclough 1985, 32]. A situation of falling agricultural prices, rising public sector deficits, mounting debt repayment obligations and flagging commitments of foreign aid is hardly one in which substantial reductions of tax rates on agriculture (particularly on export crops) or significant increases in public expenditures on food production are easy to enforce politically and economically.

A final remark is in order. If sufficient attention is not paid to considerations of allocative efficiency in the process of planning public expenditures for agriculture, net intersectoral resource transfers in favour of this sector will not succeed in ensuring its long-term self-sustainability.

This issue is especially relevant in sub-Saharan Africa where there are at least three important ways in which public resources for agricultural development have been inefficiently allocated under the joint responsibility of local governments, bilateral donors and international aid agencies. First, following the colonial pattern of priorities, a disproportionate share of the agricultural national budgets has been devoted to promoting a few export crops. As will be explained later, food crops have been correspondingly neglected in terms of extension, research, marketing arrangements and public investments⁽¹⁵⁾. Second, a large part of these budgets in many countries has been spent on subsidies (e.g. subsidies on the price of fertilizers), presumably to compensate for high rates of taxation. As a result, investment expenditures have been kept at a rather low level⁽¹⁶⁾. Third, government resources have been excessively concentrated "on a subsector of relatively large-scale farmers" [Johnston 1986, 163], as well as on large-scale, capital-intensive, enclaved and mostly unprofitable ventures, such as state farms, big land settlement schemes, large-scale and ill-conceived irrigation projects, public cooperatives, agro-business corporations, large-scale ranches equipped with sophisticated infrastructure, ...⁽¹⁷⁾. Incidentally, this shows that it is not very meaningful to talk about *general* exploitation of agriculturalists in Africa. A small number of large private farms - owned by privileged farmers, wealthy businessmen or by state employees - have often been provided with generous loans, subsidies, infrastructure, and technical assistance [Berry 1984, 80].

3. Conclusion

To sum up, the real challenge confronting African agriculture today is not so much that of finding new political coalitions prepared to reverse "faulty" pricing policies. It is much more to solve the problem of how to generate technological improvements on an endogenous basis and how to spread it out as fast as possible to large areas of the continent. This is not to say that a congenial price environment is unnecessary for that purpose : too low prices for agricultural goods can indeed hamper agricultural growth by diverting resources to other sectors, by inducing the farmers to consume more leisure, and by discouraging investment in agriculture and the adoption of technical innovations (since real returns are low and the savings pool is restricted). But it must be clearly realized that most aspects of the technological breakthrough of the kind needed in Africa today will not be price-induced. As Raj Krishna has put it, the price regime "cannot by itself explain the evolution of basic scientific knowledge and the level and growth of public investment in research, extension, infrastructure, and human capital ..." [Krishna 1984, 170]. Therefore, "the task of accelerating agricultural growth is primarily technoorganizational" and the main aim of price policies should be to avoid retarding or frustrating the main techno-

organizational effort [Krishna 1970, 190].

Technological change, *up to a certain point*, can arise from the initiative of the farmers themselves. Yet, the cultivators' dynamism can obviously not be expected to produce agricultural innovations at the pace required. If increasing pressure on land resources can lead to adaptive technical changes when the rate of population growth is moderate, population-led agricultural growth of the type analyzed by E. Boserup [1965 and 1981] is not a reliable mechanism when population expands rapidly, say, at more than 2 percent per year [Eicher 1986a, 15]. In the same way, even though we know that peasants are able to respond positively to profit opportunities when the latter are not too risky, there is far less evidence that they can take appropriate decisions when their environment begins to change dramatically and quick responses are called for [Mellor 1970, 217].

In view of the above, the new technology and the institutional innovations that go hand in hand with it will have to be produced by the state as public goods [Lele 1985, 161-62], and as part of a science-based agricultural development strategy. It is in this perspective that the problem of the African state must be looked at and that the urgent need to develop efficient bureaucracies must be assessed. The removal of technological, institutional and internal market constraints is the primary objective that should serve as a guideline for identifying the reforms required in the organizational structure of the African countries. The main problem with a doctrine concentrating on short-term pricing policy considerations is precisely that organizational and structural issues are too much neglected [Brett 1986, 22].

IV) The Role of Supply Factors : Structural Constraints and Handicaps

When attention is excessively focused on issues of short-term pricing policy, there is an almost inevitable proclivity to ascribe the present difficulties of African agriculture to "mistakes" or errors currently made by the local governments. By the same token, the natural constraints Africa is ridden with and the structural problems she has inherited from her historical past tend to be neglected or downplayed. This is particularly evident among orthodox or neoclassical economists who feel more at ease with short-term macroeconomic problems than with long-term issues which often involve many non economic aspects. Such a neglect is especially regrettable since, as we shall see below, Africa is confronted with structural constraints and handicaps - i.e. growth-inhibiting factors or barriers which cannot be easily removed or will never be eliminated at all - that put her at a clear disadvantage compared to other regions in the Third World. Therefore, whenever comparisons are attempted between Africa and these other regions - e.g. when the transfer of the Asian technology of Green Revolution to Africa is contemplated - it is absolutely essential that these structural differences be borne in mind. Any strategy of agricultural development which does not take them into account is doomed to failure.

In the remaining part of the paper, attention will be restricted to such structural constraints and handicaps that appear to have an important bearing on the present food situation in Africa. As a matter of fact, they involve quite varied aspects which go from soil conditions and water accessibility to land tenure systems and political dysfunctioning, through population densities, technological and infrastructural factors. Wherever possible, explicit comparisons with other Third World regions, particularly with Asia, will be made.

1. The effects of a wide dispersal of the population

Comparative evidence on population sparsity

A striking demographic feature of Africa is her combination of low population densities and low urbanization rates which make for a very scattered population. This is at variance with the situation observed in Asia where the density of population is very high in most areas ; and with that observed in Latin America where comparatively low population densities are counterbalanced by a well concentrated pattern of population settlement (particularly in the coastal areas).

In the middle of 1984, the density of population was around 110 persons per square kilometer in Asia (excluding the Arab oil-exporting

countries except Iran and Irak) ; 19 persons in Latin America ; and 18 persons in Africa, the latter figure being a weighted average of a density of 24 in sub-Saharan Africa and a density of only 15 in North Africa. In Africa, population densities ranged from 8 persons per square kilometer in Somalia and Sudan to 104 in Nigeria, which is in sharp contrast to densities of 178 in the Philippines, 228 in India and 681 in Bangladesh⁽¹⁸⁾. On the other hand, the percentage of total population living in cities was 28 percent in sub-Saharan Africa in 1984 (as against only 16 percent in 1965) while it exceeded 40 percent in all Latin American countries and worked out to as much as 83 percent in Chile, 72 percent in Brazil, 85 percent in Uruguay and 84 percent in Argentina [World Bank 1986b, Table 31, 240-41]. Finally, it is important to bear in mind that most African countries are small from the standpoint of their population base : more than half of them had actually fewer than 5 million people in the beginning of the 1980s [Eicher 1984, 454].

An immediate and obvious implication of the scattered pattern of population settlement in Africa is the high per capita cost of providing roads, railways, health, schools, agricultural and other services to the population. Since this issue is quite important and often neglected in the literature on the African food crisis I will look at it a little more closely, trying to highlight several ways in which it affected the history of Africa and determined certain policy choices made by modern African governments.

Looking back into history

When populations are much scattered as in Africa, there is little scope for labour specialization and market development : rural families tend to produce themselves all or most of the products which they need, roads or waterways remain undeveloped, and large amounts of natural resources remain out of reach of an existing transport infrastructure. E. Boserup has reminded us that before the arrival of the Europeans there was practically no labour specialization in the sparsely populated areas of Africa. North Africa and parts of West Africa (most notably, the medieval empires of the Niger bend) seemed to be the only important exception with their long experience of trade (including long-distance trade) in agricultural and nonagricultural goods [Boserup 1981, 146 ; see also Giri 1983, 15-41 and Bates 1984, 240-41]. On the whole, it can therefore be said that, in contrast to the situation observed in Asia and Latin America, large parts of Africa entered the nineteenth century with no transport infrastructure worth the name, with no indigenous merchant classes accustomed to money transactions and urban life, and with no ancient traditions of bazaar trade, "preindustrial urbanization" and specialized craftsmen. Also, as a result of lack of product specialization and limited exchange of goods, agricultural technologies remained rudimentary, socioeconomic differentiation or strati-

fication failed to develop to any significant extent, and the dominant culture tended to reflect peasant values rather than forming a distinct "elite culture" [Fallers 1961, 110 ; Hyden 1986, 54-55, 57 and 78, note 10]. Moreover, in a number of areas politically structured in empires or kingdoms, Africa's failure to acquire technological advances was reinforced by the fact that its rulers sustained their regimes by appropriating surpluses from long distance trade and not by promoting agricultural development. As a consequence, "African societies south of the Sahara never developed the institutional mechanisms that tied rulers to a system based on the exploitation of land" as happened in Europe and Asia and, in particular, African precolonial cities "were not productively linked to their rural hinterlands" [Hyden 1986, 54 and 69].

The colonial episode has further reinforced the above handicaps of Africa. For one thing, the sparsely populated colonies got very few railways : "only the Union of South Africa with mass immigration of Europeans had more than six meters of railways per square kilometer in 1970, and six countries had no railways at all" [Boserup 1981, 148]. Moreover, "two-thirds of the African railways built in the colonial period connected mines to a coastal harbour" [ibidem]. This was the natural outcome of a colonial policy grounded upon criteria of short- or medium-term economic profitability since railway building was usually uneconomic in the sparsely populated areas of Africa except when it could be economically justified by the existence of rich mineral deposits. As a consequence, "in most of the African continent, cultivable land, forests, and mineral deposits were not utilized. The sparse population outside the small enclaves of colonial development had the choice of remaining subsistence producers or migrating, assuming that they were not removed by force or prevented from migration by police measures, as often happened" [ibidem, 148-49]. With the truck revolution a cumulative bias actually developed in large parts of the continent. As a matter of fact, areas with small and sparse populations were bypassed by road building because it was not profitable to transform them into areas of cash cropping and there was little incentive to construct roads in regions without railways with which to connect them. To sum up, "the skewing of the transport system in favour of the enclaves continued to be an important feature in the sparsely populated hot colonies" of Africa [ibidem, 150]⁽¹⁹⁾.

For another thing, the policies pursued by most colonial governments and administrations did not encourage the formation of an indigenous merchant class nor that of indigenous skilled craftsmen. In fact, if we except North Africa, coastal West Africa (where mercantile communities were established for a long time) and parts of coastal East Africa (where Zanzibari and Swahili planters were involved in economic intermediation), virtually all the petty trading in urban and rural areas was

handled by immigrant communities coming from regions with urban and commercial traditions (Lebanese, Indians, Greeks, Portuguese, Syrians, ...). And all the other skilled occupations which the indigenous population lacked abilities to fill were equally exercised by foreigners and "ethnic entrepreneurs" [ibidem, 152 ; Young 1986, 28]. In many instances, however, the colonial governments positively prevented the spontaneous emergence or development of private traders and small entrepreneurs by contracting directly with indigenous village chiefs for the recruitment of labour and the procurement of cash crops, possibly through cooperatives effectively controlled by the colonial governors. These indigenous chiefs were usually made a more or less explicit link in the colonial administrative structure [see *infra*, section 6]. Therefore, when the trade functions were not performed by foreigners or exercised by intermediaries subjugated to foreign interests, they were often bureaucratized and placed under the strict control of the colonial authorities.

Thus, C. Coquery-Vidrovitch has noted that in Equatorial Africa "capitalism intruded at one go, under the then relatively completed form of colonial capitalism, and it did not at all try to strike a bargain ; during the years 1885-1910, there has been no attempt on the part of the Western countries to raise up, encourage or utilize an indigenous 'middle class', quite to the contrary" [Coquery-Vidrovitch 1985, 130]. In the case of the British colonies in Africa, we are told that "the eschewing of private enterprise, and the promotion of state agencies to expand colonial production, provoked little or no antagonism from within the British state apparatuses", and one reason advanced by the Colonial Office towards vindicating this policy was that "colonies ought not to be exploited by private enterprise" [Cowen 1982, 150 ; see also Bézy, Peemans et Wautelet 1981, 9-47 for the case of Belgian Congo and Gentil 1986, 35-36 for that of Western Africa]. For C. Young, it is clear that "Generally, the new colonial economy required destruction of intra-African trading systems which were not Europe-oriented and the capture of their resources" [Young 1986, 28].

There is also much evidence to show that in commercial and other matters the policies followed by the colonial states were strongly influenced by the interests of the dominant European companies. As a matter of fact, it is usually when those interests became threatened by the active competition arising from the petty trading sector of ethnic immigrants (and, more rarely, of small indigenous merchants) that the colonial administration extended its control over the sphere of circulation (marketing, banking, services). It is at the behest of a foreign merchant class with which it often colluded that the colonial state initiated Mercantilist policies designed to control competition and to give monopoly powers to a small class of vested economic interests from the West. Even the creation of state marketing boards was sometimes used to maintain

very high profits for the expatriate marketing sector, thus destroying the bargaining power of the independent local small-scale traders [Brett 1973 and 1986, 23-24 ; Bezy, Peemans et Wautelet 1981, 23-26 ; Berry 1984, 79-80]. Sometimes also, marketing board monopolies were conceived by colonial authorities as taxation devices intended for capturing profits from price booms (notably during the prolonged commodity boom of the fifties). Thus, in a number of countries, the surpluses earned by those boards were automatically transferred to the state capital account [Giri 1986, 67-68 ; Young 1986, 33].

It is clear that independent African states have inherited a number of problems which have their roots in the considerable scattering of their populations over huge land areas and which have only been exacerbated during the colonial period. First, there is the problem of the racial tensions and latent or open rivalry between the indigenous communities and the immigrant middle-classes. By monopolizing the access to all jobs requiring a minimum amount of skill, the latter have prevented the former from entering into contact with modern technology and from experimenting new ways of thinking and calculating in an environment increasingly dominated by market forces. A considerable gap, both technological and educational, thereby developed between the two groups, undermining the social cohesion of the whole societal fabric [Boserup 1981, 152]. Furthermore, it is against this background of sharp ethnic division of labour that the hostility of many African governments towards private trading (easily equated with speculative, exploitative and antisocial practices) and the free play of market forces can be properly understood [Lele 1976, 297 ; Johnston 1986, 174]. The administrative approach of many colonial governments to trade and commerce is another powerful factor that helps explain the numerous attempts of modern African states at extending their control on domestic purchases and sales of both agricultural and nonagricultural goods. The influence of this historical antecedent was, however, greatly reinforced by another circumstance pinpointed by S. Berry : "The fact that most postcolonial regimes in Africa took office under pressure - from below, above, and within - to take responsibility for developing their economies meant that they were obliged to adopt an interventionist stance toward economic activities and institutions" [Berry 1984, 67 ; see also Young 1986, 32].

Second, postcolonial governments have taken over from the previous rulers a highly skewed, export-oriented, transport network. Most of the population remained isolated from potential markets and sources of supplies "by large empty spaces without infrastructure for modern transport". In this context, many rural families continued "to keep a low labour input in agriculture" and "to have a high degree of self-sufficiency of both agricultural and nonagricultural products" [Boserup 1981, 150]. Consequently, the emergence of specialized craftsmen at the village level

was further delayed. In addition, no link was built up between urban and rural areas and "the imports of European manufactured goods and of products from the lands of origin of the urban middle class acted as a formidable obstacle to development of urban crafts and industries" [ibidem, 153]. Rural areas devoted to cash cropping exported their surplus production instead of growing food to meet the demand of expanding cities.

A hard but inescapable dilemma

In actual fact, the above description fits in rather well with the present situation of many African countries. Rather than counteracting tendencies initiated in their past histories, independent governments have often followed in the footsteps of their colonial predecessors by reinforcing the "enclave" character of their economies and by developing a host of "urban biases". Even today, most African countries have but a small fraction of the roads per square land area that are found in India and in so many other countries of Asia and Latin America [Mellor and Delgado 1987, 4]. For another thing, U. Lele has remarked that investments in the road system have been greater in countries like Kenya and Malawi than in many other African countries with lower population densities and more inadequate transport facilities : thus, road mileage per square mile of land area is only 0.02 in Sudan, 0.1 in Zambia, and 0.15 in Zaire, compared with 0.23 in Kenya and 0.31 in Malawi [Lele 1984, 445]. But U. Lele ought not to be surprised at this : African governments are only following the same logic - the logic of economic profitability - as the previous rulers of Africa. Indeed, sparser populations tend to make the building up of transport systems a more uneconomic proposition since the market potential and the frequency of exchange transactions are comparatively lower.

The fact that in Africa human settlements remain small and very much scattered in spite of a tremendous demographic acceleration during the last decades goes therefore a long way towards explaining the major infrastructure deficiencies and the profoundly unbalanced pattern of spatial development commonly observed in this continent. A vicious circle and an unequalizing process of cumulative causation of the type analyzed by Myrdal [1963] are evidently at work :

- transport networks are comparatively expensive to build in sparsely populated areas ;

- labour emigrates from these areas, sometimes alongwith their families sometimes not, to improve their conditions of living and to find better work opportunities in more densely populated areas ;

- as a result, the former regions get further depleted of their population and the per capita cost of constructing new lines of communication further rises ;

- due to poor transport systems, the per capita cost of providing various services (health, school, agricultural extension, ...) to the population is correspondingly enhanced.

Because of this process, entire rural regions are increasingly marginalized and vast amounts of potential food production get possibly lost.

Many authors have pointed to inadequate rural infrastructures as a crucial factor responsible for the slow growth of food production in Africa, and they have underlined the consequent need to expand the transportation network to and from the isolated rural areas. Thus, Mellor and Delgado have recently expressed the opinion that "improved rural roads are probably the single most important factor in transforming rural Africa" since "more and better roads would improve the delivery of farm inputs to and farm products from the widely dispersed smallholder population" [Mellor and Delgado 1987, 4]. The dominant literature of today, which emphasizes the commendability of "small farm" or "unimodal" strategies of agricultural development [Johnston 1986 ; Johnston and Kilby 1975 ; World Bank 1981 and 1986b], takes a position very similar to that expressed above. What needs to be stressed here is the simple truism that, though commendable it may be on various theoretical grounds, such a strategy is especially costly and difficult to implement when rural populations are widely dispersed. It is true that village labour could be more intensely mobilized to build up feeder roads in rural areas. Yet, as long as the latter cannot be connected with a national all-weather transport network, their usefulness will remain quite limited [Lele 1984, 450].

There is a serious dilemma here and by bypassing it one runs the risk of indulging into wishful thinking, a luxury which African governments can certainly not afford themselves. In fact, a number of strategic orientations chosen by them and often regarded as irrational or absurd can be explained on reasonable grounds when the scattered pattern of human settlement in Africa is taken into consideration. The oft-noted preference of the African authorities (and, to a large extent, of the big donor agencies from the West) for large-scale agricultural projects is a case in point. Indeed, such projects allow for a heavy concentration and neat phasing of the government's efforts and avoid the wastes inherent in the sprinkling of these efforts over large, sparsely populated, areas. Moreover, the wide dispersion of African smallholders makes for high risks of leakage of revenue and for heavy administrative costs of revenue collection per unit of money gathered by the taxation bureaucracy. In this context, centralized marketing boards are attractive since they enable the state bureaucracy to pass over to the peasants part of the administrative costs of revenue collection : indeed, peasants are forced to bring to some central point, and

to bear the corresponding costs of transportation, the produce upon which implicit or explicit taxes will be levied. Large-scale agricultural projects and state farms also offer the advantage of relatively easy taxability [see supra, 17-18].

The above considerations are bound to play a crucial role when the state machineries are new, inexperienced, and short of skilled revenue officers, as is certainly the case in many countries of the African continent. The fact that numerous large-scale agricultural projects and parastatals turn out to be actually ineffective and wasteful of scarce resources only adds to the complexity of the African situation⁽²⁰⁾. But it should not lead one to believe that the smallholder-focused strategy of agricultural development is automatically and unambiguously cost-effective as compared to other approaches which give more emphasis to economies of scale and concentration gains. There are clear cases where it would be more economical to reform large-scale projects or state integrating agencies than to wind them up altogether and to rely completely on private decentralized initiative. Thus, for instance, small irrigation schemes along the river Senegal are too much dispersed to make private mechanical workshops for the maintenance of tubewells economically profitable. Services have therefore to be provided by the SAED, the parastatal entrusted with the task of organizing and running large-scale irrigation works in the area.

2. Handicaps on the natural resources front

From her low population densities (at least when compared with Asia), can one infer that Africa is a land-abundant continent ? After all, contrary to what was observed in Asia and Latin America, most of the output gains in Africa during the last decades resulted from an extension of the agricultural frontier⁽²¹⁾.

Today, however, there is enough evidence to show (1°) that this frontier has been reached in a large number of countries or (2°) that in many instances it would be more costly to bring new lands into cultivation than to intensify production on existing agricultural (or pasture) lands. Moreover, Africa is handicapped by difficult climatological and soil conditions whereas with respect to water potential and scope for efficient water management, she is also at a clear disadvantage compared to Asia and Latin America. Let us now examine these various aspects of Africa's land and water resources in greater detail⁽²²⁾.

Land reserves

A recent study has revealed that, given the existing technology, Africa's base of cultivable land resources could enable her to feed her

whole population in the year 2000 if only massive population movements would be allowed for [FAO 1986, Annex II, chap. 7]. This is of course a completely unrealistic assumption. When attention is drawn to the situation of individual countries, the picture that emerges is quite different because land resources are inequitably distributed across the African continent. Thus, it appears that 21 countries are virtually unable to become food self-sufficient if no technological change is introduced in their agricultural sector. By the end of this century, their number would have risen to 28 even assuming that all their arable lands have been brought under cultivation [FAO 1984 and 1986, Annex II, chap. 7].

As Eicher has remarked, it is time "to shelve the misleading cliché that Africa is a land abundant continent" and "to stop thinking of African countries as if they were all the same" [Eicher 1985, 94-95]. In fact, only about one-third of the continent can be classified as land abundant (Sudan, Zaire, Cameroon, Guinea, Sierra Leone, Zambia, Mozambique and Angola), and in these countries, "seasonal labor shortages, not land, will be the major constraint on expanding production" [ibidem, 95]. Of the total land reserve of Africa (estimated at 603 million ha), a large part (75 percent) is located in two regions : humid Central Africa and sub-humid and semi-arid Southern Africa. It is also noteworthy that 75 percent of the land reserves in the Sudano-Sahelian region are located in one country, Sudan [FAO 1986, Annex II, chap. 6, para. 6.13].

