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**EMPLOYMENT GENERATION
IN
AFRICAN AGRICULTURE**

by

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EMPLOYMENT GENERATION IN AFRICAN AGRICULTURE

by

Carl Eicher, Thomas Zalla, James Kocher, Fred Winch^{1/}

1. INTRODUCTION^{2/}

Rising unemployment and explosive rates of urbanization are common problems in nearly all less-developed countries (LDCs). In Pakistan, the city of Karachi has grown from a population of 350,000 to 3.5 million since 1948. In Latin America, approximately 5 million families live in urban shanty towns and slums, and the shanty town population is growing at an estimated rate of 15 percent per year (111). In Africa, the population of many capital cities is doubling in size every ten years (112), and the population of most nations is doubling every generation (125). The population explosion and the convergence of a number of forces over the past decade have caused an increase in the number of unemployed and underemployed in most African nations.

Most African development plans in the 1960's concentrated on expanding the growth rate of per capita income as their primary policy objective. Yet in spite of high rates of growth, unemployment remains high and is expected to increase in the 1970's. Similar experiences in other parts of the world have lead many economists to question what we have conventionally assumed is a favorable relationship between growth and employment. Despite high growth rates, it is our judgment that widespread unemployment and underemployment are inconsistent with economic development. A corrolary to this proposition is that employment generation is equally as important a development objective as is growth in per capita incomes.

We have observed that planners who are preoccupied with high growth rates tend to base the economic selection of projects included in their plans solely on the basis of internal rates of return. This ad hoc project-by-project approach^{3/}

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^{3/}Throughout this paper we emphasize the shortcomings of the ad hoc project-by-project approach to planning. Planners using this approach have tended to rely excessively on internal rates of return as decision criteria rather than including a broader range of objectives such as employment generation, income distribution, etc.

to investment decisions is not sufficient to deal adequately with employment problems. Both the narrow, single-target plans and the random project-by-project approach to investment analysis need to be improved so as to confront problems of income distribution, uneven development, and unemployment in the seventies.

The results of the limited research on Africa's unemployment problems have led to a strong consensus that a significant source of employment generation lies in the rural areas, at least for the next 10 to 20 years (48, 59, 65, 76). However, this proposition does not deny the need to search for opportunities to generate employment in services, trading, industry, manufacturing, etc. Also, our discussion is not meant to imply that no further investment should be made in urban areas. Obviously, investments in consumer goods industries, agricultural input industries, and agricultural processing industries are supportive of rural development. Our task, however, is to examine employment generation in agriculture and for this reason we may give a misleading impression of overemphasizing employment expansion in rural areas. While we urge scholars, planners, and politicians in Africa to shift their attention to agriculture as a key sector for labor absorption, we do not want to overlook the need to seek opportunities to absorb labor in other sectors.

II. ON THE CAUSES OF UNEMPLOYMENT

In the 1950's and early 1960's the assumption of disguised unemployment in agriculture (zero marginal productivity of labor) in LDCs was uncritically accepted by most development economists (68). As a result, policy recommendations were advanced in many countries to launch industrialization drives, under the assumption that a sizeable redundant labor force in agriculture could be converted to industrial employment at no loss of agricultural output. Migration from agriculture was assumed to be desirable because workers who were contributing nothing to agricultural output could be employed in industry and hence increase national output. By the early 1960's, however, a number of empirical studies revealed that the assumption of disguised unemployment in LDCs was not supported when permanent rather than seasonal labor transfer was taken into account and when a number of other ceteris paribus assumptions were taken into consideration. In 1964, Kao, Anshel and Eicher concluded that

. . . there is little reliable empirical evidence to support the existence of more than token--5 percent--disguised unemployment in underdeveloped countries as defined by a zero marginal product of labor and the condition of ceteris paribus (68, p. 141).

On the basis of growing empirical evidence, development economists generally reversed their positions on disguised unemployment in the mid-1960's and agreed that a) the marginal product of labor in agriculture in LDCs was generally positive but low, b) industrialization drives (e.g., India and Mainland China) could be thwarted due to lack of a reliable food surplus, and c) relatively more resources should be devoted to agriculture in the LDCs.