Another one-third of the African countries are in semi-arid areas where the land frontier is rapidly being exhausted (e.g. Senegal, Niger, ...) and the remaining countries (again one-third of the total) are in a land scarce environment where the frontier is already exhausted (e.g. Rwanda, Malawi, Burundi, ...) [Eicher 1985, 95]. In fact, Africa offers the contrasted picture of large, but very unequally distributed, land reserves coexisting with huge land masses that are and will always remain inhospitable to farming. Around one-third of Africa's soils are too arid to permit any kind of cultivation and 42 percent of land surfaces are made of either desert or sandy soils (21.8 and 20.3 percent, respectively). Furthermore, almost half of the African continent is completely unsuited to direct rainfed crop production because the lengths of growing periods are too short (less than 75 days), and only 30 percent of it is well suited climatically to the rainfed production of millet, sorghum and maize, the staple food crops [FAO 1986, Annex II, chap. 2, para. 2.7 and chap. 3, Table 3.1].

The situation is made much worse still by the fact that in regions with significant land reserves - that is mainly in tropical humid Africa - there are very serious obstacles to the expansion of the agricultural frontier. These obstacles may arise from problems of land fertility and soil conservation, from operational difficulties regarding the reclamation and

the draining of the lands, and, above all, from health risks affecting both animals and human beings. In many parts of Africa animal trypanosomiasis is the most important constraint to livestock production and to the use of animal draught power in agriculture. The extent of the area affected, estimated at some 38 percent of the total land area of Africa, covers 37 countries where some 55 million livestock units are at risk. Trypanosomiasis also affects man (sleeping sickness) and since it virtually precludes human settlement on some of the best watered and the most fertile lands, it can really be considered as one of the major scourges of land development in Africa [FAO 1986, Annex II, chap. 6, para. 29-30 ; World Bank 1984, 102-103 ; Eicher 1986b, 18]. Unfortunately, the control of the vector - tsetse flies - is particularly difficult and, in all case, its success will depend on a high standard of management and follow-up monitoring, on effective public health research, on careful land use planning, and on the willingness of governments and aid donors to incur large expenditures⁽²³⁾.

To take two other examples, fertile river valleys are closed to human settlement because of the large-scale prevalence of onchocerciasis (river blindness), and schistosomiasis badly affects most of the African continent, particularly the Nile Valley and the countries immediately south of the Sahara, and in east and central Africa below the equator. As the experience of several water resource development projects has amply illustrated (Aswan Dam in Egypt, Gezira Scheme in Sudan, Volta Lake in Ghana, ...), any change in the aquatic component of the vector habitat (irrigation, water diversion or impoundment, ...) is likely to increase the prevalence of schistosomiasis drastically [FAO 1986, Annex II, chap. 6, para. 6.26-27 and Table 6.6].

Given the above constraints, it is not surprising that since the early 1960s, the amount of agricultural land per person in agriculture has gone down regularly in Africa [Cohen 1980, 358], and this despite rising rates of urbanization. The same constraints largely account for the fact that "despite the abundance of land relative to population, the number of hectares of cropped area per farm worker is small compared with that in other developing areas" [Paulino 1987, 35]. In the words of M. Lipton, much of Africa outside the Nile valley and Rwanda-Burundi "contains few persons per acre, yet many persons per efficiency unit of land" [Lipton 1987, 213-17].

Soil structure

Perhaps the most serious natural handicap of Africa lies in the highly fragile structure and poor physical characteristics of most of her soils. African tropical soils are often thin and depleted and, if they are easy to cultivate by hand (e.g. with a handhoe), they are not very productive

and they require long periods of time to recover after they have been farmed. These problems have to be traced back to the fact that a large part of the African continent is made of ancient geological strata which are strongly weathered. Soils are therefore easily degraded and washed away ; they present serious deficiencies of mineral salts and they are all the lower in plant nutrients as surface temperatures are very high [FAO 1986, Annex II, chap. 3, para. 3.7 and Annex IV, chap. 2, para. 2.4]. Lush vegetation conceals the low inherent fertility of much of the land in the humid tropics. On the other hand, Africa is also badly handicapped by her drought susceptibility : there is a high or very high expectation of drought over 60 percent of the continent, a problem which was less serious when populations were smaller and unlimited space was available [ibidem, Annex II, chap. 2, para. 2.21 and Table 2.4].

In fact, out of the six climatic zones into which Africa can be subdivided (on the basis of temperature and moisture, mainly), only two are relatively well fit for rainfed agriculture : sub-humid and mountain East Africa, and sub-humid and semi-arid Southern Africa. In the other regions, rainfed agriculture is only possible on a limited percentage of total land area [ibidem, Annex II, chap. 2]. Moreover, according to FAO, as much as half of Africa's rainfed cultivable land is marginal in quality. Only in regions with a reasonably wide range of moisture conditions, namely Mediterranean and arid North Africa and the afore-mentioned two regions, do marginal lands constitute no more than about one-third the extent of the total potentially cultivable rainfed area [ibidem, Annex II, chap. 6, para. 6.12].

As has been already noted, a very large part of the African continent is actually covered by sandy soils of various kinds, which soils are predominant in the semi-arid and sub-humid climates and present the characteristics described above (low content in plant nutrients, fragile structure, high susceptibility to wind blowing). In the humid areas the soils of tropical lowlands predominate "with their associated problems of acidity, low nutrient retention capacity, aluminium toxicity, low initial phosphate and potassium contents and a tendency to fix phosphate in forms unavailable to plants" [ibidem, Annex II, chap. 3, para. 3.7 and 3.8]. Even under high-level inputs, sandy soils and acid soils of tropical lowlands have low cultivation factors (corresponding to one or two years of cultivation in every five to seven years) as a result of low inherent fertility. Phosphorous and nitrogen are grossly deficient in many African soils while other nutrient deficiencies are also quite common, in particular potassium, sulphur, calcium and micro-elements such as zinc and copper. In the fertile soils of tropical highlands weed growth is often more critical than nutrient constraints. As for dark clay soils, they are difficult to cultivate because they are hard when dry, sticky when wet and prone to waterlogging. Their

tendency for compacting and hardening during the dry season results in high early season runoff and severely restricts pre-season and post-season cultivation [ibidem, Annex II, chap. 3, para. 3.11-29 ; Collinson 1987, 80]. Other physical limitations of African soils include : (1) very low structural porosity reducing root penetration and water circulation ; and (2) generally poor infiltration [Matlon 1987, 61-62].

To sum up, "there are practically no extensive areas or soils in Africa without limitations of one sort or another" [FAO 1986, Annex II, chap. 3, para. 3.34]. Perhaps paradoxically, conditions for agricultural production tend to deteriorate rather than improve with the transition from dry to wet climate [ter Kuile 1987, 97]. Some constraints are irremovable and must therefore be endured : thus, over the one-third of the continent covered by various soils of arid climates (including shallow soils, shifting dunes, saline, calcareous and gypsiferous soils), intensive development is generally not possible. However, in many cases constraints can be overcome through the farmers' own efforts, community development or government intervention and, more likely, through a mixed use of these three levels of intervention. From a technical standpoint, success in overcoming or removing these constraints will not be achieved unless appropriate soil management techniques are used which are carefully tuned to the specific characteristics of the agroclimatic environment. Land development or reclamation schemes will have to be grounded on careful analysis of soil structures, moisture conditions and temperatures [FAO 1986, Annex II, chap. 3, para. 3.9 and 3.34-38].

Land development in Africa is bound to be especially difficult not only because African populations are comparatively scattered (see supra), but also because the physical environment for agriculture (and cattle-raising) in this continent is marked by an exceptional diversity of agroclimatic and soil characteristics, of farming systems and socioeconomic conditions [Berry 1984, 60 and Johnston 1986, 159]. These highly diverse ecological (and socioeconomic) conditions are found even within individual countries and within small regions or sub-regions. Just to take one example, African soils have greatly varying abilities to supply and retain nutrients and to respond to fertilizer applications (be it through organic manures, mineral fertilizers or biological nitrogen fixation by leguminous plants). Due to such heterogeneity of environmental conditions and wide variations in farming (and livestock) systems by agroecological zones, rigid technical packages have absolutely no chance to succeed. The fact that only highly differentiated strategies of soil management and land development can form a sound basis for agricultural development in Africa makes technological progress a comparatively costly process and, in particular, it compounds to a considerable degree the administrative difficulties created by low population densities. Note that the huge losses resulting from pests,

plant diseases, rodents, grasshopper and bird attacks - the latter being a problem especially serious in Africa - can also be remedied only if they are dealt with in a selective way and at a much decentralized level⁽²⁴⁾.

There are other sources of great variability which are typical of Africa, particularly of semiarid areas. Thus, the crop-growing season is short compared to other semiarid-tropics with similar rainfall [Matlon 1987, 60]. As a consequence, the seasonality of labour input to agriculture tends to be very high in Africa, "not only absolutely but also compared to the semiarid tropics of South Asia" [Delgado and Ranade 1987, 118]. Moreover, interyear variability of rainfall is also very high in Africa and this has a considerable impact on agricultural activities in rainfed and traditional irrigation systems. A clear illustration of this is provided by the following example : in the Senegal river valley, the area cultivable under flood recession agriculture varies between 10,000 and 150,000 hectares depending upon the importance of the flood [Mathieu 1987, Vol. 1, 22].

Irrigation potential

Lipton has recently expressed the opinion that "over the next forty years, SSA [sub-Saharan Africa] cannot feed its people without massively expanding the irrigated portion of its cropland" [Lipton 1985, 75]. Unfortunately, compared to other regions of the world Africa has a lesser quantity of surface waters per unit of land area while at the same time suffering from greater evaporation. Large rivers like the Nile and the Niger cross vast tracts of interior marshlands (the Sudd in Sudan and the Niger delta) where considerable quantities of water get lost. Several other basins (e.g. the Lake Chad) are deprived of any outlet into the sea and lose the totality of their waters through evaporation or percolation [FAO 1986, Annex IV, chap. 2, para. 2.5]. There now seems to be a growing consensus that the irrigation potential of Africa is quite limited, in any case much more limited than in Asia, and that rainfed agriculture will remain the most important and most economical way to increase foodcrop production in most African countries [CILSS 1979, 162-67 ; Eicher and Baker 1982, 133-39 ; Lele 1984, 445 ; FAO 1986, Annex IV ; Matlon 1987, 65-69]. This is a clear handicap insofar as the potential yield increases that can be obtained from high yield varieties are in general considerably less under rainfed agriculture than under irrigated agriculture with generous application of fertilizers.

In Africa surface waters are distributed in a very unequal way and most water resources are not located in areas where aridity seriously limits production⁽²⁵⁾. Almost half of irrigable land areas are already abundantly watered by rainfall. Out of the remaining potential of 20-25 million ha, 9.5 million have actually been put under irrigation (between 38-47 percent), of which 6.1 million ha of modern irrigation, mainly under major government

schemes (above all in the Maghreb countries, Egypt and the Sudan) and 3.4 million ha of small-scale and traditional flood, swamp, surface and low-lift irrigation developed at the village or household level (above all in Nigeria and Madagascar). Whereas in India and Indonesia about 25 percent of the total arable land area is under irrigation, the corresponding proportion is less than 5 percent in Africa and it will take much time and efforts to raise it to its likely maximum of 10-14 percent. If in North Africa most of the irrigation potential is presently exploited, the same cannot be said of sub-Saharan Africa where as much as 88 percent of the potentialities are still being unused [FAO 1986, Main Report, chap. 2 ; Annex II, chap. 6, para. 16 ; Annex IV, i ; Paulino 1987, Table 2.8, 36]. It is therefore with respect to the latter, yet untapped, potential that one can speak with Lipton about the necessity for Africa to expand massively her irrigated croplands.

Such expansion must actually take place mainly in a group of twelve countries, eight of which have seriously restricted rainfed opportunities (the six Sahelian countries plus Kenya and Botswana), and four of which have a rainfed growing period of less than 120 days on more than a quarter of their territory (Chad, Ethiopia, Sudan, and Tanzania). Other countries with a sizable portion of their arable lands in the semi-arid zone (e.g. Guinea-Bissau, Nigeria, Cameroon, Angola, ...) also need to develop irrigation in their high-risk tracts [FAO 1986, Annex IV, chap. 6, para. 6.5-6.7]. Under all other conditions, according to FAO experts, first priority ought probably to be given to rainfed development because it "demands fewer scarce government financial or managerial resources ; less imported materials, fuel and equipment ; does not require profound social change ; and has a quicker impact". However, these experts admit, "irrigation may *eventually* become essential in these [remaining] countries, but in the short and medium term rainfed development is likely to be a better national strategy for food supply than large-scale modern irrigation" [ibidem, chap. 6, para. 6.2 ; for a similar position, see Spencer 1986, 217].

It is an unmistakable fact that access to water is much costlier and more problematical in Africa than in Asia : thus, for example, the unit cost of water is between two and three times as high in Africa as in India [FAO 1986, Main Report, chap. 2]. This is of course the basic reason why most irrigated lands are devoted to export crops (e.g. cotton, sugar cane and sugar beets) and to 'superior' foodcrops (wheat - essentially in North Africa - and rice - essentially in sub-Saharan Africa). With their low unit values subsistence crops cannot be profitably raised under irrigated agriculture⁽²⁶⁾. Note also that, *institutional and administrative problems apart*, traditional irrigation (including flood-recession farming systems, swamp drainage, and irrigation schemes under controlled submersion) is likely to be less cost-effective than modern irrigation with complete control of water. This is due to the fact that crop yields under traditional irrigation

systems are generally much lower and much more subject to wild fluctuations arising from natural hazards. At this point, it is interesting to mention a number of technical reasons which tend to make irrigation much more costly and problematic in Africa than, say, in Asia [ibidem, Annex IV, chap. 2, para. 2.6-8 and 2.37 ; chap. 5, para. 5.8-9] :

a/ High unit costs of imported capital and intermediate goods result from long distances and poor roads, particularly so in land-locked countries.

b/ Reservoirs and dams are often required to perform the essential function of stabilizing the erratic flows of many African rivers. Because of the central basement complex (shaped like a saucer) of the African continent, suitable dam locations will be found along the rim and these sites "usually require either considerable lengths of canal to bring the water to the irrigable areas or pumping".

c/ "Major flood protection dykes are often necessary for irrigation schemes. The lower costs encountered for irrigation in the flood plains in Asia are also due to the fact that such dykes already exist, having been built a long time ago".

d/ The distribution of irrigable soils "is often patchy, calling for complex water distribution and drainage networks with considerable land levelling where surface irrigation is concerned".

e/ Sources of groundwater are rather few (compared to Asia). Moreover, they are usually scattered and difficult to locate, and they do not replenish themselves easily. They are frequently found at great depths (more than 100 meters), and, as such, they are not suitable for developing cheap small-scale irrigation. Nevertheless, abundant shallow sources of underground water exist along the alluvial beds of some large rivers (like Nile, Niger and Senegal).

f/ African rivers - except those having their source in the younger geological strata of North Africa or mountain East Africa⁽²⁷⁾ - carry fewer sedimental matters than rivers in other regions of the world, particularly in Asia. Such deficiency accounts for the oft-noted fact that the fertility of irrigated fields begins to decline a few years after the completion of irrigation projects, thus making necessary to apply significant doses of mineral fertilizers to restore economic profitability [see Mathieu 1985a, for irrigation schemes in the Senegal river basin and 1985b, for schemes along the Niger in Mali]. As hinted at above, Asia is in a much more favourable position since her great rivers "get much of their water and alluvium from head-waters outside the tropics and carry a richer load of nutrient-bearing silt". Moreover, "the permanent snow cover of the Himalayas also represents an enormous resource for recharging underground aquifers, whereas the high rates of evapotranspiration in sub-Saharan Africa reduce significantly available water surpluses" [Eicher and Baker 1982, 134].

g/ Other problems arise from heavy clay soils which call for considerable mechanization, and from birds, grasshoppers and rodents which can cause tremendous destruction by attacking irrigated rice crops in the process of ripening.

Finally, possibilities of multiple cropping are far more limited in Africa than in Asia because of the much poorer waterholding capacity of soils in the former than in the latter continent [Matlon 1987 ; Delgado and Ranade 1987, 126-28].

Conclusion

The situation of Africa with respect to agricultural natural resources can be summarized in the following way :

a/ Africa still possesses considerable land reserves and uncultivated lands are often of high fertility (particularly those located in deltas, swamps and floodplains). However, these land reserves are very unequally distributed and they are largely inaccessible due to serious animal, plant and human diseases. This is in contrast to what obtains in other parts of the world where great civilizations of past millennia tamed the infested river valleys and coastal swamps through long-sustained measures of land reclamation and sanitization [Hart 1982, 101 and Bray 1986, chap. 3].

b/ A large part of the African continent (around one-third) is covered by various soils of arid climates. In these regions intensive development is usually impossible while prevention of degradation of the sparse vegetation is imperative on the desert margins.

c/ African soils are often fragile, shallow and depleted, and rainfed agriculture is only possible on a limited portion of the total land area which comprises moreover a good deal of marginal lands. In addition, soils in Africa have a very low waterholding capacity.

d/ Africa is characterized by an exceptional diversity of agroclimatic conditions, which further complicates the task of soil management. This is a crucial point since progressive intensification of use of land already cultivated will not be a viable strategy unless highly differentiated and very careful soil management techniques are applied under rainfed agriculture.

e/ In semiarid tropics the crop-growing season is very short and rainfall varies considerably on a year-to-year basis with dramatic effects on rainfed and traditional irrigation agricultural systems.

f/ The irrigation potential of Africa is rather limited, especially so if considerations of economic profitability are added to those of technical feasibility. In many countries rainfed development will remain the most

cost-effective way to increase food staple production, at least in the short and medium term. It is mainly in the Sudano-Sahelian belt and in a few other countries, - particularly so in deltaic plains and river valleys -, that irrigation development will be an essential element of future food strategies.

g/ Because of various technical reasons, the scope for comparatively cheap small- and medium-scale irrigation is much less extensive in Africa than in Asia.

h/ Large tracts of Africa's land are drought-prone, a problem which has become increasingly serious with the decline of the average annual rainfall observed in sub-Saharan Africa since the mid-fifties.

3. Retarded and biased process of technology generation

The lack of Green Revolution-type breakthroughs in African agriculture

In sharp contrast to other developing areas, sub-Saharan Africa has been characterized during the last decades by low and more or less stagnating per acre yields of many subsistence food crops. On an average, the yields of cereals in Asia and Latin America are presently twice as high as they are in Africa [Giri 1986, 59]. Worse still, in many African countries, yields of traditional foodgrain have declined, sometimes to a marked degree and for a large number of consecutive years. From the table below, a rough idea can be obtained of the comparatively poor performance of sub-Saharan African agriculture with respect to growth of yields per land unit.

TABLE 2 : Average annual percentage change
in yields of cereals, 1960-84.

	Years	Wheat	Maize	Rice	Millet	Sorghum
Developing countries	1960-70	3.54	2.47	2.20	3.19	3.53
	1970-84	3.87	2.91	2.44	0.13	1.43
East Africa (south of Sahara)	1960-70	2.28	0.96	1.10	1.11	0.68
	1970-84	2.73	-0.58	-0.42	-1.00	-0.90
West Africa (south of Sahara)	1960-70	1.10	1.76	0.15	-0.41	- 2.87
	1970-84	1.86	-0.26	1.55	0.03	2.31

Source : Adapted from World Bank, *Poverty and Hunger - Issues and Options for Food Security in Developing Countries*, Washington, 1986, Table B-3, p. 60.

Furthermore, recent evidence has shown a picture of little or negative per capita productivity change in the agricultural sector of many parts of the African continent [Paulino 1987, 23-28]. On an average (but not at the margin), productivity of agricultural labour seems to be significantly higher in Asia than in Africa in spite of much more acute land scarcity [Delgado and Ranade 1987, 122].

The factors responsible for such a disappointing performance are complex and not always easy to disentangle. There is no doubt, however, that an overwhelming cause lies in the absence of any significant dynamics of technical change in African agriculture. It is often the lack of new, and adequately tested, technical packages geared towards the needs of small farmers which has prevented them from increasing the productivity of their land and which has led them, in areas subjected to heavy population pressure, to break the fundamental rules of agroecological balance in extensive agriculture, and to cause the land fertility to decrease inexorably. Thus, a group of FAO experts have recently come to the conclusion that there are practically no technical packages ready to be transferred to African farmers with respect to most food crops under rainfed conditions, particularly in the Sudano-Sahelian belt. This is especially disquieting since "it is also in this belt that possibilities of extension of rainfed area under present practices are extremely limited" [FAO 1986, Annex IV, chap. 6, para. 6.3]. Moreover, lack of technical advances in conditions of increasing land scarcity and poor off-farm work opportunities tends to lead to decreasing levels of rural welfare. Indeed, *when technology is held constant*, intensification of land use following a decline in the amount of agricultural land per person in agriculture (e.g. through a move from shifting to permanent cultivation practices) is generally associated with increased labour requirements per unit of land area and, therefore, with diminishing returns to labour.

It would be absurd to envisage the production of new food technology only in terms of the sacrosanct trinity "seeds-fertilizers-pesticides". There are apparently many ways in which African farming systems can be made more efficient, e.g. through rotational improvements (including tree crops, leguminous plants, and mixed farming), better integration of crop and livestock production, new crop management practices, improved methods of soil conservation, improvement of intercropping systems, introduction of animal draught power wherever feasible (possibly after controlling severe animal diseases), diffusion of more effective work tools, or of seeds more carefully disinfected and better sorted out,... This being said, it cannot be denied that the production of new, high-yield varieties of seeds - and of new, more productive, livestock breeds - forms an essential component of the technical revolution which has occurred in agriculture during the present century, and that it can

probably not be bypassed by Africa without putting her food-producing capacity in serious jeopardy. It is basically a correct and appropriate attitude to emphasize the deep implicit knowledge which African farmers possess about their natural environment, and to point to the untapped or neglected potentialities which lie in the backlog of local traditional practices. Nevertheless, such a posture should not mislead us into thinking that, contrary to what has happened in all other areas of the world, Africa does not need to shift gradually from traditional resource-based agriculture to a science-based agriculture in which the discovery of new genetic processes and new plants or breeds occupies a central position. This is all the more so as many African farmers are actually perplexed and even anxious before the new challenges confronting them.

That Africa is far from having completed - or even from having embarked upon - the above shift is plainly evident from the fact that no major breakthrough in high-yield varieties for most food crops has occurred in Africa so far. This is exactly what C. Eicher means when he writes that "in fact, the green revolution has barely touched Africa" [Eicher 1984, 464]. Apparently, the only exception is that of maize for which East and Southern Africa has accumulated a backlog of new technology from the colonial period. In fact, Southern Rhodesia was the first country after the United States to release a hybrid variety of maize (the SRI) for commercial farmers and this success was achieved after 17 years of continuous research efforts (from 1932 to 1949). The dominant variety today - the SR-52 - was produced after eleven more years of research, but it is only since the early 1970s that it has been used at the smallholder level [Lipton 1985, 77 ; and Eicher 1986a, 10, footnote]. In Kenya, research on hybrid maize started only in the mid-fifties and the Kenyan variety known as Kitale was released about ten years later [Lipton 1985, 77 ; Eicher 1985, 93 and 1986a, 10-11]. However, even with respect to maize, a lot remains to be done in Africa. For one thing, the new hybrid varieties such as the SR-52 and the Kitale have benefited only a few countries - Zimbabwe, Kenya, Malawi, Tanzania, and Zambia - and, within these pioneer countries, only some regions, while they could be used on an area roughly twice as large as that presently cultivated with them [FAO 1986, Main Report, chap. 2, para. 2.19]. For another thing, serious amounts of adaptive research are needed to discover hybrid varieties of maize suited to other agroclimatic regions, particularly to West Africa where research on maize is still in its infancy.

No comparable breakthroughs have taken place for other food crops. As a matter of fact, there is today a large agreement among agricultural experts to the effect that, under actual farming conditions (as opposed to ideal conditions prevailing in experimental research stations), traditional local seed varieties remain superior to the new varieties developed through modern genetic research. Either the latter do not give better average yields

than the former, or they appear to be much more sensitive to pests, drought, winds, ..., which makes them too much risky for most farmers to adopt. Thus, for example, after ten years of research and trials on improved varieties of rice in West Africa, the conclusion has been reached that "only 2 of over 2,000 imported varieties were yielding as well as the best local varieties" [Eicher 1986a, 9]. With regard to sorghum and millet, two important staple foods in low rainfall areas in West Africa, the Sudan, Ethiopia and Southern Africa, 44 years of research started by the French during colonial times (1931 to 1975) did not lead to any noticeable improvement in yields. As a result, ICRISAT - an Indian research institute specialized in problems of arid and semi-arid agriculture - was invited to set up a sorghum and millet research program in the Sahel in the mid-1970s. Today, however, the failure of this attempt at transferring hybrid varieties from India to West Africa is officially admitted [ibidem, 9-10 and FAO 1986, Main Report, chap. 2]. As a result, "probably less than 2 percent of total sorghum, millet, and upland rice area in West Africa is sown with cultivars developed through modern genetic research" [Spencer 1986, 224].

The situation for other African staple foods - like cassava, yams and root crops - is basically similar to that described above. Again, the same conclusion can be extended to livestock production since the record of recent attempts to introduce new breeds is distressingly poor : local breeds remain superior to the so-called "improved breeds" developed through scientific approaches, mainly because they turn out to be much more resistant to local diseases [Leonard 1986, 201 and FAO 1986, Annex III, chap. 3, para. 3.54-62].

It would be wrong and dangerous to infer from the afore-mentioned failures that in Africa traditional agricultural technologies and practices have a decisive and permanent advantage over modern technologies and practices derived from a science-based approach. Indeed, it will be argued in the following sections that underlying the bleak picture given above are structural factors, biases and constraints that can be redressed or released to a significant extent provided drastic corrective measures are taken up. These obstacles and distortions often arise from policy trends that can be traced back to colonial times or to deeply-engraved misconceptions about the nature or process of technical change on the part of African governments and international donor agencies. But they may also originate in special difficulties resulting from some structural characteristics of the African continent. The above two categories of technical change-impeding factors will now be analyzed in succession with a view to identifying a new set of reasons why Africa is lagging so much behind Asia and Latin America with respect to food technology and production.

Misguided policy trends : the "export bias"

A conspicuous feature of agricultural strategies followed by most African governments lies in the modest investment in research on food crops compared to similar investments on export crops. Lipton has rightly noted that in Africa "the lack of 'congruence' between research effort and the importance of a crop" takes on extreme proportions and is in fact far more serious than in most of Asia [Lipton 1985, 70]. Thus, for example, in 1976, sub-Saharan Africa spent almost twice as much money on national soybean research as on national cassava research, although the area covered by the former crop represented only 3 percent of that covered by the latter [ibidem, footnote] ! In 1984, 7 percent only of the agricultural scientists working in this region devoted all their research efforts to millet and sorghum while these two food crops accounted for as much as 41 percent of total cereal production and almost 60 percent of the total land area under cereal crops [FAO 1986, Main Report, chap. 1, para. 1.26 and Annex I, chap. 3, para. 3.29]. This being said, the table below shows that the *discrimination* in agricultural research efforts runs essentially against *traditional* staple foods while "superior" food crops which are mainly consumed in urban areas (like wheat, rice, beef, pork and vegetables) fare much better.

TABLE 3 : Research as Percentage of the Value of Product,
By Commodity : Average 1972-79 Period.

Export Crops		Food Crops			
		Traditional staple foods		"Superior" food crops	
Soybeans	23.59 %	Cassava	.09 %	Pork	2.56 %
Coffee	3.12 -	Coconuts	.07 -	Poultry	1.99 -
Cocoa	2.75 -	Sweet potatoes	.06 -	Beef	1.82 -
Sugar	1.06 -			Vegetables	1.56 -
Citrus	.88 -	Intermediate		Wheat	1.30 -
Groundnuts	.57 -	Maize	.44 -	Rice	1.05 -
Bananas	.27 -				
Cotton	.23 -				

Source : Adapted from A.M. JUDD, J.K. BOYCE and R.E. EVENSON, "Investing in Agricultural Supply : The Determinants of Agricultural Research and Extension Investment", *Economic Development and Cultural Change*, Vol. 35, No. 1, October 1986, Table 6, p. 92.

The biased allocation of research efforts between (traditional) food crops and export crops is in fact a direct legacy of colonial research systems. As a rule, the agricultural development strategies of colonial powers were "geared almost exclusively to the expansion of export crop production for the metropolitan countries" and, therefore, their research efforts were largely concentrated on export crops and on the needs of commercial farmers and managers of plantations [Lele 1984, 447 ; Eicher 1984, 460 ; Giri 1983, 237-38 ; Spencer 1986, 220-21]. Quite often, these efforts were highly productive and yielded impressive results since in many cases new seed or plant varieties were developed which were well adapted to African agroclimatic conditions. In this sense, Hart is right in pointing out that "the colonial period saw the groundwork laid for the development of a scientific agriculture" [Hart 1982, 98].

Well-known examples of colonial, green revolution-type, breakthroughs are : the development of hybrid oil palm in Zaïre, Nigeria and the Ivory Coast (thanks to the pioneering research carried out in the INEAC - Institut National pour l'Etude Agronomique du Congo - created in 1933 in the Belgian Congo) ; of cotton plants adapted to Sahelian conditions in Mali and Burkina Faso (under the aegis of the CFDT - Compagnie Française pour le Développement des Fibres Textiles) ; of a new type of coffee - known as Arabusta - obtained again in the INEAC by crossing Robusta and Arabica types ; of varieties of cocoa suited to West African environmental conditions (under the impulse of the West African Cocoa Research Institute in Ghana) ; and of high-yielding groundnut varieties in Senegal and Gambia (through the efforts made at the research centre of Bambey which was created as early as 1913).

What all these examples converge to show is that a science-based agriculture is possible in Africa as elsewhere : local varieties can be surpassed by modern hybrid varieties, new plants can be adapted to her highly specific conditions, and plant-breeding materials can be successfully transferred from other regions of the world (as demonstrated in the case of imports of oil palm materials from Asia ; of cotton and maize materials from the United States ; and of coffee materials from South America). There are good reasons to believe that the same positive results could be obtained for food crops if only sufficient resources were devoted to developing an adequate research base and if the research efforts aimed at improving their yields were conducted with the same determination as was encountered in the case of export crops. The success story of hybrid maize in Zimbabwe and Kenya provides further support to this thesis. However, this should not be taken to mean that it is necessarily wise to devote large amounts of research efforts to the development and adaptation of alien plants (like wheat in drought-prone areas or rice in rainfed areas). Such efforts may well be wasteful of scarce research resources which would be better

committed to traditional food crops with a long history of adaptation to the African soil. In this respect, the positive research discrimination which "superior" food crops are presently enjoying in Africa is probably as disquieting as the longer-lived "export research bias".

A last remark is in order. C. Eicher has noted with an apparent good sense that the low priority given to investment in research on food crops during the colonial period could be defended because population and demand for food were growing in a relatively slow fashion and surplus land was available which could easily be brought under cultivation by smallholders when the need arose [Eicher 1984, 460]. After all, the only real breakthrough which took place in food crop technology was the afore-mentioned development of hybrid maize in Southern Rhodesia (and, later, in Kenya) where an important community of politically influential European farmers were engaged in production of both food and export crops [Johnston 1986, 166]. It is also interesting to notice that while developing their export-biased agricultural strategies colonial administrators could take advantage of the strong division of work and leisure prevailing in sub-Saharan Africa where most agricultural tasks were performed by women [Boserup 1981, 147]. Underemployed men were thus induced or forced to work in the new money economy either as wage labourers on plantations or as peasant producers of export crops. As a result, the new cash crops became "men's crops", although women often helped to produce them, and the food crops remained "women's crops" considered as a part of women's traditional obligations to provide for the family consumption [ibidem]. Therefore, a kind of collusion was created between colonial administrators and leading male villagers insofar as they had no interest in improving the food crops and their whole attention was concentrated on enlarging the scope and increasing the yields of export cash crops.

As is evident from the above discussion, several powerful forces converged during the colonial period to produce an "export bias" in agricultural development strategies. However, the enlightened policy followed by the Belgians in Zaïre shows that another approach was possible which gave more weight to long-term considerations and to the well-being of the masses (including the women). As a matter of fact, the agricultural research system which was established in 1933 (the INEAC) was not only a strong organization which eventually became the largest of its type in Africa and obtained impressive results (see supra), but it also devoted a significant part of its resources to research on food crops. In this respect, it is noteworthy that the INEAC was independent of the colonial administration and that its financing was rather diversified [Eicher 1986a, 13 and 1986b, 10].

Misguided policy trends : the "technological dependence bias"

With respect to agricultural technology development and diffusion, the experience of the last decades has taught us a very instructive lesson : the model of direct "material" technological transfer does not work because agricultural technology is highly "location-specific" [Hayami and Ruttan 1985, 271]. It is true that the development and rapid diffusion since the second world war of modern high-yielding varieties of rice, wheat and maize in Asia and Latin America has followed a dramatic process of agricultural technology transfer. Yet, what deserves to be emphasized is the following : if the new seed varieties propagated during the 1960s and the early 1970s were those developed by international agricultural research centers (such as the IRRI for rice and the CIMMYT for wheat and maize), they have been gradually replaced by crosses of the international center varieties with *local* varieties developed by national research and experiment institutions so as to better suit local environmental conditions [Hayami and Kikuchi 1981, 44-45]. This creative process of adaptation of prototype high-yielding varieties (or of other prototypes of genetic material and equipment) developed in temperate zone countries has been made possible "by a series of institutional innovations in the organization, management, and financing of agricultural research" in the receiving countries themselves. More than the direct transfer of materials and designs, it implied the international migration of scientific manpower and the development of indigenous research capability [Hayami and Ruttan 1985, 264 and Johnston 1986, 165]. It can therefore be concluded that *from a technical standpoint* the success of the Green Revolution in Asia and Latin America was due to two main factors : (1°) the existence of a large backlog of scientific and technical knowledge in advanced countries which could be used in tropical countries through the mediation of highly performing international research centers ; and (2°) a considerable strengthening in the latter countries of capabilities for research, experimentation and administration of agricultural programs, through the building up of new institutions (including agricultural universities), a marked increase in the supply of well-trained scientists, engineers and administrators, and a rapid accumulation of on-the-spot practical knowledge and learning by doing.

In actual fact, the experience of Africa with agricultural technological change during the 20th century largely bears out the above diagnosis. It does so in both a positive and a negative way. The positive test is provided by the history of technical change during the colonial period. Indeed, it is evident from this history that technical breakthroughs were always the outcome of well-focused and long-sustained adaptive research and experimentation carried out in locally established research-experimentation networks. The story of oil palm technology development, as reported by C. Eicher, is particularly illustrative in this regard :

"INEAC's pioneering research on hybrid oil palms [in the Belgian Congo] laid the foundation for the modern oil palm industry in West Africa. Basic information on oil palm genetics was transferred to Nigeria and after a decade of adaptive research in the 1950s, Nigerian hybrid varieties became the centerpiece of the eastern region's smallholder oil palm scheme in the early 1960s. The Nigerian hybrids yielded 300 percent more than local (wild) varieties under farm conditions" [Eicher 1986a, 13].

As for the negative test, it is supplied by the numerous cases of failure in international direct transfers of agricultural technology to Africa during the last twenty years. Such failures even occurred when foodgrain varieties were transferred from other tropical developing areas (like Mexico and India) with apparently similar agroclimatic characteristics. The disappointing results obtained by ICRISAT, - a renowned and competent Indian agricultural research centre - when it tried to transfer hybrid sorghum and millet varieties from semi-arid India to Sahelian countries in the late 1970s have already been mentioned. Causes of this failure were located in "unforeseen problems with disease, variability of rainfall and poor soils" [Eicher 1984, 464], and in "the difficulty of transferring, crossing or adapting exotic varieties so that they suit local conditions especially regarding striga weeds and quelea (weaver) birds" [Lipton 1985, 78]. Other experiences of direct international transfers of agricultural technology in general, and of genetic material in particular, do not tell a different story. After two decades of experimentation, optimism about the possibility of transferring the Green Revolution technology to Africa has faded away. FAO experts refer to the "excessive confidence" which has been put in transfers of imported technologies from other continents [FAO 1986, Main Report, chap. 4, para. 4.75]. The US department of Agriculture considers that high-yielding varieties have distressingly failed to spread to Africa [quoted by Lipton 1985, 77]. B. Johnston writes that among the factors responsible for inadequate rates of technological progress in African agriculture are "overly optimistic expectations about the availability of profitable technical innovations adapted to Africa's diverse environmental conditions and impatience for quick results". According to him, "this over-optimism about the potential for direct technological transfer" partly resulted from a misinterpretation of Asia's experience with the Green Revolution [Johnston 1986, 164-65]. Finally, C. Eicher reached the conclusion that "international technology transfer of plant varieties has been constrained by differences in soil conditions, pest regimes, farming practices" [Eicher 1986b, 24], and, one could add, by differences in rainfall patterns and moisture conditions, in access to water and water quality, and in a host of varied socioeconomic conditions. His judgment can be extended to livestock technology and animal genetic material, as is plainly evident from the following excerpt :

"Starting with great confidence in the early sixties, western donors imported western models of ranches, capital intensive abattoirs and planeloads of exotic cattle in an attempt to 'bring development' to Africa. But in practice, these livestock improvement programs failed under institutional and environmental conditions that were sharply different from those in North America, Europe and Australia" [ibidem, 18 ; see also Leonard 1986, 201].

In the light of the above analysis, the low pace of technical change in African agriculture must be attributed to an "absence of effective local scientific capacity to screen, borrow, modify and adapt the most promising technology to local conditions" [Eicher 1986b, 24] ; to sheer neglect of the potential contribution of local materials (seeds, forest, fish and livestock species) in development of new varieties or of local systems in development of new technologies (thus, serious research on intercropping started only in the 1970s although in most countries intercropping occupies over 90 percent of cropped area - Spencer 1986, 224) ; and to a lack of genuine commitment to, or investment in, improving food crop technology, particularly at the smallholder level. While the latter factor - low priority to investment in food crop research - was at work both during the colonial period and the postindependence era, the other factor - inadequate adaptive agricultural research capacity - is characteristic of postindependence Africa. However, this should not be taken to mean that African governments only are to be held responsible for this dramatic underinvestment in research-building capacity. As a matter of fact, the responsibility of the international aid community is also heavily engaged and, moreover, the dearth of trained African scientists and administrators can undoubtedly be traced back to colonial times⁽²⁸⁾.

While many Asian countries benefited from sizeable foreign aid programs with a high priority on long-term objectives of institution-building and development of graduate training in science and agriculture, Africa had curiously to be content with programs of more limited size and shorter duration [Johnston 1986, 165]. Data compiled by FAO for the period 1974-83 illustrate this distortion in a clear fashion : only 3 percent of donor contributions to agriculture in Africa were used to develop national research systems and training, compared to 5.4 percent in Asia. Furthermore, during 1974-79, 22 percent of donor assistance to agriculture went into direct support of crop production in Africa, compared to only 5 percent in Asia [Mellor and Delgado 1987, 3]. Some authors have explained this differential treatment of Asia and Africa in terms of an all-pervasive "extension bias" in the analysis of the needs of the African continent. Thus, C. Eicher has noted that after independence, "donors assumed that inexpensive extension workers (mainly Africans) were a substitute for relatively expensive agricultural research scientists (mainly Europeans)"

[Eicher 1986b, 8 ; see also Evenson 1978 and Johnston 1986, 166]. Lagging agricultural development in Africa was seen primarily as the consequence of a failure to make effective use of available technology due to various reasons among which lack of knowledge and motivation among farmers stood foremost. Technical assistance and community development programs therefore appeared as the best strategy to generate rapid modernization of African agriculture. In varietal research, all that was thought to be needed was "importing varieties from other parts of the world, testing them for adaptability, and selecting the suitable ones" [Spencer 1986, 225].

To a large extent, however, this "extension and community development bias" (Eicher) was also at work in Asia, especially during the 1950s [Hayami and Ruttan 1985, 264]. It is in fact the availability of *new* technologies tuned to Asia's ecological conditions but requiring on-the-spot adaptation which largely imposed, during the late 1960s, a major revision of past conceptions and strategies. Whatever the reasons may be, there is a clear contrast between Asia and Africa : while in Asia foreign aid has been used to strengthen indigenous scientific capacity to carry out research and field experiments as well as to generate new technologies adapted to local circumstances, in Africa it went mostly into direct assistance projects, thus preventing Africans to develop their expertise and skills. Africa has remained a big builder and receiver of agricultural extension programs "which have generally been quite ineffective because they have had so little to extend" [Johnston 1986, 166], and of complex integrated rural development projects which cannot be properly handled due to an evident lack of trained manpower. In this respect, it is probably revealing that in 1980, the ratio of agricultural extension workers to research workers was more than three times as high in Africa (9.9) than in Asia (3.2) and Latin America (2.7) [computed from Judd, Boyce and Evenson 1986, Tables 1 and 2, 82-85]. Also telling and typical of so many African countries is the case of Senegal where the National School of Agriculture - the first establishment to offer an undergraduate training in agriculture in the country - was not created until nineteen years after national independence (in 1979) [Eicher 1984, 471]. English-speaking countries did not fare much better since in the mid-sixties there were only three African scientists working in research stations in Kenya, Uganda and Tanzania [Eicher 1986a, 19].

Obviously, Africa will not be in a position to master her long-term process of agricultural development if she does not call radically into question the present human capital model grounded on "overseas training and the provision of expatriate experts to Africa" [Eicher 1986b, 35]. Indeed, the current situation under which the number of African scientists, technicians and administrators capable to deal with Africa's agricultural problems is too low and too slowly growing involves many long-term social costs. It cannot be otherwise when national development plans are drawn

out by foreign agencies (often donor agencies), when research priorities are decided by foreign directors or scientists and, most importantly, when the learning by doing is appropriated by an ever-growing and continuously changing community of expatriate technical experts whose central commitment is elsewhere. Such a deep and chronic dependence on foreign aid and expertise can only alienate and frustrate all the Africans who work - whether formally or not - under the orders of foreigners and, moreover, it is bound to undermine the authority and prestige of national governments [Helleiner 1979 ; Lele 1984, 450 ; Lipton 1985, 72 ; Eicher 1986c, 264 ; Mellor and Delgado 1987, 3]. This is all the more so as foreign technical assistance is very costly, often of mediocre quality, and "tackled in an ad hoc and half-hearted manner" [Eicher 1986b, 41].

Therefore, if Africa is to acquire the capacity to adapt and generate new technologies targeted to her specific conditions - particularly with a view to intensifying agriculture on dry-land farming systems -, she must increase her education and training programs for high-level agricultural personnel (biologists, agronomists, irrigation engineers, agricultural economists, rural sociologists,...) and change her graduate education priorities by downgrading studies in law, medicine, arts and social studies. The well-conceived role of the international community would be to encourage this reshuffling of priorities and to support the process of institution-building involved as it has done with apparent success in Asia⁽²⁹⁾.

As a matter of fact, it is not only the level but also the orientation of investment in agricultural research which has been inadequate during the last decades in Africa. Three important sources of misallocation of research resources will be briefly mentioned here. First, instead of pursuing the colonial tradition of strong national or regional research services, donor agencies chose to invest heavily in the establishment of big International Research Centers (IRC) located in Africa but staffed with expatriates. This decision turned out to be "a major research policy mistake" since it meant (1°) that the building of indigenous scientific capacity got only casual and slight support and (2°) that priority was given to international technology transfers over local generation of new technologies and development of local materials directly relevant to the targeted areas [Eicher 1986b, 9-12 ; Spencer 1986, 225].

Second, too many resources (whether in the IRC's or in national research services) have been committed to applied research at the expense of basic science (soil science, plant physiology and pathology,...) [Lipton 1985, 71 ; Eicher 1986a, 11-12 ; Mellor and Delgado 1987, 4]. This bias is obviously the reflection of the "extension" or "technological dependence bias" according to which international diffusion of available technologies

can be the engine of technical change in African agriculture. Third, research efforts have been dispersed over too many crops or commodity programs and over too large a geographical area. Experience in Africa (during the colonial period) and elsewhere has shown that successes have usually been achieved by long-term, highly focused research on one single commodity [Eicher 1984, 470 and 1986b, 11-13]. Lipton has aptly remarked that "dispersion prevents any one group of scientists from applying, to any agricultural research challenge, the 'critical mass' of time and interdisciplinary cooperation needed for progress" [Lipton 1985, 72]. This certainly applies to Africa where difficult problems such as low soil fertility, serious livestock diseases and destructive pest attacks cannot be resolved unless long-sustained research efforts (extending to 10 or even 20 years) are devoted to them. In addition, African agricultural research centres have been seriously handicapped by numerous inefficiencies originating in poor personnel management and work discipline, lack of performance incentives and professional advancement, inadequate operating funds, high rates of staff turnover, untimely budgetary allocations, poor financial management and planning of resources [Spencer 1986, 222-23].