While economists were trying to resolve the disguised unemployment question in the early sixties a few economists who were close to "real world" problems in the LDCs observed that the need to expand agricultural productivity in order to release workers for industrial employment was an academic question. An "army" of unemployed people was already in the cities searching for work. These economists reported that rural to urban migration was proceeding at a rapid pace, even though labor earnings were positive in agriculture and urban unemployment was already high.

In Latin America, for example, Currie pointed out in a series of articles in the early 1960's that effective demand, income distribution, and employment were the key policy questions rather than expanded food production. However, he assumed that

traditional agriculture could not be modernized rapidly enough to absorb more labor. Instead, he advanced the thesis that public housing and other projects could be undertaken in urban areas to provide employment for workers who migrated from agriculture (31). Currie's optimism for labor absorption in urban areas in Latin America was, of course, unwarranted. Nevertheless, his foresight should be recognized since he clearly saw that employment generation, effective demand, and income distribution were important problems which had been generally ignored or underplayed in plans which emphasized the achievement of high growth rates.

Turning to Africa, we have tried to identify some of the common causes of unemployment. We have not quantified the extent of unemployment in African agriculture. However, we agree with Hansen who concluded from his study of rural unemployment in Egypt that

. . . a clear distinction has to be made between adult males, adult females, and children. The level of employment for these three categories and the functions they perform differ widely. . . . the level of employment in rural areas is much higher than had earlier been thought. By ignoring nonfield work and nonagricultural work, . . . labor requirement calculations systematically and grossly underestimated actual employment (54, p. 311).

The causes of unemployment and underemployment in African economies encompass a complex set of ecological, social and institutional parameters. In North Africa, the ecology of arid zone agriculture restricts labor absorption in agriculture (61). Seasonal unemployment which is related to the agricultural cycle is widespread elsewhere in Africa. Callaway recognized over ten years ago that unemployment among school-leavers was a major social and political issue (26). Frank (48), Kilby (69), Lewis (76), and Harbison (57) argue that many institutional factors operate to encourage rather than discourage unemployment.

To these can be added cultural factors which restrict labor activities to specific sexes or which induce young people to leave their "restrictive" village setting for the pleasures and freedom of town life (19). Indeed, there is a wide range of explanations for unemployment and underemployment in both urban and rural Africa. The important causes of unemployment in Africa are as follows.

1. Population explosion
2. Factor price distortions
3. Rising labor productivity
4. Increasing gap between rural and urban incomes
5. Urban bias in provision of social services

6. Unbalanced educational expansion
7. Tied aid
8. Political and ethnic barriers to internal and external migration
9. Ecological constraints

Population Explosion

Since the present population explosion in Africa will bring a surge of newcomers to the labor force within 15 years, any discussion of policies to expand employment in agriculture in the 1970's should also analyze the nature and dimensions of the present population explosion and its implications for employment problems in the 1980's. However, since this paper is mainly concerned with employment generation in African agriculture, only summary attention is devoted to population problems in this section of our paper. A detailed discussion of population problems, labor supply, and family planning is found in Appendix A.

Birth and death rates in Africa are among the highest in the world. Fertility rates are not likely to decline appreciably in Africa within the next 15 years while death rates, which are now high by world standards, will probably continue to decline. The population of tropical Africa can be expected to increase from 214 million in 1965 to about 350 million in 1985. The population of Northern Africa may increase from 72 million in 1965 to over 125 million by 1985. The male labor force will increase by 50 percent by 1985 and perhaps double by 2000; 70 to 90 percent of this increase will occur in the rural areas. Primary school-age children will increase from 32 million in 1965 to well over 50 million by 1985 in tropical Africa (125).

The capacity of African economies to provide social services and employment opportunities for their burgeoning populations are two overriding key policy issues in the short run. The long-run specter of severe food deficits already present in some areas of Rwanda requires advanced planning for both population control and for expanding food output. The population explosion could lead to substantially higher levels of unemployment in many African countries in the 1980's. Available evidence suggests that family planning should be introduced or accelerated in some African countries in order to slow population growth in the 1970's and the concomitant expansion of the supply of labor in the 1980's.

To date, most African nations have refused to admit that they have a population problem and have adopted a "wait and see attitude" towards family planning. This policy may be sound in some countries but in others it will simply result in

an expansion of the supply of labor which may or may not be productively employed, and postponement of the achievement of social goals of universal primary education, rural water supplies, etc.