Structural disadvantages : limited size of nation-states and traditional consumption patterns

Two structural disadvantages of Africa deserve to be pointed out in the context of the present discussion. The first one follows from the already noted smallness of many African nation-states (see supra, 32), a feature which was imposed on Africa by the old colonial powers when the time of independence had come. Indeed, the above argument about the negative effects of dispersion of research efforts on the rate of technical progress in agriculture takes on added significance if the absolute size of the research services or centers is small. Unfortunately, considerations of national prestige and autonomy have led the newly independent African states to dismantle the highly efficient regional research institutes which had been built during the colonial period, and to convert them into national institutes with much more limited resources at their disposal. Thus, for example, the famous EAAFRO (the East African Agriculture, Livestock and Forestry Research Organization) was dismantled after the breakup of the East African Community in 1974 so that "the scientists in the 94 research stations in the EAAFRO network had to discontinue their cooperative research programs on common problems in Kenya, Tanzania and Uganda" [Eicher 1986b, 13-14].

The outcome of this parcelling out of the research set-up inherited from the colonial powers is truly alarming : only one-third of the African countries today have an agricultural research establishment above the critical size - about 100 scientists - required to run and test three adequate

commodity programmes. To make matters worse, research workers are usually dispersed into many tiny stations which are supposed to cater to the differentiated needs of various agroclimatic zones and/or farming systems [Lipton 1985, 71-72 ; Spencer 1986, 233 ; Mellor and Delgado 1987, 3]. E. Kodjo is therefore right to call on all African governments to create larger political spaces or entities because only they would allow for more systematic regional cooperation and enable the member-states to meet Africa's present and future challenges in a satisfactory way [Kodjo 1985]. Such a move would actually mean a return to a long-established historical tradition in Africa, a tradition which has been largely broken down by the colonial powers for political and administrative reasons [Coquery-Vidrovitch 1985, 127-35].

There is a second structural handicap which limits the possibilities of agricultural technical change open to Africa. This handicap arises from traditional consumption patterns that prevent Africa from benefiting from the international pool of scientific and technical knowledge to the same extent as Asia and Latin America could do it. A striking feature about Asia's Green Revolution is that comparatively rapid advances could be made, from a relatively modest research investment, in the development of modern hybrid varieties of wheat and rice (wheat and maize for Latin America) transferable to tropical areas. We know today that such impressive results could not have been obtained if the prototype high-yielding varieties were not already in existence in advanced, temperate zone, countries (Japan, the United States and Europe). In other words, modern biogenetic research targeted to the needs of Asian (and Latin American) tropical countries was "able to draw on a large backlog of past research accomplishments on wheat and rice [and maize] in the temperate regions" [Hayami and Ruttan 1985, 270 and 279]. This is an important feature as it is increasingly recognized today that breakthroughs in agricultural research "are often a result of past research in which a great deal of work has already been done" [Spencer 1986, 231].

In Africa, however, wheat and rice are not part of the traditional food diet and, even though we have noted that their consumption has risen quickly during the last decades, especially in urban areas, the main African staple foods still remain, with the exception of maize, traditional cereals (sorghum and millet), a variety of root and tuber crops (notably cassava, yams and sweet potatoes), and pulses. In Central Africa, roots and tubers account for as much as 50 to 65 percent of caloric intake and the proportion is still higher - from 65 to 80 percent - in humid West, East, and southern Africa [Spencer 1986, 232]. Since such commodities are not consumed in the temperate regions, there was no backlog of readily available knowledge which African countries could draw upon. As a result, wrote Hayami and Ruttan in a cautious style, "the flow of new technology from the newer

[international research] institutes, and its impact on agricultural production, has proceeded more slowly. Accomplishments have taken the form of incremental gains rather than revolutionary breakthroughs" [ibidem, 270].

4. The problematic shift to intensive agriculture : the issue of labour availability

The urgent need for intensification

Our analysis of Africa's natural resources and constraints has made it clear that the exhaustion of the land frontier in some countries and the high marginal cost of opening new land for cultivation in other countries have led to declining land-labour ratios in response to rising population pressure. It is in fact because land farming systems have remained basically extensive that Africa is characterized simultaneously by relatively low population densities and relatively high land pressure. A shift from extensive to intensive farming and livestock systems has therefore become inevitable if African agriculture is to avoid falling into a deepening crisis of sustainability. This is especially so as "African soils tend to deteriorate quickly under conditions of increasingly regular or intense exploitation" [Berry 1984, 68 ; see also Delgado, Mellor, and Blackie 1987, 11]. Note, however, that intensification is not an altogether new phenomenon in Africa since high population densities and intensive systems of cultivation were well established in areas of urban growth (Hausaland) or in areas subject to chronic insecurity (like in northern Cameroon, central Nigeria, and northern Tanzania where slave raiding prevented mountain-dwellers to move freely into the plains), long before European incursions of the late nineteenth and early twentieth centuries [Berry 1984, 69 and 87-88 ; see also Pingali, Bigot and Binswanger 1987, 49-50].

Intensification of agriculture will not always take the form of irrigation development - particularly that of modern irrigation systems with complete control of water - because, as we saw it, Africa's irrigation potential is rather limited and many African irrigation projects are costly in economic terms [see supra, 37-40]. In many cases, at least for a long time to come, it will have to take place under rainfed conditions within the framework of dry-land farming systems. Therefore, most land productivity increases will arise from higher crop yields and better crop mixes rather than from enhanced cropping intensity. This will hold especially true in arid and semi-arid areas where the rainy season is short and access to water difficult or costly.

Now, whatever the circumstances in which it occurs and whatever the exact forms it takes, intensification of land use generally requires the application of increasing amounts of labour (and other inputs) to a given

cultivated area. This is not only so because current productive operations (such as land preparation, fertilizing, weeding, harvesting, and animal husbandry) require comparatively large doses of labour when the productivity of the land is increased, but also because many labour investment activities associated with land (such as levelling, destumping, terracing, draining, bunding and irrigating) are an indispensable component of agricultural intensification. Strictly speaking, the agricultural soil must be gradually "constructed" [Giri 1983, 222 and 1986, 64], as is clearly evident from the history of agricultural development in Europe, Asia and pre-Columbian Latin America. In these continents, vast amounts of family and village labour have been used to build fences, pick stones, remove stumps, construct flood embankments, level and terrace land, drain water, and so forth, all labour-intensive and hard works which have mobilized many generations of farmers [Boserup 1965 ; Ishikawa 1981 ; Bray 1983 and 1986 ; Eicher 1985, 88]. Equally important is the fact that investment labour is also required on a recurrent basis in order to maintain the land infrastructures once they have been built. Indeed, if the soil can be "constructed", it can also be destroyed and the process of soil destruction is especially rapid in countries - like those of Africa - where problems such as leaching, wind or water erosion, and flooding are permanent threats.

The problem of labour shortage

The reality cannot, therefore, be escaped that, in Africa as elsewhere, increasing and stabilizing agricultural yields will take time and require enormous inputs of labour. For technical and economic reasons, the use of mechanical devices - assuming that African countries can afford them and have the capacity to service them properly - and of other labour-saving technologies will substitute only partially for labour. As pointed out above, there are historical antecedents of intensive agriculture in Africa. Some areas have overtly stridden along the road to intensification, like the Dogon area in Mali and the Kirdi area in Cameroon [Giri 1986, 64]. Nonetheless, the general picture gives much less support for optimism regarding the pace at which Africa will be able to make her transition from extensive to intensive agriculture. Evidence of this is provided by the disappointing performance of irrigated farming, various schemes for intensive culture (including fish culture), and many soil conservation or land improvement programs during the last 20 or 30 years. Moreover, many observers of the African scene would agree with G. Hyden that "more labor-intensive husbandry is a necessary corollary to the adoption of yield-increasing technologies. Yet, this is not happening on the average peasant farm in Africa" [Hyden 1986, 60]. Since it would be simplistic to assume that this failure can be solely attributed to state mismanagement or corruption, we must look for other factors or constraints operating in the African countryside. In this respect, the increasingly oft-cited evidence of labour shortage [Berry 1984, 86 ; Lele 1984, 445 ; Mathieu 1985 ; FAO

1986, Main Report, chap. 4 ; Delgado and Ranade 1987, 124-30] appears to be a central and perhaps paradoxical cause of retarded - or blocked - intensification of agriculture in Africa. What is not clear, however, is the exact nature of this labour scarcity and the factors which account for its emergence.

A first possibility, or a partial explanation of the afore-mentioned phenomenon, is that labour shortages are largely seasonal. In the circumstances, acute dearths of labour during the short peak season - the rainy season in rainfed agriculture - can be reconciled with the fact that "unemployment and underemployment of rural labor are also increasing, particularly where population pressure on land is rising rapidly" [Lele 1984, 445]. The question then is : why African farmers do not make better use of the time available during the off-season, like their Asian counterparts did, to build up, consolidate, restore, maintain and repair rural infrastructures which can improve the land and ensure a better spread of agricultural activities across the year ? Another possibility is that labour shortages result largely from rural outmigration (of a transitory, circulatory or permanent kind), or from the development of off-farm work opportunities. This fact is as well documented as that of marked seasonal variations in agricultural demand for labour in dry-land farming systems. Thus, it has been found that rural poverty often forces people to seek off-farm employment to supplement meager income from agricultural activities, and that smallholding households (in countries like Kenya, Lesotho, Tanzania, Senegal, Burkina Faso, Zambia, Niger,...) may derive a substantial part of their annual income from such off-farm sources [Berry 1984, 81-83 ; Hyden 1986, 55-57 ; Mathieu 1987, Vol. 1, chap. 2].

A straightforward interpretation of the increasing commitment of African smallholders to non-agricultural activities is that the expected income from these activities is higher than the implicit returns to their on-farm labour [Delgado and Ranade 1987, 129], and/or that vulnerability to risk of falling into distress is thereby reduced thanks to diversification of their activity portfolio. From there, it would be tempting to conclude that intensification of agricultural production is not justifiable on the grounds of allocative efficiency considerations and that African countries would better develop by diversifying their production into non food activities. Even though the necessity of economic diversification in Africa is indisputable, it does not follow from this that agricultural intensification should be eschewed. Indeed, the above conclusion can be criticized from several angles. First, since intensification of agriculture involves the production of capital goods (including land improvements) and since there are obviously no futures' markets where anticipations about future returns could be taken into account, maximizing behaviour on the part of private agents is not conducive to intertemporal social optimality. Of course, uncertainty

regarding future returns is not typical of the agricultural sector and, as such, it cannot be considered as a conclusive argument in favour of encouraging agricultural production. Rather, the point it serves to emphasize is that the existence of comparatively low returns in agriculture is not a sufficient reason for giving up agricultural production if technical changes can be introduced in this sector and if a long-term perspective is adopted (as it should always be when development strategies are discussed). The fact that investments associated with these technical changes require comparatively low amounts of foreign exchange is an important consideration. It should prompt African states to incite their farmers - through education, material incentives or more direct support - to undertake works and to make technological shifts that are or could be socially profitable in the longer run. Note incidentally that there is a comparatively great role for public sector investments in technological change in Africa since in many parts of the continent the resource base for rural capital accumulation is rather narrow due to low average labour productivity [Delgado and Ranade 1987, 124 and 134].

Second, alternative incomes obtained outside the agricultural sector may have a non productive origin in the sense that they do not result from the creation of new value added but from simple income transfers. Not infrequently, these transfers have a more or less forced character as witnessed by the spawning of thieves and crooks of all hues in many African big cities. Third, important externalities are involved in the individual decisions taken by African farmers so that, on this ground also, the market cannot be expected to perform efficiently. For instance, by neglecting to take soil conservation measures on his own plot of land for the sake of increasing his short-term private income, a farmer may cause a decrease in the productive capacity of his neighbours' lands. Therefore, low agricultural incomes obtained in an environment dominated by unhampered competitive market forces (or by inefficient institutional arrangements) do not give a correct idea of the potential incomes which could be earned under a more congenial system of economic regulation. Finally, it is too simple to assume that migration decisions are exclusively influenced by economic considerations. Thus, the desire to escape from the hierarchical social structure of many African village societies may be an important determinant of migratory moves by young male villagers. Indeed, it is a well-known feature of traditional lineage societies in Africa that social relations are strongly differentiated on the basis of age (and sex).

There is yet another possible cause of labour shortage in intensive farming activities. It deserves to be dealt with at some length not only because, for reasons that will soon become apparent, it is largely ignored or underplayed in the specialized literature, but also because it is capable of resolving questions that are left unanswered by the above two lines of

argument. Two such questions arise from facts commonly observed in areas where modern irrigation facilities are available :

- why is it that, during the peak agricultural season, African cultivators often appear to give preference to traditional rainfed farming over irrigated farming, even though the latter could afford them higher and more reliable incomes than the former ?

- how can we account for the fact that, even during the off-season, farmers working in modern irrigation schemes tend to treat maintenance and repair works in a rather casual way ? And, more generally, how can we explain that African farmers are "often more concerned with saving labor than conserving cultivated area" [Berry 1984, 86], even where there is an acute shortage of land ?

Related to the latter observation is the well-documented and sobering experience that in the Sahelian states of West Africa, "the amount of new land being brought under irrigation each year (around 5,000 hectares) is roughly equal to the amount being abandoned each year *because of neglect and lack of maintenance*" [Eicher 1986a, 4 ; see also Johnston 1986, 170]. The situation was somewhat better in Senegal between 1982 and 1983, since the SAED came very close to achieving the ambitious objective set up for her by the government : to bring 2,575 hectares of new land under irrigation in the Senegal river valley. However, half of the tremendous effort made by the SAED (construction of new facilities over 2,400 ha) was lost because 1,200 hectares of irrigated land were in the meantime abandoned following degradation of the infrastructure [Mathieu 1985, 655].

As for the former observation, a recent FAO in-depth study of African agriculture has reported that :

"Modern irrigation schemes have commonly suffered from the farmers' insistence on maintaining the traditional diversity of their rural activities. On projects in Sierra Leone, the Gambia and Madagascar, planting of wet season irrigated rice was delayed until labour was released from work on rainfed crops elsewhere, thus reducing potential yields and overall irrigation intensity. Destitute pastoral nomads settled on small-scale government irrigation schemes in Northern Kenya remained only until they had accumulated enough money to re-establish their herds and resume a nomadic life ; plots were then left with women or sharecroppers" [FAO 1986, Annex IV, chap. 5, para. 5.24].

It is worth noticing that the observation that "priority is given to the rainfed area as soon as the rains arrive" [ibidem, para. 5.23] applies not only where the irrigated crop is a cash (export) crop such as cotton or sugarcane, but also where it is an (admittedly unfamiliar) foodcrop such as rice grown in modern irrigation schemes or even a traditional staple food grown in traditional flood irrigation systems.

Aversion to intensive work

A partial clue to the afore-mentioned relative neglect of intensive farming in Africa lies in the existence of a cultural bias against the type of work implied in intensive farming practices. This bias follows from the fact that Africa has a millenary tradition of extensive agricultural and pastoral activities which get inevitably reflected in her cultural patterns and values. One could therefore argue that Africa is not only characterized by an extensive *agriculture* but also by an extensive *culture*, that is by a culture whose world-view is rooted in the idea of an infinite or boundless space. On the level of labour requirements, extensive agriculture and stock-farming present two noteworthy features. First, the productive tasks involved can be performed with a relatively light work burden because the favourable man-land ratio makes long-fallow agriculture (or pastoral nomadism) possible. E. Boserup has gathered data showing that labour input is relatively low in different parts of Africa where both subsistence food crops and export crops are being produced : average weekly work hours in agriculture turned out to be fourteen hours for men and boys and fifteen hours for women and girls. The work burden carried by women is of course much larger since they have to perform domestic chores in addition to their agricultural duties. However, for the family as a whole, and for men in particular, the total work burden is no doubt lighter than that of smallholding families in more densely populated areas with more intensive agricultural systems [Boserup 1981, 147-48]. Just to take one example, under intensive farming practices, natural processes can no more be relied upon to restore the fertility of the land. Fertilizer must be applied by man and this operation takes time insofar as long walks are needed to collect the required manure or manure crops have to be grown in some of the fields. Since these operations have to be repeated, off-season periods of leisure or nonagricultural work are bound to be reduced [ibidem, 46]. This is in stark contrast to the situation obtaining in African dryland systems. Indeed, if African farmers perform long and intense work hours during the relatively short agricultural season (since good soils are rock hard at the end of the dry season farmers cannot prepare the land before the onset of the rains), there is typically little work to be done during the following long dry season [Pacey and Payne 1985, 27-28 ; Delgado and Ranade 1987, 128]. In fact, labour inputs per hectare in most Africa are reported to be "very low" [Delgado and Ranade 1987, 122].

A second essential feature of labour performances under extensive farming systems is that productive tasks involve much less drudgery than those required by intensive farming systems. Thus, it is certainly easier to sow broadcast in an open field than to transplant rice seedlings in an irrigation scheme : while the cultivator can almost stand up while accomplishing the former agricultural operation, he (or she) must break his (or her) back and sink into mud to perform the latter. Also, it is apparently

a more comfortable task to open a new field through the slash-and-burn technique when the existing land has become exhausted, than to take constant care of the same piece of land (or of animals) in order to ensure that its long-term productivity is not impaired. Indeed, the latter strategy involves considerable "husbandry skill", continuous and painstaking efforts to build up and maintain protective dikes, flood embankments, draining canals, conservation ditches, and so forth.

Intensive farming systems thus involve far more complicated, labour-consuming and toilsome processes than extensive systems. Therefore, it should not come as a surprise that people who have been accustomed for millenia to extensive (agricultural and stock) farming practices look at the prospect of intensifying production with some strong reluctance and distrust. This attitude is especially noticeable among the old-age classes whose values and beliefs crystallize the history of the society's past practices. As always, young farmers display more enterprise and resilience in the face of new challenges. Consequently, the relative position of the young-age classes in village relations of power is bound to play a determining role in the rate of adoption of intensive farming practices. Opposition of the elders to their aspirations for change - on the basis of traditional authority patterns - can only prompt them to escape from rural poverty through migration, a decision which has long-run adverse effects on the economic future of the villages as well as on the future ability of the domestic food supply systems to feed growing populations.

A few writers have noticed the absolute aversion which African village elders may display for the type of work required by agricultural intensification, and many field-observers of African rural realities could join them on this point. Intensive practices are often considered as debasing and status-lowering, just good to be performed by slaves, subordinates or women. Thus, C. Coquery-Vidrovitch has reported that the Zarma peasants in Niger have strong cultural prejudices against the growing of rice in modern irrigation schemes :

"Walking backwards for the transplantation of rice is traditionally considered by old people as 'slave's labour' which 'brings misfortunes'. It is for this reason that such people have refused to adopt the work cadences which the Chinese have introduced in the Kolo irrigation scheme at the door of Niamey. The Chinese have then turned to the youth, ... and, in spite of the difficulties encountered, the results appear promising" [Coquery-Vidrovitch 1985, 187].

Another author has pointed out that among the Mandingues rice-growing activities have been entrusted to women [Singleton 1983, 7], which tells much of the low status of this occupation since in Africa women are often treated as beasts of burden [Coquery-Vidrovitch 1985, 151]. In Zambia, weeding is considered too degrading for men and have remained a typical work for females [Pausewang 1987, 8]. In the same vein, it is not

rare that old farmers who have taken to irrigated farming entrust the actual work to sharecroppers of inferior socioeconomic status [Mathieu 1985b and 1987, Vol. 1, 148]. More generally, Hart has remarked that "the social and material conditions that would compel a laborer to work like an Asian peasant, up to his knees in paddy water... do not yet exist in West Africa" [Hart 1982, 88-89]. A FAO study came to a similar conclusion when it emphasized recently that under the present circumstances "labour availability for intensive production under irrigation is likely to remain a serious concern for some time to come in parts of sub-Saharan Africa with little tradition of intensive irrigation" [FAO 1986, Annex IV, chap. 5, para. 5.23]. One of the main barriers to the spread of intensive systems of production would lie in the fact that they demand "more time and cash" than the African farmers have been accustomed to commit in traditional agriculture [ibidem, chap. 3, para. 3.8].

A clear indication of the unwillingness of many African farmers to engage themselves in intensive farming practices - as illustrated again by the case of irrigated farming - is provided by the well-documented fact that acceptable commitment of the irrigators has usually been obtained only where few other options existed for them. For example, small and medium-scale village irrigation schemes in Senegal (along the river Senegal), Mali (along the river Niger) and Burkina Faso (using small dams) have been successful whenever smallholders could no more satisfy their food consumption needs from rainfed or flood-recession farming due to severe drought conditions [ibidem, chap. 2, para. 2.40 and chap. 5, para. 5.30 ; Boutillier 1980 ; Hart 1982, 89 ; Mathieu 1983a, 1983b and 1987]. In the Soninkés villages of Senegal, it has been observed that the cultivators who have shifted most resolutely to irrigated farming are people from lower socioeconomic strata (descendants of slaves, sons of artisans or outsiders) who do not possess land on their own and can have access to flood-recession lands only on costly terms [Weigel 1982, 321-23]. Revealingly, however, when some alternative opportunities exist to work outside the village, outmigration is often preferred to intensive farming. Thus, the Sarakollé from the Senegal river valley have migrated almost everywhere in West Africa and, not infrequently, they have travelled much longer distances (up to France) to find work. In the same way, many young Mossi (from Burkina Faso) have settled in Ghana and the Ivory Coast. By contrast, the Mafas of Northern Cameroon, blocked in their mountains, first by the persecutions of the Empires of the Chadian Basin and thereafter by those of the Foulbé Sultans, had no other alternative than to intensify their system of production at the price of tremendous efforts [Giri 1983, 222].

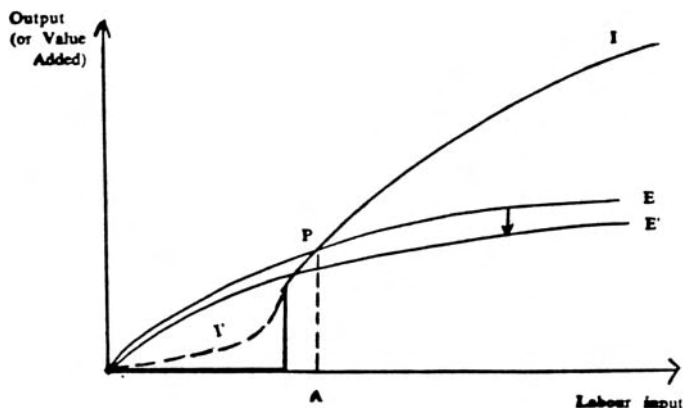
To sum up, in the many parts of Africa where there is practically no tradition of intensive farming (notable exceptions are Northern Africa, Madagascar, Nigeria and Guinea Bissau), villagers have usually a strong

aversion to the kind of work required by the intensification of agriculture (and stock farming). Cultural prejudices against intensive work - particularly among the elder male members of the village communities - reveal the profound dislike African farmers have for long work hours and toilsome productive tasks carried out on a continuous basis. Therefore, intensive farming tends to be taken up as a last resort when all other income-earning possibilities have been exhausted or have vanished. And, even then, there is a tendency to entrust the 'dirty' work to low-status people, including women. If intensive farming is not perceived as a survival necessity, villagers are likely to prefer more leisure to more income so high is the disutility associated with intensive work. Young farmers, nonetheless, do not necessarily react in this way, especially so if the elder members of the village community allow them a sufficient margin of freedom and if the income prospects afforded by intensive farming are reasonably good.

Perverse effects, self-defeating strategies or self-fulfilling prophecies

The above-described situation is typical of a transition period and, as such, it is basically unstable. It is unstable because it is fraught with inner contradictions which render the results of many intensive enterprises or projects rather unpredictable. Indeed, intensive agriculture is characterized by "threshold-effects", meaning that if minimum amounts of labour input are not applied (e.g. for gathering and application of fertilizers, for maintenance of land infrastructure,...), its productive performance is likely to be inferior to that of current extensive farming practices⁽³⁰⁾.

Figure 1 : Hypothetical relations between "extensive" and "intensive" production curves with certain outcomes.



This is the situation depicted in Figure 1 below where labour input is measured along the horizontal axis and agricultural output along the vertical axis. Curve E is a production curve which shows the maximum amount of produce that, say, a village can get for each amount of labour input through an expansion in cultivated land area (whether this is achieved via additional deforestation, shortening of the fallow period, or otherwise) : following Hayami and Ruttan [1985, 310], we may call this strategy "external land augmentation". This curve has a conventional Ricardian shape since its slope is continuously decreasing to reflect diminishing returns to labour as lands of lower fertility are brought under cultivation. As for curve I, it is supposed to describe an "internal land augmentation" strategy in which labour efforts are applied to improved land infrastructure and men use land-augmenting technologies. Curve I exhibits a discontinuity to reflect the indivisibility referred to above. Or, alternatively, a curve I' may be constructed which is comprised of two phases : a first phase during which output is low but increases quickly as additional labour inputs are applied, and a second, more conventional phase, during which returns to labour are declining. Because of the pressure of population on land, curves I and I' rise above curve E beyond the crossover point C, but if farmers put in less than OA units of labour efforts, the "internal land augmentation" strategy will be less profitable than that of "external land augmentation". However, insofar as the latter strategy causes a gradual decline in the fertility of all the existing village lands (e.g. because of increased soil erosion following new encroachments upon the forest lands), the production curve E will shift downward from E to E', thus increasing the relative advantage of intensification for a given amount of labour input and lowering the crossover point beyond which curve I rises above curve E.

From the above conceptualization or "stylization" of the relations between "internal" and "external" land augmentation strategies, it is easy to understand how the transition from extensive to intensive agriculture can be arrested due to the operation of "perverse" effects. Indeed, if African smallholders are reluctant to devote enough time and efforts to intensive agriculture - because of their perception of the risks and costs of adoption of intensive farming practices (including the disutility associated with toilsome intensive work)⁽³¹⁾ -, a vicious circle "low returns - insufficient application of inputs - low returns" may easily develop [Platteau 1985, 96-97]. This will result in a kind of "self-fulfilling prophecy", since the farmers will be able to mention the disappointing results obtained from intensification to vindicate and strengthen their belief that it is not worth the trouble and the drudgery it requires.

The problem is, in fact more complicated than is suggested in Figure 1, because outcomes are not certain. It could be argued, therefore, that

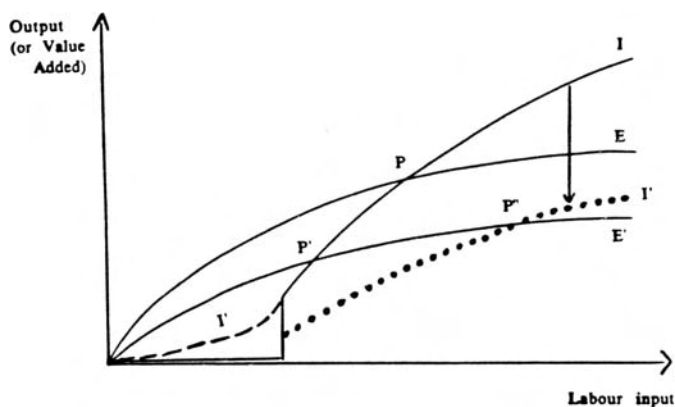
the reluctance of African smallholders to adopt intensive farming practices arises from the fact that these practices are not only perceived as costly utility-wise, but are also considered to increase vulnerability to risk irrespective of their being new and unfamiliar. Revealing would then appear the oft-noted observation that African farmers are unwilling "to abandon the traditional risk-spreading strategy of a mix of agricultural activities in favour of full-time work on the irrigated plot provided by the government" [FAO 1986, Annex IV, chap. 3, para. 3.8]. Yet, this is not an entirely convincing argument since some intensive agricultural technologies are ostensibly designed to reduce risk [Ghatak and Ingersent 1984, 15]. Improved water management in drought- and flood-prone areas is a case in point. In the circumstances, risk aversion on the part of smallholders may not be a valid - or complete - explanation for their reluctance to shift to intensive farming practices on a full time basis. Once again, it would appear difficult to account satisfactorily for such a behaviour without entering cultural or noneconomic factors into the picture.

It has been already noted (1°) that African smallholders have recourse to full-time irrigated farming only when no other alternative is available, and (2°) that they tend to return (or give priority again) to rainfed farming as soon as the rain comes back in sufficient quantities, be it within the season itself or during a forthcoming agricultural year. The latter phenomenon has been widely observed in West Africa in the years 1985-86, when Sahelian farmers responded to the return of abundant rains by abandoning the modern irrigation schemes in which they had taken refuge during the drought years. What deserves to be stressed in the context of the present discussion is that this kind of unstable attitude on the part of the producers is likely to reinforce the afore-mentioned "perverse" effect. Indeed, continuous and unpredictable shifts between rainfed extensive farming and intensive agriculture tend inevitably to thwart labour and other investments in land improvements. Unless public agencies are ready to maintain the new land infrastructures when the peasants are not forthcoming to do the job themselves, or to impose upon the latter a minimum of discipline, the capital which these infrastructures represent will be degraded and its future productive capacity will be inexorably impaired. As a consequence of their self-defeating strategies, farmers will thus be caught in a basically precarious situation since their livelihood will no more be guaranteed in times of weather hardship.

In Figure 2, a situation has been described in which intensive farming eventually becomes almost technically inferior to extensive agriculture due to severe neglect and lack of maintenance of land improvement infrastructures. Curve E is the production function which obtains under rainfed farming when rainfall is reasonably adequate both in terms of quantity and timing pattern. Curve E' is also a rainfed farming produc-

tion curve but it is observed when drought conditions prevail. There is assumedly a single intensive farming production function which obtains under both "states of the world", which follows from the fact that intensive agriculture is supposed to be potentially both yield-increasing and yield-stabilizing or risk-reducing. The relative advantage of technology I over technology E is therefore greater when drought conditions occur, not only because the distance between the two curves is then larger, but also because the crossover point shifts leftwards (from P to P'). Provided that the disutility associated with intensive work is not too high and that individual preferences are not too skewed in favour of leisure (the marginal rate of substitution of leisure for income is not too high), the farmers would maximize their intertemporal utility by making a complete shift to intensive agriculture. If this is not the case, however, the risk is high that land improvement infrastructures will not be properly maintained. In Figure 2, such a neglect would be reflected in a downward shift of the intensive production curve from I to I' and there would be a real possibility that intensive farming practices become less profitable than extensive practices, *even under conditions of wheather hardship* (curve I' is below curve E' over most of the relevant range). Eventually, the interest of the farmers would lie in sticking to their traditional agricultural system !

Figure 2 : Hypothetical relations between "extensive" and "intensive" production curves with uncertain outcomes.



It is worth noticing, incidentally, that in conditions such as those analyzed above, it is very difficult to assess the comparative profitability of intensive and extensive farming practices. In particular, conclusions that

irrigation schemes are unprofitable in many parts of Africa ought to be qualified or stated in a less peremptory way than they often are⁽³²⁾. It is a lesson to be learned that such comparative exercises or cost-benefit analyses are extremely delicate and difficult to interpret in conditions of agricultural transition or rapid technical change.

The Myth of the Good Peasant

The kind of analysis that has been offered here is not much in vogue among development specialists nowadays. Many social scientists consider that one cannot really talk about "a general cultural bias against labor intensive practices" without implying the "pejorative view" that African farmers are lazy [see, for example, Berry 1984, 69 and 97 note 4]. This is of course a 'non sequitur' as all economists acquainted with the subjective theories of peasant equilibrium know very well. However, by insisting that farmers in Third World countries behave so as to maximize their (expected) incomes or profits (after allowing for risk considerations and, possibly, for transaction costs), economists have actually lent credence to the view that values play no role in the choices made by agricultural producers. Moreover, this restricted type of peasant rationality is supposed to hold not only with respect to static allocative decisions but also with respect to innovation and change : farmers are receptive to innovation provided that the changes contemplated are "appropriate", that is low-cost, low-risk, and fitting well into the traditional agricultural cycle. This myth of the "good peasant" which emerged as a (rather healthy) reaction against the long-lived prejudiced view of the irrational peasant is also a reflection, in the field of agrarian economics, of the proclivity of the economic profession to produce complete explanations of individual behaviours on the basis of economic variables alone.

In fact, recognition that peasants may have a strong aversion for labour-intensive practices does not imply that they behave irrationally in the economic sense. This is evident from the fact that such an assumption can be easily accommodated into the neo-classical framework by entering two distinct types of labour (extensive and intensive), in addition to income and leisure, into the peasant's utility function, and by assuming that each type of labour is associated with a different production technique. The disutility of intensive labour may then be so high as to exceed the utility increments associated with the extra incomes resulting from application of intensive technologies (assuming constant leisure).

This being said, the central problem is not whether agricultural producers behave rationally when considered individually (according to economic theory, they are rational by assumption), but whether the social outcomes they produce together are desirable when assessed *in a long-term perspective*. The foregoing analysis purported to show that, if

sufficient attention is paid to cultural factors such as the norms, values and beliefs which shape the individuals' preference orderings or limit the range of feasible strategies, there is a real possibility of rational farmers producing socially disastrous long-term results. To understand this, it must be borne in mind that individual behaviours are influenced by collectively-produced cultural patterns that reflect past experiences of man's adaptation to his environment as well as the customary ways in which have been interpreted and evaluated by the society concerned. In most parts of Africa, these experiences are clearly tied to a long tradition of land-extensive agricultural practices. It is therefore no wonder that local cultures have tended to emphasize the merits of the way of life implied by land-extensive farming systems and to underplay or even deride alternative systems of *production and social life*.

The problem arises because cultural systems do not adjust *instantaneously* to marked changes in environmental parameters, in particular to rising pressure of population on land resources. To say this is not to contend that African meaning and agrarian systems are fundamentally conservative or rigid. They are bound to change and they have already started to evolve, particularly under the pressure of new dramatic challenges and under the aegis of young age-classes [for evidence of this, see Pingali and Binswanger 1986]. But a transitory period cannot be escaped during which Africa will be relatively handicapped because she is equipped with an *extensive culture* at a time when she must shift to *intensive agriculture*. Such a contradiction underlies the observation made by FAO experts that "only in a relatively few cases has the fundamental conflict between traditional sub-Saharan attitudes to agriculture and the intensive demands of modern irrigation been satisfactorily resolved" [FAO 1986, Annex IV, chap. 5, para. 5.30]. Policy-makers as well as intellectuals would do well to reflect on this a little more than they usually do. Indeed, the length of the transition period is not a priori determined and, depending upon the approach to rural education and agricultural extension, this period may be rather short or become dangerously long.

It may also be noted that the so-called common property resource problem to which economists usually refer to explain why individually rational actions sometimes produce socially harmful effects cannot be analyzed without mentioning cultural factors at some point. Indeed, a crucial question which suggests itself is why the traditional modes of resource management and of control of access have ceased to play their customary regulatory role.

Towards a more balanced assessment

Now, much in the same way as it is simplistic to attribute all the woes of Africa to policy mistakes committed by local governments, it would

be absurd to ascribe the rigidity of agrarian systems, to the extent that it exists, solely to inappropriate - even though understandable - attitudes on the part of smallholder producers. Cultural factors in general must also be considered to shed only partial light on the problematic shift of Africa from extensive to intensive agriculture. If they were largely brought into focus in the above discussion, it is only because they are systematically downplayed in most analyses of Africa's current food crisis. In such complex matters, single-factor explanations cannot be trustworthy. However, a number of causes which are commonly pointed at in the specialized literature can be roughly summarized under one heading : *organizational problems*. These problems usually originate in both the state and the rural communities :

"Group action by farmers or public investment by the government is required and in turn demands both leadership and discipline. These qualities cannot be developed immediately as the need arises ; such organizational capacity and habit grow in a rural society only over time, perhaps several generations" [Hayami and Ruttan 1985, 312].

With particular reference to irrigation, one can agree with U. Lele that "in most of Africa there is not the complex institutional and managerial capacity to operate irrigation systems indigenously" [Lele 1984, 441]. Perhaps the most usually cited problems of organization are those linked with the rationing or the delayed distribution of crucial inputs, such as fertilizers, new seed varieties, credit or spare parts for transport, irrigation and production equipment. Difficulties on the level of national economic management and balance of payments deficits, absence or imperfection of essential markets (most notably, capital and insurance markets), and inopportune interferences of the state with the development of local markets are all factors to which such deficiencies may be traced back.

The technical challenge posed by the required technological shift must not be underestimated either. For farmers accustomed to extensive farming practices, intensification of agricultural production represents a complete departure from the past :

"It is not only a question of mastering the complexities of the numerous cultural operations involved in the new technology : think of the need for a right spacing of the seedlings in the nursery when the transplanting technique is used for rice cultivation ; or of the split application of fertilizers at various stages of the vegetative cycle of the plant ; or of the need for an adequate drainage in order to prevent salinity. It is also a question of performing efficiently the mechanical tasks (lest the motor pumps would break down or wear out quickly) as well as the management tasks (if the gasoil is not available in the right quantities in the right time, the whole system is disrupted) which are an essential component of the new technologies" [Platteau 1985, 97].

In the case of irrigated farming again, major problems often arise from structural defects in irrigation systems which are clearly the responsibility of state agencies or foreign contractors and consulting bureaux. When systems of water control are not adequate, farmers lose confidence in timely and adequate water arrivals, and they tend justifiably to run away from irrigation schemes.

It is not difficult to understand how the above mishaps, deficiencies and dysfunctionings can significantly increase the risk of - and reduce the motivation for - adoption of intensive farming practices, thus postponing further the time at which Africa will be able to meet adequately her food challenge. But the fundamental fact must be accepted that it will take time to resolve all these problems. An essential lesson from Asian experience is precisely that considerable periods of social adjustment and institutional development are needed before intensive agriculture (as well as intensive stock-raising and fish farming) can be made to work satisfactorily. The experience of North Africa points to the same conclusion [FAO 1986, Annex IV, chap. 3]. It is no doubt true that sub-Saharan Africa can learn and get inspiration from solutions evolved in Asia [see Lipton 1985] and North Africa. Yet, like in the case of new seed varieties, such borrowals will never save her the need to go through the lengthy and painful process of learning-by-doing which solutions suit best her own environmental and social conditions. In the words of G. Hyden :

"... governments and donors alike have ignored the narrow margins of survival that characterize African countries at all levels. Above all, they have failed to adequately look for African solutions to African problems... It is high time, therefore, that the present crisis in Africa is recognized to a very large extent as the product of human arrogance and impatience in years past. Africa's problems are not primarily its backwardness and poverty, but rather the unwillingness of those concerned to accept that the continent is caught in its own historical process of development... They [African governments] have almost totally ignored the fact that development is a do-it-yourself process" [Hyden 1986, 53 and 65].

5. The problematic shift to intensive agriculture : the issue of property rights

The presumed inadequacy of existing land tenure systems

Traditional land tenure systems are often regarded as a major impediment to growth of agricultural output and productivity in Africa. Only a few authors would probably go as far as J. Giri when he says that Africa is in need of a genuine land reform [Giri 1983, 271]⁽³³⁾. But it may be taken for granted that most of them would agree with C. Eicher that "land tenure and land use policy issues will be of strategic importance in

the 1980s and 1990s as the frontier phase is exhausted, land markets emerge, irrigation is expanded, and herders shift from nomadic to seminomadic herding and sedentary farming systems that integrate crops and livestock" [Eicher 1984, 455-56].

The main thrust of the argument could be formulated as follows : there is a fundamental disequilibrium or misfit between existing land arrangements that reflect a long tradition of extensive farming practices and the requirements of growth in the context of intensive agriculture. More precisely, communal control over access to land and the absence of active rural land markets are supposed to discourage investments in land improvements, careful soil husbandry practices, and intense and continuous labour efforts. As a matter of fact, there appear to be two rather distinct theses in this argument which are not always clearly distinguished by their proponents. Both are nevertheless well-known views commonly expounded in the literature about contractual choice, property rights and transaction costs [see, for example, Demsetz 1967 ; Williamson 1985 ; Rosenzweig and Binswanger 1986]. The first thesis assumes the existence of communal tenure (or arrangements allowing multiple interests in a given piece of land) and considers it to be a major disincentive to labour and investment efforts and to conservation practices because decision-making is diffused among many persons (management problem) ; because the risk of labour-shirking or asset mismanagement is comparatively high while the cost of controlling it is also substantial (transaction cost problem) ; and because the effectiveness of sharing incentives is low especially so if the produce has to be distributed in accordance with social rules or norms (incentive problem). Of course, all these difficulties are assumed to be greater as size of the social unit in which land rights are vested increases.

Thus, attention has often been drawn to serious deficiencies in land husbandry and conservation measures that result from the open access nature of many African lands :

"Communal and allocated lands are frequently abused because neither farmers nor graziers feel any responsibility for their conservation. To the farmer there is little to be gained from constructing conservation ditches if they are to be trampled by another's cattle when farms are open to communal grazing after harvest. In some rangeland areas it often pays the herder to over-use the forage ; if he does not, someone else will and he will be the loser" [FAO 1986, Annex II, chap. 9, para. 9.22 ; see also Platteau 1985, 98 ; FAO 1986, Main Report, chap. 4, para. 4.89].

It is interesting to note that the above problem - usually referred to as the "common-property resource problem" or "the tragedy of the commons" - would not arise if land was available in plenty and/or if the internal solidarity or the authority structure in the group controlling the land was strong enough to enforce adequate management rules. As we

know it, only recently the first condition ceased to characterize most parts of Africa due to increasing pressure of population on land resources. Violation of the second condition - i.e. the existence of efficient social structures that discourage opportunistic behaviour on the part of their members - is the result of several complex factors such as commercialization of agriculture, large incidence of migration, interventions from state systems of bureaucratic control, redefinition of social rules of access to productive resources under the impact of colonialism and postindependence national policies, and so forth. It is also true, however, that the two conditions are narrowly interrelated since opportunities of conflicts over land-use rights increase considerably when land becomes scarce, and they may thereby undermine or thwart the conflict-management capacity of traditional social systems.

The second and main criticism of communal tenure clearly assumes a system of individualized occupancy : land is held and controlled by a social group who allocates it to individual households for their personal use. Here, the crux of the argument is that traditional systems of communal tenure in Africa do not provide security of tenure. As a result of this insecurity, farmers are reluctant to invest in physical capital and to adopt innovations that would increase the value of their land for fear that the benefits would be appropriated by other persons and would not accrue to their own children [see, for example : Christodoulou 1966 ; Dorner 1972 ; Cohen 1980, 353-55 ; Giri 1983, 270-71 ; Bachelet 1986, 154]. Without securization of smallholders' rights of access to land, the "accretionary type of capital formation whereby family labor improves land productivity and the productivity of livestock herds over generations" will not occur in Africa as it did in other parts of the world [Eicher 1985, 88]. Moreover, under communal tenure systems, land cannot be used as a collateral to raise credit and the occupier's ability to invest is correspondingly restricted [Cohen 1980, 354-55 ; Noronha 1985, 189-90 ; FAO 1986, Main Report, chap. 4, para. 4.90]. Communal control over access to land is therefore seen as a factor that limits both the willingness and the ability of smallholders to undertake long-term investments in physical equipment and land improvements. Finally, corporate tenure is held to block the flexibility in land use that is considered essential for a dynamic farming sector. In a nutshell, the idea is that land cannot be efficiently used unless it is "commoditized", that is unless it is transformed into a fully marketable asset [Cohen 1980, 354-55].

The view that existing arrangements with respect to control of, and access to, land resources in Africa are a major factor inhibiting growth of agricultural output and land productivity is very much appealing because it appears to be grounded on commonsense arguments. In fact, as we shall see below, the criticism of communal tenure systems can offer fruitful

insights into Africa's disappointing performances of food production only if it is qualified and amended in several important senses. In substance, the main idea that will be developed below is that in many African countries today, the debate over whether to grant formal or customary land titles has become much more critical than the assessment of the relative merits of communal and individual tenure systems⁽³⁴⁾.

Inadequacy of African agrarian systems : a critique of the conventional view

To start with, there are three important facts that are clearly neglected by the critics of traditional communal tenure in Africa. First, *these critics have partly misunderstood the systems of land-use rights they were evaluating*. In effect, security of tenure under such systems is often greater than what they seem to believe [Cohen 1980, 360 ; Noronha 1985, 181-95 ; FAO 1986, Main Report, chap. 4, para. 4.87]. It is no doubt true that possession of land under communal tenure is neither exclusive nor definite. Possession of land is personal and statutory, since only someone considered to be a member of the relevant social group is entitled to a portion of the communal resources. However, except in extreme circumstances (like in the case of open conflict with customary chiefs or headmen), the allottee's right of access is safeguarded as long as he keeps cultivating the land⁽³⁵⁾. Moreover, the heirs would normally be given the lands that were cultivated at the time of the death of the allottee, even though their rights do not generally extend to lands which had been cultivated by the same but were under fallow when he died. Finally, land can be exchanged or gifted (or even pledged) among members of the same landholding group, whereas transfers of land outside the group are subject to strict approval of the village chief or the earth priest. In the light of the above, the right of a cultivator under traditional African communal systems cannot be termed a usufructuary right : the scope of the former is obviously larger than that of the latter [Noronha 1985, 195].

It is also evident that when the critics of communal tenure consider that the practice of shifting cultivation leads to insecurity of possession, they are guilty of confusing a system of land usage with title. Indeed, what is then being criticized "is not so much land law as a form of land usage" since shifting cultivation "reflects a relative abundance of land and a relative poverty of soils as well as minimal use of other inputs" [ibidem, 192]. Of course, the point remains essentially correct that land laws corresponding to extensive land usage are not appropriate for the kind of intensive farming practices that are so urgently required in Africa today. It must however be admitted that, contrary to what is suggested by the critics of communal tenure, individual tenures can exist under a system of communal tenure. Garden lands offer a good illustration of this possibility since they "were always deemed to belong to the family that cultivated

them" and did not fall under the scope of the general rules of land allotment and control [ibidem, 186-87 and 193]. Interestingly, especially in areas of high population densities, these lands were usually well-settled (possibly terraced or even irrigated) and subject to continuous cultivation thanks to regular application of vegetal manure and careful soil husbandry practices [see, for instance : Raynaut 1976, 287-88 and Dupriez 1980, chap. 9].

This takes me to the second, and more important, weakness of the conventional view that communal tenure is a barrier to agricultural growth and investment in Africa. This weakness originates in a clear *underestimation of the flexibility and adaptation capacity of traditional African land arrangements*. As a matter of fact, there is much evidence to show that the mounting pressure of population and the increasing commercialization of agriculture, particularly since colonial times, have given rise to gradual but meaningful changes in land tenure arrangements in the direction of increased individualization of tenure and growing incidence of land transactions. As noted by J. Cohen, "corporate-tenure land is much less static and inalienable than the ideal model and Western logic lead one to believe" [Cohen 1980, 361].

Apparently, even before the advent of colonialism, exclusive appropriation of land and land sales did occur in some places even though they were strongly prohibited by the customary law. What is worth noticing, in this respect, is the fact that those "illegal" practices seem to have mainly taken place in areas where land was becoming increasingly scarce [Boutillier 1963, 116-18 ; Raynaut 1976]. Thus, we are told that, among the Hausas of Niger,

"There is no doubt that, even before the arrival of the Europeans, private appropriation and sales of land parcels could occur in areas where population was heavily concentrated, and where land was scarce and subject to intensive farming practices. However, during the expansion period, when large areas of cultivable lands became available again, less clear-cut and more unstable land relations re-emerged. Those fluctuations were more the effect of pragmatic adjustments to evolving environmental conditions than manifestations of profound changes in the people's cultural patterns" [Raynaut 1976, 288 - my translation].

The process of individualization of tenure titles has received a decisive impetus - or, in most cases, has been initiated - under the combined effect of population growth, the development of communications, the rise of markets, the adoption of new plants and the increasing incidence of taxes⁽³⁶⁾ which characterized the colonial period. From his detailed survey of the existing literature on the subject, R. Noronha has concluded that "the history of tenure during the colonial regime shows a gradual emphasis on individual (or family) appropriation of land for its own use", as well as a growing potential for land sales to non-members of the group

following marked increases in land values [Noronha 1985, 105 ; see also Berry 1980 ; Pingali and Binswanger 1986]. The traditional image of Africa as a "seemingly changeless society ruled by legislation that only countenanced 'communal' tenure" now appears to be a stereotype that cannot even stand the facts pertaining to colonial times [Noronha 1985, 78]. The results of the pioneering study of Ghanaian cocoa-farmers by P. Hill have thus been amply confirmed [Hill 1963]. In particular, it is interesting to note that many cash crop growers opted for migration with the main purpose of escaping from the social control of their native village and from their social duty to share the newly earned income. In the new area, on the other hand, the rules of communal tenure could not be applied since there was no group to enforce them [ibidem and Noronha 1985, 79]. When the growing of new tree crops was undertaken in the native area itself, customary principles of access to land were adjusted to allow for the new circumstances. As explained by R. Noronha : "Now the customary rules of tenure provide that the field is 'occupied' when crops are grown", and since trees are crops, as long as they are standing on the field, the field is considered to be 'occupied' [Noronha 1985, 78].

Land sales increased during the colonial regimes. However, as they were in open violation of customary land laws, they were often disguised under the form of traditional land exchanges or gifts. Moreover, the practice of land pledging began to spread and, apparently, not a few lands changed hands through land foreclosure [Raynaud 1976, 284-85]. Finally, it is worth remarking that adaptations of land tenure arrangements were not the only changes generated by the newly emerging socio-economic conditions. Indeed, changes in the patterns of inheritance also occurred (like in Ghana between the two world wars) which usually consisted of a shift from matrilineal to patrilineal inheritance. This shift can be easily understood once it is realized that matrilineal succession loosens the nuclear family solidarity (since property is inherited by persons outside the nuclear family) while, on the contrary, patrilineal succession ensures that the fruits of family labour, investment and risk-taking will accrue to the children of the deceased father [Noronha 1985, 98-99 and Coquery-Vidrovitch 1985, 155].

It is probably ironic that in some cases resistance to change in the traditional system of land rights was offered by the government of the colonial power (that is the "putative agency of capitalist expansion") against the pressures from members of the indigenous agrarian societies [Bates 1984, 242-48]. Thus, in parts of West Africa, in Zambia and in Kenya, the policy of the colonial government actually promoted tribalism by forbidding any registering of individual titles of land ownership and sale transactions of land. According to R. Bates, the form of property law encouraged by the colonial powers "was shaped by the desire of the colonial state for poli-

tical domination of an agrarian population and by the nature of the political accommodations it had to make in order to secure its hegemony" [ibidem, 248]. In Kenya and Zambia, two territories where the institution of chieftaincy was nonexistent, the British colonial authorities promoted the establishment or the preservation of communal property rights as part of their effort "to elaborate systems of rural political control over an agrarian population". This was done by (creating and) empowering local chiefs loyal to the colonial power to allocate the key resource in an agrarian economy according to their own will. In Kenya, interestingly, the demand for enforcement of private rights to land was pressed all the more urgently by the Kikuyu as they felt increasingly insecure "in the face of the uncompensated seizure of lands by the colonialists". Nonetheless, in other areas where the colonial authority was not reliant upon the creation of rural elites, the situation was different and the agrarian policies it followed often tilted towards commercialization of land rights or extreme forms of "Junkerization" of landed relations [ibidem, 244-47].

Postindependence Africa was characterized by the many attempts of national states to pass land laws that would be in accordance with the socio-political philosophy of the ruling regimes. In this respect, Africa has shown considerable diversity and the only common denominator behind all these attempts is the apparent difficulty "to categorize any nation as falling entirely into the 'individual tenure' or 'communal tenure' camp" [Noronha 1985, 107]. Revealingly, however, the trends initiated during the colonial period - individualization of tenure and increased land transactions - continued unabated in most countries "despite legislative intervention generally, though at times taking advantage of legislative enactments" [ibidem, 108]. In the words of J. Harbeson: "patterns of land tenure, insofar as they have changed markedly, appear to have evolved less in response to specific governmental policy initiatives than as a result of, and in conjunction with broader patterns of socio-economic change" [quoted from Noronha 1985, 135 ; see also Cohen 1980, 356 ; Mathieu 1985a ; Hesselings et Mathieu 1986, 317].

In fact, the movement towards increasing individualization of land tenure, increasing freedom from interference by customary land authorities (as attested by the growing number of sales without permission), and increasing incidence of patrilineal modes of land transmission has accelerated during the last decades as land availability became a more and more acute problem and as opportunities of market involvement multiplied in many African countries. A gradual process of "wresting of lands from lineage, to sub-lineage, then to extended family, and, finally, to the nuclear family" [Noronha 1985, 184 ; see also Raynaud 1983, 92] is under way almost everywhere, even though the methods through which it works itself out may vary significantly from country to country depending upon the

state laws, the posture of the administration and other exogenous factors. What Raynaut has said about Niger could be easily extended to most other areas where land has become a scarce factor :

"Land possession takes on an increasingly private character, the sharing of family property between the sons becomes the rule, the land is increasingly parcelled out, and the modes of transmission of land-use rights and control over the land that are distinct from patrilineal succession assume growing importance" [Raynaut 1976, 284 - my translation].

A third source of dissatisfaction with current criticism of communal tenure in Africa lies in the fact that *group titles to land, or communal resource exploitation are deemed to be a priori, and sometimes dogmatically, less efficient* - that is, apparently, less conducive to growth of land productivity - *than private property rights and family management*. To enter into a detailed discussion of this problem is clearly beyond the scope of this paper. There are just two points which are worth making with a view to calling into question drastic statements of the above kind⁽³⁷⁾. First, as has already been pointed out with respect to the "tragedy of the commons" [see supra, 71], inefficient collective management of productive resources may arise not only from maladjustment to changing environmental conditions (declining land-population ratios), but also from dissolution of solidarity structure or erosion of authority patterns in traditional landholding groups. Clearly, there are activities subject to externalities, indivisibilities and scale economies, such as livestock management and irrigated farming in modern irrigation schemes. And the experience of Africa so far does not show unambiguously that private or state management is systematically superior to traditional forms of group management. Thus, for instance, management of watering points has probably never been as efficient - in a long run perspective - than when these points were the property and the responsibility of well-defined social groups [Leonard 1986, 202]. In some cases, it may therefore be wiser to revive or to support such groups than to interfere with their normal functioning by superimposing new structures upon them [Putterman 1985].

Second, success stories of communal property and collective management are not rare in Africa, but the informal character of the social group and its relative freedom from state inopportune interventions seem to be important conditions of success. An illustration is provided by the case of Serahuli kinsmen who "pool their savings to purchase heavy agricultural equipment from the state and have recently begun to grow rice on large, mechanized, irrigated farms worked by labor mobilized within corporate kin groups of up to one hundred or more persons" [Berry 1984, 84]. Note in passing that such forms of traditional partnership are not necessarily democratic, since they are bound to reflect the internal inequalities of African village societies⁽³⁸⁾. In the light of such experiences,

it is difficult to accept uncritically the view that the emergence of innovators and progressive rural entrepreneurs is hampered by corporate patterns of land use.

Land tenure systems as impediment to agricultural growth :
the real issue

From the above discussion, the impression could be gathered that existing land tenure systems do not pose major problems in Africa since, thanks to their inner flexibility, they gradually adapt to the changing circumstances. To rising land pressure and increasing commercialization of agriculture, African land tenure systems respond by shifting from communal to individual tenure arrangements in which farmers have more incentive to intensify their labour efforts and to undertake investments in land improvement. This is however a grossly simplified view of the process of agrarian evolution presently under way in Africa. An analysis which is so obviously grounded on a mechanistic interpretation of human and societal processes can hardly be convincing. Land systems cannot be expected to adjust automatically and harmoniously to satisfy the evolving functional needs of agricultural development and population growth. Historical processes of transition are always characterized by tensions arising from the clashing of contradictory forces. The outcome is necessarily influenced by the way in which the political power - crystallizing the existing class structure of the society - has decided to deal (or to refrain from dealing) with the newly emerging situation, and by the relative bargaining power of the social groups/classes that have an interest in maintaining or breaking the status quo. That agrarian systems can resist the pressure for change is evident from the afore-mentioned and currently observed fact that farmers may have to leave their native village and escape from the indigenous system of sociopolitical control to be able to respond to new challenges and opportunities in the way they like [see, for example, Geschiere 1984, 18]. How far the established power structure will go to meet the new demands will depend upon numerous factors - among which its own interest in the change always comes foremost - and cannot be predicted a priori and mechanically. The following example shows clearly that, like in the case of attitudes vis-a-vis new agricultural technologies and farming practices, adjustments in land tenure arrangements can never be considered to proceed smoothly and instantaneously :

"In sub-Saharan Africa much land for traditional uncontrolled flood irrigation is still allocated on a seasonal basis by community leaders according to ancient custom. Land access for fixed, more intensive forms of irrigation, especially vegetables production, has however been subject to the same trends which have affected land access for the rainfed cultivator. Due to population pressure and commercialization of agriculture, individuals have increasingly attempted to claim long-term rights of occupation or personal ownership" [FAO 1986, Annex IV, chap. 4, para. 4.55].

The transition process will be all the more unstable if the new 'de facto' emerging rights of access to land are not properly securized, say, because there is a clash or a discrepancy between formal legislation and customary land rights. We have seen how a system of individual property *tends* to develop over a factor when this factor becomes scarce. But this is not the whole story since, concomitantly, there are likely to be numerous conflicts - actual or potential - with respect to the control and the use of the scarce factor. If such conflicts are not settled in a clear-cut and definite fashion, insecurity over land rights develops which is highly detrimental to investment efforts and, as will be explained below, wasteful of non-land resources as well. In extreme cases, a situation in which communal tenure rights are well-established could be more conducive to agricultural growth and investment than another in which individual tenure expands in a quick and anarchic way.

In Africa, unfortunately, many insecurities exist presently around the land because the land laws passed by many governments are ambivalent, confusing, inconsistent, inapplicable or badly applied. As a result, access to, and control of the lands take place "within a framework of conflicting legal and political principles and practices" [Berry 1984, 92]. As Hart noted with respect to West Africa, "a confusing and conflict-ridden situation has been loosely organized through the erection of a dual system of 'traditional' chiefs and law courts" [Hart 1982, 91 ; see also Mathieu 1983a and 1985a]. After a detailed survey of national land policies in a large number of African countries since independence, R. Noronha has reached a similar conclusion : the insecurity of possession and use of the land "arises when the 'law' is in a state of transition and the individual can then take advantage of two systems : the customary rule that recognizes the right to possession so long as land is being cultivated, and the formal law which will grant individual tenure..." [Noronha 1985, 207 ; see also Marty 1985, Vol. II, 794].

Of course, as the same study shows [*ibidem*, 107-50], the situation varies a lot from one country to another. There are countries - such as Rwanda, Swaziland and Tanzania - where confusion about use and possession of land is almost total due to the "provisional" character of land laws enacted by the state, to frequent legislative changes, to non-implementation of stated policy or legislation, to inconsistent official statements,... In numerous countries - such as Nigeria, Uganda, Zaïre, Kenya, Zambia and Liberia - long delays are needed until land titles are established, a result which must be attributed to complex procedures of bureaucratic control that tend to breed fraudulent practices. In Liberia, Zambia and Zaïre, access to land and land transactions are subject to the approval of numerous layers of the administration and the government before having the decision confirmed or denied by the president himself

[Hart 1982, 91 ; Masaki 1987, 93-97]. In still other countries - such as Senegal, the Ivory Coast, Lesotho, Cameroon and Zaïre again -, the main insecurity lies in the power of the state to requisition lands for public purposes, to acquire lands with a view to leasing them to agribusiness firms, or to seize them "in order to fight speculation". There are numerous countries - such as Malawi, Botswana, Kenya, Zaïre, Sudan, Lesotho, Burkina Faso -, in which powers of land allocation have been formally transferred from customary authorities to the administration, but where earth priests, headmen and other traditional land allocators remain in fact powerful. Inversely, some countries have opted for vesting customary village authorities (Ghana, Mauritania, Mali, Guinea Bissau, Sierra Leone), or Rural Councils representative of both the traditional and the modern worlds (Senegal, Mali) with considerable prerogatives in land matters. There, the main risk is that continuous interferences by state officials or managers of parastatals (like those of the SAED in Senegal) deprive the local bodies or authorities from any genuine autonomy [Mathieu 1985a and 1987].

The costs of uncertainties of land rights

In spite of all the above variations, the general picture remains that of countries in which "formal law has penetrated the rural areas only partially" [Noronha 1985, 143], and the superposition of a new system of land rights has created serious uncertainties about the application of indigenous rules. The indigenous system of land tenure, despite all its flexibility, loses its effectiveness, particularly in those areas where competition for land is stiff and land has gained commercial value. As a consequence, land disputes have become more and more frequent. The pattern they follow appears "fairly consistent" : first, they arise about 'tribal' boundaries and, somewhat later, about inter-village boundaries ; thereafter, they are increasingly concerned with family land boundaries and, finally, they tend to multiply within the (extended) families themselves [ibidem, 212]. Now, a situation characterized by continuing uncertainty about the effectiveness of land titles and the validity of land claims is bound to inhibit agricultural growth (and even general economic growth). The first way in which this can happen has already been pointed out : since their ability to forecast is greatly impaired by current insecurities regarding the exact nature of their rights, landholders are deterred from making decisions about long-term investments in land improvements. Accumulation of productive capital for development of intensive agriculture is therefore held in check.

Transaction costs are a second kind of social cost arising from ambivalent situations with respect to land titles. They are *ex-post costs* when claimants have to waste time and money in long litigation procedures⁽³⁹⁾. And they are *ex ante costs* when, through a variety of strategies, people try to insure themselves against the risks generated by

the existence of a dual system of land laws⁽⁴⁰⁾. Such strategies may be very costly indeed, from an individual as well as from a social standpoint. Moreover, the greater the insecurities, the higher the premia people are willing to pay in order to control the above risks. Thus, for example,

"It is the fear of expropriation by Government that makes the cultivator in Ivory Coast plant more coffee and cocoa, with very wide spacing, so that the returns are 'inefficient' and the ten hectares planted produce what could have been obtained from three hectares of close-spaced trees. The cultivator is afraid of the lands being acquired and future generations suffering from land shortages" [Noronha 1985, 208].

Likewise, it is only for the sake of protecting their customary rights of access to the river Senegal that Peul herders have taken to irrigated farming in the valley near St. Louis. In a revealing way, the work on small-scale irrigation schemes has been entrusted to old members of the community who do not take this occupation very seriously. By contrast, the young Peuls continue to devote all their time and efforts to traditional pastoral activities to which they attach overriding importance in spite of low returns [Mathieu 1987, Vol. 1, 200].

There are also countless cases where absentee owners living in cities cling to their rural lands in the expectation that they will turn into a useful productive asset, or that land transactions will become (or remain) difficult or costly in the future (or that land value will increase). Such a strategy entails *private* costs : as a matter of fact, the owners see to it that their lands appear to yield something - even if it is at a loss -, lest the rightfulness of their claims to them would be questioned by the land authorities. But *social* costs are also clearly involved insofar as a scarce resource is used in a wasteful way.

Substantial costs - for both the individual and the society - may arise from more "political" strategies too. Although costly, these strategies may be effective when property rights are "politicized rather than privatized" [Berry 1984, 92] and when, through the newly established land control system, politicians and bureaucrats are given considerable power of patronage. The latter possibility is all the more easily encountered as, in Africa, there is no respect of "universalistic civil service norms" within the bureaucracy. According to Brett, the African civil servant cannot be expected to act as a disinterested servant of the state since, being confronted with numerous and urgent demands for assistance, it is inevitable that his decisions come to be powerfully influenced by personal and other sectional interests, as well as by particular considerations and material advantages [Brett 1986, 26-27]. In Africa, moreover, there are narrow links between the state bureaucracy and the rural elites - whether old or new -, if only because African civil servants were typically recruited from a society of rural small-scale producers and retained their control

over productive resources in their native village [ibidem, 26 ; Hyden 1986, 57 ; Bienen 1987, 300-302].

It is in the above context that the strategies of "politicized but unproductive accumulation" highlighted by S. Berry, and called "politics of affection" by G. Hyden, must be understood [Berry 1984, 89-96 ; Hyden 1986, 57-63]. In substance, the idea is that people have to invest heavily in loyalty and patronage relations in order to gain access to - and retain control of - productive resources, land in particular. The acquisition of resources and the defense of property rights are therefore largely preconditioned on "membership in various social groups or institutions, ranging from the family to the state" [Berry 1984, 91 ; see also Putterman 1985, 185 ; Hyden 1986, 62 and Mathieu 1987]. In many countries (e.g. Senegal and the Ivory Coast), the ruling party is actually tied to rural areas "through a client system that operates via ethnic and factional channels" [Bienen 1987, 302]. Group-based modes of access to land and other productive resources thus prevent the farmers from becoming too independent from rural networks of social relations and political power. This is all the more so as loyalty and patronage are "often associated with ascriptive forms of status or social identity", even though they "do not flow automatically from them" [Berry 1984, 91]. Bear in mind, however, that "groups of access" are not, strictly speaking, traditional structures or institutions. Most of them, like the Rural Councils in Senegal or the village "tons" in Mali, are mixed institutions in which elements of the old elites (headmen, councils of "notables", earth priests,...) sit side by side with members of the new elite (members of the trading, business, professional or military classes) and representatives of the administration and the government.

It is true, as has already been mentioned, that villagers always have the possibility to cut off their costly socio-political ties with their native area through permanent outmigration. Nevertheless, for the reasons explained above, this is a very risky strategy which may work only under special sets of circumstances (like when freely accessible land does still exist in other, land-abundant, areas). In this respect, it is revealing (1°) that most migratory movements in Africa are apparently "tied migrations" which have been decided or approved by the (extended) family or the kin-group ; and (2°) that most *individual* migrants are young people, that is persons belonging to a dependent and low-status social group in the traditional village communities of Africa.

The need for formal registration of land rights

From the foregoing analysis, it is evident that large amounts of resources are spent in gaining and protecting access to land. The mechanisms of access which have been outlined are socially wasteful since

these resources are no more available for investment in increasing land productivity. S. Berry is therefore right when she says that "more stable or less contentious conditions of access and adjudication of rights to productive resources" must be established to ensure future growth of agricultural production capacity in Africa [ibidem, 96]. National and formal registration of land titles - which need not necessarily be private titles - is clearly a step in that direction. The case for introduction of such a system has been cogently argued by R. Noronha :

"The need for land titling (and registration) arises when there are growing uncertainties about the application and effectiveness of indigenous systems to control land transactions. This takes place most often when there are dual systems of control both of which cover land transactions, areas of uncertainty between the two systems, growing land values and pressures on land, and the potential use of land for commercial gain" [Noronha 1985, 220].

This being said, an important problem arises from the fact that adjudication and registration of land rights are complex and expensive operations for which many African states are ill-prepared or ill-equipped. As a matter of principle, they should not be undertaken when the expected social benefits (or reduction in social costs) are smaller than the likely administrative costs. Thus, it may be taken for granted that nationwide registration and formalization of land titles are not justified in areas where land is abundant and/or has no commercial value, where land transactions and land disputes are few or nonexistent, and where other markets are absent or poorly developed [ibidem, 215-17 and 220].

In a context of stiff competition for land, the security afforded by the traditional system of land control can no more be relied upon to allocate land and to settle land disputes. A modern system of nationwide registration and land-titling ought therefore to be substituted for the customary laws and practices. Such a conclusion might be strongly opposed by some authors on the ground that the latter system is more conducive to equality than the former, and that considerations of equity should have precedence over those of efficiency. Unfortunately, even if we agree with the second part of the statement, there is no sufficient reason to change the above-reached conclusion because the first part is seriously open to doubt. We know today that pre-colonial village communities of Africa were not exempt from various sources of socioeconomic differentiation [see, for example, Boutillier 1963 ; Raynaut 1983]. What needs to be especially emphasized here is that, under the combined effect of increasing land pressure and commercialization of agriculture, traditional inequalities have been exacerbated, even in areas where customary rules of communal tenure still apply. Landlessness has increased because ancient village communities have tried to protect their rights of access to available land by imposing more and more stringent conditions of membership upon 'outsiders' (in order to deny them such access, or to drive them into margi-

nal land areas). And processes of socioeconomic differentiation have started off or accelerated precisely because customary authorities, like village chiefs and earth priests, have often exploited their privileged position of land-controller to promote their own interests whenever opportunities existed to do so. There is in fact considerable evidence to show that, thanks to their association with members of the new elite, the modern bureaucratic state, the international business community and foreign aid projects, they have been able to confirm their elite status and to increase their material wealth [Cohen 1980, 357 ; Mathieu 1985a and 1987 ; Noronha 1985, 143-44 and 203-206 ; Pingali and Binswanger 1986, 26 ; Hesselting et Mathieu 1986, 315].

Analysis of income distribution effects of politicized accumulation strategies has led S. Berry to a similar conclusion : group-based modes of access to productive resources "have not necessarily served to redistribute income in an egalitarian manner, nor to provide security to the venturesome or to the poor and dependent" [Berry 1984, 94]. In view of the above facts, one can strongly doubt that the interests of the poor and the weak would be better protected by divesting the state from all land allocation and adjudication prerogatives and by entrusting them to customary institutions dominated by members of both the old and the new elites.

6. Political instability and authoritarianism in the approach to rural development

The fragility of African states

In section 4 above, attention was drawn to some institutional or organizational barriers to agricultural growth in Africa. Probably one of the main lessons which can be learned from the Asian and the Western experiences is that intensive agriculture and rural infrastructures (technical, economic, social and cultural) cannot be developed very far unless local farmer organizations and decentralized forms of peoples' associations emerge to mobilize communal labour and to take on-the-spot initiatives. Asian experience also teaches us that when the structure of the government is too centralized and too despotic (like it was in Korea during the Yi dynasty), or when the political situation is too unstable (like it was in North China when village communities were invaded by the northern tribes), the afore-mentioned developments are dangerously slowed down or blocked altogether. These two kinds of adverse circumstances are frequently encountered in Africa, and this helps explain why rural development and agricultural growth do not proceed at the pace desired.

Political instability, to begin with, is a recurrent feature of the African scene. In most countries, indeed, the state is a relatively new and fragile institution which is continuously threatened with military coups, social turmoils and ethnic secessions [Hart 1982, 102-105 ; Leonard 1986, 205]. T. Mars goes as far as saying that in Africa "power when examined turns out to be a description of the lack of the existence of an institutional framework for political relationships" [Mars 1986, 17]. Clearly, many African countries have still a long way to go before achieving a reasonable degree of national unity or cohesion. It is therefore no wonder that "obedience has to be extracted by the threat of force or the inducement of personal advantage", instead of being "unproblematically extended" because those who obey feel morally inclined to do so [ibidem]. It is thus revealing that "only thrice in post-colonial African history has a change of incumbents come about through the electoral processes". Moreover, "since 1966, 40 to 50 percent of the regimes in the continent have been military in origin and in states not under military rule, intervention by the security forces remains a tangible threat" [Young 1986, 37 and 41]. In Africa, the military coup has become an institutionalized "vehicle for ruler displacement", a feature which came to dominate the African political scene when it became clear that "political monopolies guaranteeing incumbents indefinite prolongation of their mandates were becoming the rule" [ibidem, 37].

There are of course many complex factors accounting for the volatile political situation of most African countries, and it is increasingly being acknowledged that they can be properly understood only if they are put in the right historical perspective. Three important points will be shortly mentioned here. *First*, many African states have inherited from the colonial period arbitrary and absurd boundaries which tend to make the objective of national unity comparatively difficult to achieve. What Hart has said about West Africa could easily be extended to other areas as well : "The further balkanization of West Africa as the price of independence has only increased the problem of borders by multiplying them" [Hart 1982, 103]. This is especially distressing in view of the long tradition of continuous flows of goods and people across large parts of Africa. *Second*, historical studies have shown that the ethnic problem - which is an important destabilizing factor in postindependence Africa - has been largely 'fabricated' by the colonial powers in order to increase their administrative, political and even religious control over the people subjected to their rule. Thus, R. Noronha considers that "ethnic consciousness, if not born through colonialism, was reaffirmed and strengthened" [Noronha 1985, 65], while, for C. Coquery-Vidrovitch, the impact of colonialism has been to cause a shift from 'ethnic' to 'tribalist' identity feeling among African people [Coquery-Vidrovitch 1985, 127-35]⁽⁴¹⁾. Unfortunately, the policy of granting concessions and privileges on the basis of tribal affiliations has not been discontinued by independent African states. On the contrary, ethnic

identity has become an important criterion for rationing access to scarce government or administrative posts as well as to the monopoly rents allocated by the state bureaucracy [Platteau 1984, 78-83]. As aptly noted by C. Young, "The politically ambitious had discovered that crystallizing ethnic consciousness was the swiftest and surest way to attract a political clientele" [Young 1986, 36].

Third, the political project of many African states at the time of independence was to follow a "socialist/populist strategy", that is a strategy directed towards instituting "a rational and non-conflictual development process" by giving a central role to the state "in relation to both overall regulation and direct intervention in the production process itself" [Brett 1986, 24]. It was grounded on a domestic class alliance made of disparate elements which were supposed to transcend their own particularistic interests in the name of nationalist emancipation and progress. Such a project was bound to fail and to weaken the state structure not only because the responsibilities entrusted to the state clearly exceeded its capabilities, but also because it eschewed the crucial question of how and among whom to allocate the scarce resources available. In a rather paradoxical way, African countries have often attempted to escape or postpone the inevitable setting of priorities and to smoothen the accompanying class, regional or ethnic tensions by increasing their dependence on foreign capital (both public and private), thus thwarting their initial plan of national emancipation.

Paternalistic and instrumentalist biases in the institutional approach to rural development

Political instability tends to discourage investments and risk-taking in agriculture, and to jeopardize long-term efforts to reduce population pressure on limited land resources. Similar adverse effects result from the "control orientation" (Leonard) or the "top-down bias" of the institutional approach to rural development followed by many African governments. The latter have usually ignored the important lesson that self-sustaining growth of the rural economy cannot occur "without a policy designed to make positive use of indigenous community institutions and organizational principles as a basis for modern rural development institutions" [Hayami and Kikuchi 1981, 225]. Instead of building up on indigenous village-community organizations and mechanisms of decentralized decision-making - that is, instead of starting with what already exists and encouraging local associations or voluntary agencies to promote organizational development from below and to diversify institutional responsibilities (what G. Hyden has called the "greenhouse" approach - 1986, 71-76) -, they have almost systematically preferred to establish highly centralized and bureaucratized institutions, often entrusted with monopoly or monopsonistic powers.

Thus, for example, Africa is well-known for her long tradition of informal savings clubs - known as "tontines" in West Africa - which in many cases are run by women on the basis of extremely sound principles of savings management. As remarked by Leonard, these clubs could well have been developed into small credit unions with a view to providing "the base for small, cost-effective credit operations through links with more formal banking institutions" [Leonard 1986, 194]. Instead, most African governments opted for setting up from the top complex multifunctional cooperatives one function of which is to provide credit to their members according to rather rigid administrative procedures. Tragically enough, women are normally deprived of access to membership on the ground that households are adequately represented by their male head. To take another example, instead of supporting traditional rural artisans by helping them to acquire better tools, learn new techniques and adapt to new market opportunities (intensive agriculture requires better agricultural implements), many African governments have preferred to follow a largely inefficient and expensive top-down approach. As described by Lipton, this approach involves "the training of largely unskilled and inexperienced would-be entrepreneurs, mollycoddled in subsidised and capital-intensive 'industrial estates' for a few years of market-unrelated 'training', and then either sent out to sink (or, rarely, swim) alone, or permitted to pressurise their way to endlessly prolonged 'estate' cocooning" [Lipton 1985, 80 ; see also Please and Amoako 1984, 57].

More generally, in a world dominated by pervasive production externalities and by high information and transaction costs, local associations - that is, typically, non-market institutions grounded upon tight social interactions - must develop to undertake collective actions and to create public goods, particularly around resources that are becoming increasingly scarce [Hayami and Kikuchi 1981, 11-23]. If large-scale organizations cannot be dispensed with in some peculiar circumstances (e.g. in the cases where construction of dams or large canals is required to ensure adequate distribution of water), they ought to be avoided whenever and wherever possible, because they tend to encourage free-riding.

Two central considerations seem to have led African leaders to believe that agricultural institutions subsumed under central government control are more appropriate and more reliable than private voluntary organizations, possibly based on lineage and extended family connections. For one thing, rural masses were regarded as too amorphous and too much liable to merchants' exploitation to be capable of raising their levels of living without the constant protection and support of the State (*the paternalistic bias*). For another thing, public institutions were considered as the best way to make small-scale rural producers efficient instruments of government policies and programs, particularly those geared towards

increasing agricultural exports and public revenues (*the instrumentalist bias*). At a more general level, the notion largely prevailed that "economies can be developed like armies under a single command" [Hyden 1986, 65].

In many countries, the main rural institutions set up by the administration and the political system have taken the form of cooperative structures. As a rule, two chief tasks were assigned to them, both of which are revealing of the instrumental role reserved for the peasantry in most African strategies of national development. First, on the political plane, rural cooperatives were supposed to organize the villagers with a view to facilitating the transmission, towards the rural masses, of political orientations and instructions decided at the top. Second, on the economic level, their planned function was to serve as a relay between state societies, parastatals and government departments on the one hand, and the mass of petty rural producers on the other hand. In more concrete terms, they were conceived as a kind of channel through which the state would distribute modern agricultural inputs and credit, convey market information and collect the agricultural produce (mainly export products). As a matter of principle, it is no exaggeration to say that rural cooperatives, far from being partners or pressure groups with which the government has to negotiate, are in fact "the lower element of state apparatuses" [Gentil 1986, 75].

Insofar as cooperatives are considered and organized as a simple extension of the administration and the government, it is not surprising that the latter feel perfectly entitled to continuously intervene in the affairs of the former, by deciding and formalizing their rules of functioning (including the conditions of membership, the size of the cooperative,...), by appointing the chairman, by imposing certain activities (such as the cultivation of some crops or the building up of certain social infrastructures), by exercising permanent financial control, and so forth. In some extreme cases, like that of rural state organizations in Mali (the 'Groupements ruraux de production et de secours mutuel'), the government had even dispensed with the cooperative façade to organize the peasantry in a more direct and ruthless fashion (1960-1968). Adhesion was made compulsory to all villagers and the administration (then under the strong influence of the dominant political party, the US/RDA) was authorized to "influence" the election of village chiefs and peasant delegates [ibidem, 61-73]. In the particular case of the *Office du Niger*, government irrigation schemes were run like military work camps and extension officers were acting both as technical advisers and as police guards [Coulibaly 1985, 218-222]. The "villagization" programme of Nyerere in Tanzania also suffered from continuous and demoralizing interferences from the state bureaucracy, thus preventing the emergence of self-determining and democratic collective groups [Kitching 1982, 104-24 ; Putterman 1985, 181-86 ; Swantz 1987]. Unfortunately, examples of this kind could be

multiplied 'ad infinitum'.

Social costs of the "control model"

Given the above set-up, the attitude of African smallholders who regard the cooperatives as "belonging to the government, and not to the peasants" [Gentil 1986, 202 ; see also Jacquemot 1981 ; Geschiere 1984 ; Marty 1985], is perfectly understandable. Many such reactions have been actually observed. Thus, Tanzanian peasants perceived the 'collective fields' instituted under the 'villagisation' programme as "farms of the government" [Putterman 1985, 184], while on government irrigation schemes it is not rare that tenants "feel and behave as if they were government labourers" [FAO 1986, Annex IV, chap. 5, para. 5.28]. In Senegal, for example, smallholders regard the irrigated fields of the SAED as the "gardens of the state" and, accordingly, they consider that maintenance of the infrastructure is the exclusive responsibility of the state, which is not without engendering serious tensions with the extension and supervision personnel [Mathieu 1983a, 291]. Evidently, the latter participate in the process of peasant alienation since they tend to behave as state employees (which they often actually are) and not as agents of the agricultural communities which they are supposed to serve. Moreover, they frequently embitter the relations between the peasants and the agricultural state services because of their "lack of interest in peasant cooperation, except insofar as it serves personal and government aims" ; and because of their "habits of authoritarianism and attitudes of disdain for peasants" by which they convince themselves that they have eventually succeeded in rising over their own peasant roots [Putterman 1985, 185]⁽⁴²⁾.

As could also be expected, rural small-scale producers use all sorts of defensive strategies or evasive reactions to thwart - or to minimize the effects of - the government's attempts at enrolling them against their will. Some of these strategies have been described by D. Gentil : to put in minimum amount of effort when the compulsion is too strong (in collective fields) ; to simulate submission while abstaining from undertaking any concrete action ; to send a few village leaders or men of straw to meetings which they will attend passively without taking any commitment on behalf of the village community ; to take maximum advantage of what the state offers, for instance, to borrow as much as possible and to repay as little as possible ; to sell a few bags of agricultural produce to the marketing cooperative while disposing of the largest possible portion of the harvest through illegal channels [Gentil 1986, 147-48]. The main defect of the top-down control model is now evident : it lies in the serious incentive problems that it inevitably creates on the level of rural producers. In the absence of participatory decision-making, the latter tend to consider themselves not as genuine members of the institutions which are supposed to be run to their benefit, but as simple customers or hired labourers with

all the attendant consequences in terms of risks of labour-shirking, asset mismanagement, output under-reporting, and other 'moral hazard' problems. That such problems involve large social costs is a point too well-known to deserve further elaboration.

What needs to be borne in mind, however, is that advantages distributed by cooperative societies or other rural organizations are far from being equally shared among the members or other potential beneficiaries. Like in the case of access to land rights (see *supra*, 82), the old (rural) elite and the new (urban/rural) elite have managed to secure a preferential access to state favours. In most cases, this was done by using traditional networks of clientelist relations to get "elected" to key positions in the above organizations ; or by establishing privileged relations with influential bureaucrats, party leaders and government representatives who are often keen to distribute patronage in return for personal advantages or party support. As a consequence, far from being eroded by the emergence of so-called 'democratic', 'cooperative', or 'people's' organizations in the countryside, the structure of vertical leadership within African villages has actually been strengthened by the convenient alliance of rural elites and the new bureaucratic class.

Inequitable mechanisms for distributing state-channelled resources (credit, subsidies modern agricultural inputs or tools, irrigation equipment,...) are particularly determining and self-reinforcing with respect to development of intensive agriculture. Indeed, access to the best lands belonging to the public domain is normally preconditioned on access to these resources on the ground that land belongs to he who can till it properly. In a rather cynical way, a customary principle of land allocation is thus invoked to justify growing socioeconomic differentiation in African agriculture. This is what happens, for example, in the Senegal river valley, where good irrigated lands are allocated to rich urban dwellers and to traditional village leaders because only they possess the equipment required to exploit them according to the rules of the SAED [Mathieu 1985a, 658-62 and 1987]⁽⁴³⁾.

Autocratic legacy of the colonial system

To some extent, the problems which have been highlighted above are typical of most Third World countries. Where Africa distinguishes herself, however, is in the comparatively high degree of authoritarianism commonly displayed in her top-down approaches to rural development, and in the strong resistance that such authoritarian modes of conduct oppose to change. To understand these two characteristics, one does not have to go very deep back into African history since it is mainly during the colonial period that the control orientation of many present African political systems has been shaped. C. Young has thus pointedly remarked (1°) that

contemporary African states remain "deeply marked by the hegemonial pretensions and authoritarian legacy of the colonial state" since "in innumerable ways, the peremptory, prefectorial command style of the colonial state remains embedded in its successor" ; and (2°) that the colonial state has been much more authoritarian in Africa than in Asia and Latin America, with the result that subjugation and exclusion of civil society was particularly thorough in the former continent [Young 1986, 33-34 and 46]. The second feature is ascribed to two facts. On the one hand, "the African colonial state was implanted in a highly competitive environment where consolidation of its rule was an immediate requirement". On the other hand, the colonial class in Africa "had a more profound conviction of its cultural, biological, and technological superiority, and a more systematically negative view of its subject population than was the case elsewhere" [ibidem, 34].

With particular respect to rural/local organizations, a fascinating study on cooperative movements in West Africa [Gentil 1986] has revealed that the cooperative societies presently existing in the countries concerned are an almost exact replica of the colonial SIP, SP, SMPR and SMDR (Sociétés Indigènes de Prévoyance ; Sociétés de Prévoyance ; Sociétés Mutuelles de Production Rurale ; Sociétés Mutuelles de Développement Rural). It is particularly worth noting that the latter societies were all considered to be part of the French colonial administrative system - Gentil calls them "structures of a para-administrative type" [ibidem, 43]. This implied (1°) that the colonial bureaucracy always took the initiative of creating them ; (2°) that it could use them towards achieving official objectives (in particular, the development of export cash crops and the collection of government revenues under the guise of membership fees) ; and (3°) that it was entitled to intervene at every stage of their functioning. This intervention could go very far indeed since (French) province governors were automatically appointed chairmen of the "cooperative" societies situated in their administrative territory, and since membership was often made compulsory for all the villagers (women and young people excepted) living in the area [ibidem, 27-57]. Even the ill-famed *Office du Niger* was in fact created in 1932 by the French to succeed the STIN (Service Temporaire d'Irrigation du Niger) which was a para-military organization run by military officers and relying upon a system of forced labour [Coulbaly 1985, 220].

Interestingly, village chiefs and their clients - provided that they professed allegiance to the new ruling power - were incorporated into the governing bodies of the colonial "cooperative" societies. They were thus given a preferential treatment in the access to the resources, goods and services provided by them. In fact, the political strategy of colonial powers consisted of incorporating submissive chieftains into the entire administrative machinery and not only into rural "cooperative" organizations [Noronha

1985, 61-65 ; Coquery-Vidrovitch 1985, 112-27]. In this way, even though they were not very high in the colonial hierarchy⁽⁴⁴⁾, village chiefs came to be vested with enormous power at the local level : the power to allocate tribal lands ; to collect revenue on behalf of the colonial state ; to raise compulsory labour and to fix the criteria for selection of individuals ; to punish defaulters when cropping programs were imposed by the administration ; and so forth. The whole political fabric of pre-colonial African societies was therefore perverted, since in these societies the village political space was traditionally "plural" and the chief was not allowed to concentrate powers [Bates 1984, 245-48 ; Coquery-Vidrovitch 1985, 113 and 126]. The result has been a hybrid and "monstrous" creature vividly depicted by C. Coquery- Vidrovitch :

"The 'chief' of today - whether the so-called 'traditional' chief or the modern bureaucrat -, appears, strictly speaking, as a 'monster', that is as the combination, still badly effected and poorly understood, of two power systems which had initially nothing in common. Being so, he represents, at the least, an attempt at fusion between the old dominant groups and the new elites borne out of the colonization and decolonization processes".
[Coquery-Vidrovitch 1985, 126-27 - my translation].

In today's Africa, this "monstrous" creature remains incorporated in a global political system of vertical relationships of personal subordination but, what makes matters still worse as compared to the colonial period, this system is now characterized by an almost complete "patrimonialization of the state" (C. Young) as well as by chronic instability following the demise of colonial tutelage. The logic of this macro-political system has been adequately captured by C. Young :

"Abstract bureaucratic jurisprudence no longer sufficed after independence. Hostile cliques and conspiracies had to be pre-empted by ensuring placement of personnel at critical points in the state apparatus whose fidelity to the ruler was not simply formal, but immediate and personal. Thus rulers constructed an inner layer of control - key political operatives, top elements in the security forces, top technocrats in the financial institutions - whose fidelity was guaranteed by personal fealty as well as by hierarchical subordination. The surest basis for such fidelity is affinity of community or kinship... Beyond and often in addition to affinity, personal interest is the most reliable collateral for loyalty. Accordingly, rulers must reward generously and impose severe sanctions for any weakening of zeal. Thus public resources become a pool of benefits and prebends, while dismissal from office, confiscation of goods, and prosecution face those who show slackness in their personal fidelity. Holders of high office individually tend to become clients of the ruler and collectively a service class" [Young 1986, 38]

As is evident from the above analysis, the preference for state control and direction and the authoritarian modes of conduct of most African rulers are a *structural* feature of contemporary societies in Africa. They answer the need of social control in a fluid political setup dominated by ethnic and interdistrict competition, factional struggles, religious ties and complicated relations of affection and patronage that cannot be

encompassed by class analysis [Hyden 1986, 66 and Bienen 1987, 298-300]. That the political economy of Africa described above is uncongenial to rural development hardly needs emphasis. It is sufficient to stress that villagers have many ways to express their resentment against a village chief who is not "customary" but a creation of the colonial order. If they usually comply with his orders so long as he acts as a representative of the government (especially if these orders are backed up by administrative sanctions of superior links in the hierarchy), they are often found to hinder and to oppose him in his performance as a (pseudo-) traditional leader in the village [Geschiere 1984, 16-17]. The ensuing cost in terms of lost opportunities of rural progress may be tremendous, since many African villages thus lack the minimum social cohesion and the leadership dynamics that are so much needed to carry out communal projects of rural development, whether in the productive or in the social sphere.

V) Conclusion

African agriculture is confronted today with a dramatic challenge arising from both demand and supply factors. On the demand side, the picture is twofold : on the one hand, consumption for food increases quickly, mainly as a result of very high rates of population growth, and, on the other hand, consumption patterns undergo drastic changes for a variety of reasons among which rapid rates of urbanization stand foremost. On the supply side, disappointing performances - although difficult to measure precisely due to the paucity and low reliability of the data available [see Berry 1984, 61-64] - can obviously not be attributed to a single factor or even to a small number of causes. While both supply and demand factors are responsible for the growing dependence of Africa on food imports and for the ensuing tightening of the continent's foreign exchange constraints, the poor performances of the agricultural sector and the gradual shift of consumption patterns towards import-intensive foods have combined their effects to reduce the incomes of the majority of rural people.

In much of the specialized economic literature, attention has been essentially drawn to policy "mistakes" currently made by African governments, either out of sheer ignorance of sound economic logic and macroeconomic constraints, or because of considerations related to the "political economy" of Africa. The dominant image emerging from many such analyses is that of misguided, incompetent, exploitative and corrupt states that are actually killing the peasantry from which they draw their living. Overvaluation of national currencies, urban food subsidies and excessive reliance on foreign food aid programs - all these policies having the effect of

cheapening foreign foods artificially - ; high rates of effective taxation of agricultural production ; inefficient distribution of agricultural inputs and food output, are considered to be the main factors acting as a brake on the expansion of domestic food supply. The dominant policy conclusion that seems to follow from such a diagnosis is that by just reversing the present policies and by redressing the existing economic distortions agricultural growth could be considerably stimulated. Admittedly, such reversals of economic policies will not be easily achieved since they require new political coalitions ready to call the "old order" into question. Such a view has apparently been confirmed by the fact that policy changes in favour of agricultural producers during the last ten years were usually imposed upon many African states by the world economic crisis and the "instructions" issued by powerful international organizations (the IMF and the World Bank).

It would be absurd to pretend that the above school of thought is completely off the mark, since it has brought into focus a number of important problems that bear upon the agricultural situation in Africa. Moreover, bumper food harvests and grain surpluses recently recorded in several African countries (most notably in Mali and Sudan) seem to have partly resulted from policy reforms suggested by the price-focused doctrine, even though it is impossible to separate the influence of these reforms from the effect of exceptionally good climatic conditions. This being said, the dominant view must be criticized, not only on its own ground because of internal weaknesses (both empirical and theoretical), but also and mainly because it had the effect of distracting attention from the most crucial issues confronting African agriculture today. Indeed, Africa will not be able to raise the incomes of the mass of rural smallholders on a sustainable basis, nor to reduce her food dependence with a view to sparing scarce foreign exchange for her industrialization, if rapid technical advances do not take place in the agricultural sector. More precisely, Africa has no choice but to generate and diffuse technological progress at a rate sufficiently rapid to cause regular increases in land productivity (so as to expand food supply despite the exhaustion of the "land frontier"), and in *per capita* labour productivity (so as to increase the real incomes of the farmers), possibly at the cost of increased labour efforts. In the present context of Africa, the afore-mentioned challenge amounts to finding how African countries (particularly those below the Sahara desert) could make a significant shift from extensive to intensive farming practices.

When the question is raised in those terms, growth-inhibiting factors of a more structural type than those pointed at in the "price-focused" approach come to the foreground of analysis. More concretely, Africa appears to suffer from several serious handicaps which can be traced back to her colonial and pre-colonial history, or which result

from specific characteristics of the African continent. In many instances, Africa turns out to be at a disadvantage vis-a-vis other continents, Asia and Latin America in particular. This is not to say that such structural deficiencies and handicaps cannot or will not be overcome. But attempts at overcoming them will use up much time, much energy and large amounts of resources, while time runs against Africa and some badly needed resources (such as agricultural research personnel) are awfully scarce.

Six "constraint areas" have been investigated in this paper. The underlying theses can be schematically formulated as follows :

1°/ In Africa, human settlements remain small and very much scattered, with the result that the development of markets is slowed down and the per capita cost of providing numerous services to the rural population is quite high.

2°/ On the natural resources front, Africa is handicapped by the extraordinary diversity of her agroclimatic conditions ; by the low quality and high fragility of her soils ; by difficult and costly access to water ; and by the inaccessibility of some of her best lands.

3°/ So far, African staple foods have not benefited from any technological breakthrough in high-yield varieties, a situation which must be ascribed to a variety of factors among which : the structure of traditional consumption patterns ; the small size of many African states ; a large dispersion and a biased allocation of agricultural research efforts under the joint influence of "export" and "technological dependence" biases.

4°/ The transition from extensive to intensive agriculture is made more difficult because Africa has inherited an "extensive culture" from her long history of long-fallow agriculture and pastoral nomadism.

5°/ Because land laws in Africa are presently in a state of transition and a dual system of land titles often prevails in the countryside, access to land is not properly securized. As a consequence, land investment is discouraged and valuable resources are wasted in costly strategies of acquisition and protection of land rights.

6°/ Many African states are characterized by a high degree of political instability and by the "control orientation" of their institutional approach to rural development. The "paternalistic" and the "instrumentalist" biases implied in this approach create many incentive problems among rural producers, which turn out to be very expensive in terms of transaction costs and lost opportunities of agricultural growth.

From the above list of factors, it is evident that the problems which Africa will have to solve in order to trigger off new growth and development impulses in her agricultural sector do not lie wholly in the technolo-

gical sphere. Changes in institutions and in the cultural and political systems will also be required. Moreover, it is worth stressing that the levels of income and the food security of the smallholder majority in Africa will not be improved unless serious attention is paid to equity issues and distributive effects of agricultural growth-promoting strategies. This is one of the main lessons from the discussion of the last two afore-mentioned constraints. Indeed, in Africa like in Asia and Latin America - and contrary to a popular picture depicting Africa as a relatively egalitarian society -, there is a high risk that the growth of sustainable productive income-earning opportunities in the countryside bypass the poorer and politically weaker segments of rural populations, while encouraging the emergence of a small group of progressive rich farmers with a privileged access to valuable resources.

It is equally important to note that in many African countries - particularly in the arid and semi-arid areas - removing or reducing the various constraints that hamper agricultural growth will not be sufficient to grant new purchasing power to small family-operated farms. Strategies promoting diversification of rural production and creation of new off-farm employment opportunities will be needed - mainly during the dry season in areas where the rainy season is very short - to supplement the farm incomes of African smallholders. Priority should of course be given to activities having potential linkages with agricultural production or producing simple consumption goods demanded by rural consumers.

It would however be a mistake to think that in the next future development of non agricultural activities could make technical change in agriculture superfluous or even wasteful. Indeed, given that in many instances investments in non agricultural activities are likely to be much more import-intensive than investments in agricultural intensification in which labour investments play a considerable role, a relative neglect of agriculture would have two adverse effects upon the balance-of-payments. First, there is the effect resulting from the rising food import bill and, second, increasing imports of intermediate and capital goods will be required to create and sustain employment opportunities outside the agricultural sector. The problem is compounded by the fact that the prospects of non agricultural exports are rather bleak for Africa today. Furthermore, if non agricultural activities are developed in the countryside to the detriment of agricultural production, the cost of transporting food will be high given the low population densities in most African countries. If, on the contrary, these activities are spatially concentrated, the acceleration of already fast-rising urbanization rates will entail considerable social costs besides causing rapid population depletion in entire regions of the continent.

There is no doubt that the challenge facing African agriculture today is tremendous. For one thing, given that populations grow very rapidly, all the changes required in technology, institutions and cultural systems to solve problems of declining labour productivity or of environmental degradation must occur simultaneously and within a short span of time. There is thus a serious risk that these changes "fail to emerge at a sufficiently rapid pace to prevent decline in human welfare" [Pingali and Binswanger 1986, 27]. For another thing, difficulties are compounded by the fact that Africa's food crisis has deep historical roots which can be traced back to precolonial times (e.g. the lack of tradition of productive links between African cities and the rural hinterland) and to the colonial era (e.g. the role of the colonial state legacy in shaping contemporary African states). When placed in its right historical perspective, this crisis therefore appears to be far more difficult to overcome than what many current prescriptions for simple policy reforms tend to suggest.

This is probably a disappointing conclusion for all those who expect scientists to prescribe clear recipes for helping Africa out of her awkward agricultural predicament. Yet, the role of any structural analysis is precisely to shake off naive beliefs in the illusory power of short-term policy measures to solve long-term development problems. Besides, - and in a more positive way -, it points to the necessity of carrying out in-depth country case studies before venturing to suggest measures or strategies for agricultural development that must inevitably, to a large extent, be country-specific. As a matter of fact, the main purpose of this paper was to identify sensible "problem areas" which should be carefully investigated in the case of each African country or region contemplating redress of present imbalances. In the very process of this identification, some schematization was unavoidable and idiosyncrasies were left out of the picture so that the issues highlighted could be made relevant for a large number of countries belonging to the African continent.

NOTES

- (1) The import content of total calorie consumption for Africa as a whole more than doubled within a decade : from 6 percent of total calorie supplies in 1969-71 to 13 percent in 1979-81 [FAO 1985, 34].
- (2) Bear in mind the exception of India where per capita consumption levels have remained more or less stagnant because increased production has essentially served the purpose of replacing previous food imports (and to build up sizeable stocks of grain). In Chile, during the period 1977-85, the same type of import substitution strategy has created a situation in which average nutrition levels declined while wheat production increased rapidly.
- (3) Africa actually achieved the world's highest rate of growth of total feed use during the years 1966-80, that is 6.2 percent per year as against 2.9 percent for food use [Yotopoulos 1985, 468]. It is true, however, that this continent started from a very low base, with a share of feed use in total disappearance of cereals amounting to 8.3 percent on an average during the years 1966-70 and reaching 10.3 percent on an average during the years 1976-80. Note that in this respect North Africa is far ahead compared to sub-Saharan Africa : while in the former region, the above proportion was 16.6 and 21.0 percent during the two periods considered, respectively, it was only 5.6 and 6.1 percent in the latter region. For all the developing countries (including China) taken together, the share of feed use worked out to 14.1 and 15.7 percent during the same time periods, successively [adapted from IFPRI 1986]. In sub-Saharan Africa, the low share of feed use in total domestic utilization actually reflects the fact that "livestock feeding in the region is still largely dependent on open range and waste products" [Paulino 1987, 31].
- (4) However, expenditures on cereal consumption represented only 30 percent of total food expenditures. Note also that, for the whole of Africa, per capita production (and consumption) of traditional staples has increased at the following negative rates during the period 1970/71 - 1983/84 :
- | | |
|------------------|---------------|
| millet | - 3.9 percent |
| sorghum | - 3.2 - |
| roots and tubers | - 1.3 - |
| cassava | - 1.6 - |
| pulses | - 2.0 - |

Source : FAO, *Production Yearbook, 1975, 1985*, Rome.

- (5) Between 1969-71 and 1979-81, for example, the share of rice and wheat in total grain consumption increased from 18 percent to 25 percent [FAO 1986, Main Report, chap. 2, para. 43]. In 1982-84, the import-content of domestic consumption of milk and milk products exceeded 50 percent in 15 out of 43 African countries for which data are available [FAO 1986, Annex I, chap. 3, para. 20]. Note also that the cereal deficit in Africa amounted to about 25 millions tonnes on an average during the years 1982-84 (15.7 millions for North Africa and 9.1 millions for sub-Saharan Africa). This figure compares rather well with the grain deficit of the USSR during the eighties (more than 30 millions tonnes per year). However, what is really alarming in the case of Africa is the prospect for the future : thus, according to FAO projections, Africa's grain deficit would reach 70 millions tonnes in the year 2010 (43.5 millions for North Africa and 26.6 millions for sub-Saharan Africa). See : Giri 1986, 48 ; and FAO 1986, Main Report, chap. 2, Figure 16.
- (6) Certain attempts have already been embarked upon, like the experimental production of bread from wheat and millet in the Sahelian region [Berg et al. 1986, 10]. In her recent and comprehensive study of African agriculture, FAO has also emphasized the need to improve traditional staples [FAO 1986, Main Report, chap. 4, para. 25].
- (7) In African countries which experienced an oil boom during the 1970s (like Nigeria and Gabon), the dearth of young male labour in the countryside created huge problems in the smallholder food-producing sector and was mainly responsible for its bad performance [see Monferrer 1985 for Gabon ; Andrae and Beckman 1986 ; and Aboiyade 1987, 246 for Nigeria].

- (8) Thus, in September 1981, the average unofficial price for three cereals (millet, sorghum and maize) in thirteen market places of Bamako was 218 Malian francs per kilo while the average official price was only 85 francs [Gueymard 1985, 226-note 6].
- (9) For a similar, albeit less articulated, analysis, see : Dupriez 1980, 149-58.
- (10) This is clearly the path followed by M. Anson-Meyer in her analysis of Benin, Ghana, Nigeria and Togo [Anson-Meyer 1985, 276-84] and by R. Galli in her case study of Guinea-Bissau [Galli 1987].
- (11) On the whole, it is probably correct to say that real agricultural prices for many food crops have risen since the late seventies. An outstanding exception is rice in most Sahelian countries where it is mainly produced in governmental irrigation schemes. The situation has been less satisfactory for many export crops, however, and this is in spite of substantial currency devaluations that occurred in a good number of African countries.
- (12) For obvious reasons, farmers are more dependent on state marketing channels in the case of export crops than in that of food crops. Yet, even in the case of export agricultural goods, possibilities of smuggling across borders often exist in Africa as borders are not well guarded and people have a long historical tradition of interregional trade. Thus, to quote an extreme example, the Secretariat of Planning of the Republic of Guinea-Bissau estimated that it lost as much in clandestine trade as it gained in official trade between the year of national independence and 1983 [Galli 1987, 94]. In the circumstances a nation-state has an obvious interest in raising the official purchase price of the contraband goods in order to avoid regular and important losses of scarce revenue and foreign exchange.
- (13) Consumption and other goods were allocated by priority to the capital city of Bissau.
- (14) The experience of developed countries tells the same story : "There are many episodes in the record of advanced countries in which the (lagged) terms of trade facing agriculture have stagnated, and yet farm productivity has grown 2-3 percent a year for considerable periods" [Krishna 1984, 170].
- (15) A good illustration of this export-bias is provided by the striking contrast, in Mali and Burkina Faso, between the neglect of staple food crops and the privileged access of cotton growers to public resources [Morrisson 1985, 70].
- (16) In Zambia, the percentage of the agricultural budget spent on subsidies exceeds 70 percent [Lele 1984, 442].
- (17) For a case study of Gabon, see : Monferrer 1985.
- (18) All the figures have been calculated from World Bank 1986b, Table 1, 180-81.
- (19) The situation was altogether different in the few African countries endowed with climatic conditions close to those obtaining in the temperate zone (Maghreban countries, Zimbabwe, South Africa), since those regions received massive inflows of European immigrants.
- (20) Not all large-scale projects and state boards have been failures, however. Famous successes such as Ethiopia's CADU, Rwanda's Coffee Marketing Board, the Kenya Tea Development Authority, the CMDT in Mali and the SOFITEX in Burkina Faso (both working in the field of cotton production and marketing) are worth bearing in mind [for more details, see Lele 1975 and 1976].
- (21) In sub-Saharan Africa, output per hectare growth rate represented only 8 percent of the production growth rate during the 1970s, compared with 62 percent for the whole developing world. During the 1960s, it was -9 percent [Mellor and Johnston 1984, 536 ; see also Paulino 1987].
- (22) South Africa is always excluded when reference is made to the African continent.

- (23) Trypano-tolerant breeds of livestock exist (e.g. in West Africa) but they can only be used in particular ecological conditions.
- (24) A well-known parasite in Africa is the striga which attaches itself to the roots of millet and sorghum, two crops often cultivated in association. Quelea (weaver) birds are famous for the havoc they often play in the harvests of these two traditional subsistence crops. On the other hand, rice harvests are also highly susceptible to bird attacks as well as to rats and borers.
- (25) Thus, the Zaïre basin which covers 16 percent of the total land area in sub-Saharan Africa carries as much as 55 percent of the average annual flows running in this region. Unfortunately, the river Zaïre does not flow through areas where low rainfall puts a serious drag on rainfed agriculture. However, some of the large rivers of the continent flow through extensive arid areas (Nile, Niger and Senegal) [FAO 1986, Annex IV, chap. 2, para. 2.8].
- (26) Between 50-60 percent of the total irrigated land area is devoted to cereal crops. Nevertheless, by far the largest portion of lands under *modern* irrigation schemes is used for raising export crops [FAO 1986, Annex IV, chap. 2, para. 2.60-63]. The question could be asked as to why traditional foodcrops are not displaced by high value crops under dry-land farming systems too. There are two main answers to this question. First, due to technical reasons, most crops with high unit values could not be profitably raised under rainfed agriculture. Second, the food diet in the African countryside still remains heavily biased in favour of traditional staple foods which the farmers are keen to produce themselves and to which they give absolute priority in their time allocation pattern.
- (27) Sedimental matters can also be locally abundant in the enlarging areas which have lost their plant cover following overgrazing or deforestation. In this instance, however, the nutrients are obtained at the cost of destroying land resources elsewhere in the region: think, for example, of the considerable quantities of sediments flowing away from the Abyssinian plateau as a result of huge deforestation to be eventually dispersed among the fields of Egyptian farmers along the Nile river.
- (28) C. Eicher has reminded us that by the time of independence in the early 1960s, there was only one faculty of agriculture in French-speaking tropical Africa. Furthermore, between 1952 and 1963, only 4 university graduates in agriculture were trained in Francophone Africa, and 150 in English-speaking Africa [Eicher 1984, 459].
- (29) For more concrete proposals, see Eicher 1984, 472.
- (30) Thus, in a modern irrigation scheme (with complete control of water) in Timbuktu (Mali), it was found that in the plots where the technique of broadcast sowing (without recourse to fertilizer) has been used, the average yield per hectare was not much higher than that obtained under more traditional farming systems (including flood irrigation systems). But it was much lower than the average yield obtained by those irrigators who applied fertilizers and used the technique of transplantation. Moreover, the variability of yields was much lower in the latter than in the former case in spite of the fact that the control of water was good in both cases. Calculations of net monetary returns per labour input unit confirmed the above differentials [Islands of Peace, Annual Reports 1984, 1985 and 1986]. The lesson to be drawn from this exercise is straightforward: there is no sense in applying extensive farming practices (broadcast sowing and no application of fertilizer) to land improvement infrastructures designed for intensive farming.
- (31) Bear in mind that labour input units measured along the horizontal axis in Figure 1 are not "utility-wise" homogeneous since the disutility associated with "intensive" labour efforts is much higher than that associated with "extensive" efforts.
- (32) It is often suggested that village irrigated agriculture is not (much) rewarding because net monetary income is negative, after having deducted rice for family auto-consumption from the gross produce [Coquery-Vidrovitch 1985, 177; Haubert and Frelin 1985, 27; Mathieu 1985b, 55]. But this is no convincing evidence since there is no economic sense in effecting this subtraction to arrive at conclusions about the profitability of this technique. However, what the above evidence shows unambiguously is that the irrigated plots are too narrow to

provide for the irrigator's family livelihood and that they are just a supplementary source of income and consumption. In fact, such plots are also a narrow basis for employment as it appears that average weekly work hours on them do not usually exceed a few hours.

- (33) Thus, for example, Hart wrote that "land reform is not a significant issue in West Africa, but reform of the land law is" [Hart 1982, 92].
- (34) While writing this section, I got much inspiration from a recent review paper by R. Noronha [1985]. As my views on the subject appeared to be very close to his own, I did not hesitate to refer to his work at all appropriate places.
- (35) This has two obvious implications : (1°) the allottee does not have the freedom or the right to decide whether or not to use the land allocated to him ; and (2°) land in surplus of his requirements can be taken away from him by the customary land authorities.
- (36) Thus, in the already quoted study of a Hausa community in Niger, Raynaud has shown how the increasing burden of taxes has led household heads to abdicate their fiscal responsibility for the entire group of their dependents. As a result, junior members of the extended family system began to neglect work on the collective fields and to devote more time to their own, individually controlled, fields (or to wage employment). The collective fields were then subdivided among them and they became personally entitled to the whole produce obtained from these "individualized" plots of land [Raynaud 1976, 282-83].
- (37) *For a more theoretical discussion, see in particular : Bonin and Puterman 1987.*
- (38) These inequalities are inherited from the long pre-colonial history of African village settlements and/or they have developed or have been accentuated during the colonial period.
- (39) Note that, almost everywhere in Africa, customary land tribunals have lost the right to settle land disputes.
- (40) The distinction between *ex ante* and *ex post* transaction costs has first been introduced by Williamson (1985).
- (41) By 'tribalisme', C. Coquery-Vidrovitch apparently means "the manipulation of the ethnic feeling" in order to further particularistic interests on the basis of race criteria. Such manipulation could be driven very far indeed. In Zambia, in order to avoid the costs of large-scale unemployment in the copper mines during cyclical downturns, the colonial government instituted an administrative procedure of purely artificial "tribalization". To retain rural land rights, urban dwellers (like factory workers) had to be "tribalized", that is they had to affiliate with the political officials of a rural community and establish membership in a kin group belonging to that community. In times of crisis, laid off workers could thus reincorporate themselves into the rural economy "quickly and peacefully", with no cost for the colonial Treasury [Bates 1984, 249].
- (42) It is revealing that in an official document the government of Mali has criticized rural agents of the central administration for the "omnipotent power they have vested themselves with" and for the way they have "traumatized" the population during 18 years of national independence [Gouvernement du Mali 1984, 9].
- (43) The positive experience of Ronkh village (on the Senegal river), where a group of rural youth could get access to a portion of SAED-allocated irrigated lands, actually confirms our analysis. Indeed, it is mainly because this group was led by an educated person who decided to put an end to his teaching career but could still act as a "broker" for the villagers vis-a-vis the urban authorities, and because the group was strongly determined, courageous but also full of political tact, that it could eventually succeed in obtaining the support from the SAED [Gentil 1986, 206-16].
- (44) In French colonies, the village chief was a simple assistant to the Commandant and derived no authority independent of the administration [Noronha 1985, 63 ; Coquery-Vidrovitch 1985, 121].

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