Our analysis of the population explosion and family planning in Appendix A underlies the simple fact that even if fertility could be reduced in Africa through family planning programs, it would take 15 to 20 years for this reduction in fertility to reduce the rate of growth of the labor force. Therefore, the "wait and see attitude" to family planning should be reconciled with the consequences that pursuing this policy will have on employment problems in the 1980's. The experience of population control problems in less-developed countries to date has indicated that it requires at least 5 to 7 years and perhaps longer to develop the administrative capacity, training, and experience necessary to implement a reasonably efficient family planning program.

The experience of family planning in India, Tunisia, Morocco, etc., suggests that population planning requires a time horizon of at least 10 to 15 years from the time a national family planning program is initiated until it has any effect on school-age populations, and 20 to 25 years before it will affect the size of the labor force. Moreover, it may require an additional 10 to 20 years before family planning can contribute to reduced requirements for educational expenditures. With the present large, and in some areas, growing numbers of primary-age children unable to attend school, it is likely to require several generations before the goal of universal primary education can be attained in African nations. Any delay in initiating a family planning program will move forward the effective dates accordingly. For this reason, it is imperative that once a nation becomes convinced of the benefits of reducing its population growth rate, it should take immediate steps to establish a national family planning program. A program initiated in 1970 may start to reduce the growth of the school-age population by the mid-1980's and perhaps begin to ease the education and employment burdens in the 1990's. A program delayed 10 years would not bear fruit before the end of this century.

Our discussion has pinpointed the need to keep two important issues in mind when discussing employment generation. First, the population explosion of the 1970's will lead to an expansion of the labor force which may or may not increase the level of unemployment, depending on the effective demand for the expanded labor force. However, the decision to reduce the size of the labor force in the late 1980's must be taken today, as the size of the labor force for the next 15 years

(1970-1985) is already determined by living children. Consequently, a nation's strategy for generating employment should include policies and measures to expand employment until a family planning program can reduce the fertility rate and the number of newcomers to the labor force. This discussion points up the need to consider family planning policy as an integral part of a nation's strategies for coping with employment problems.

The second point about our discussion of population concerns the changing nature of the justification for family planning programs. In many land surplus countries in Africa the case for family planning can be advanced not by referring to a man/land ratio but by a population/social services ratio. This change in emphasis is caused by the high priority which African governments are placing on the provision of social services--universal primary education, public health, rural water schemes, etc. An example of the population/social service pressure is found in the 1961 Addis Ababa agreement of African Ministers of Education to set a 1980 target for the achievement of universal primary education in Africa (56).

Factor Price Distortions

Several factors discourage the use of labor-intensive production techniques in African economies. Imperfect factor markets distort capital and labor costs. Undervalued interest and overvalued foreign exchange rates are reinforced by a wide spectrum of concessions and fiscal policies such as investment credits, depreciation allowances, tariff rebates, and corporate tax laws. Wages for unskilled labor tend to be overvalued because of minimum wage and social legislation, trade union pressure, and to some extent, the desire of foreign-controlled enterprises to present a good public image. Wages for skilled labor, on the other hand, tend to rise above minimum rates because of relative scarcities. The general scarcity of skilled manpower coupled with overvalued wages for unskilled workers and undervalued capital shift investment toward more capital-intensive production combinations.

A number of related factors encourage the adoption of capital-intensive production techniques; among them are external economies, capital-using technological innovations, and prestige--the latter being especially true with respect to public investments. In certain industries the choice of available technology may be restricted to capital-intensive techniques. Foreign investments may impart an inefficient factor bias when familiar capital-intensive techniques are simply transferred to a country with a substantially different relative factor endowment.

Research and Development (R and D) also favor capital-intensive investment in LDCs. In a recent paper, Singer notes that roughly 95 percent of world expenditures in research and development take place in North America, Europe and Japan (104). In addition, R and D priorities in these developed countries emphasize capital-intensive production techniques suited to the factor endowments of developed countries. Singer maintains that, as a result, a capital bias is introduced when these techniques are then transferred to the labor surplus factor endowment of LDCs. Such a transfer aggravates LDC employment problems and perpetuates national and international dualism. It is obvious that external donors should devote substantially more resources to assist the LDCs in expanding their R and D capacities, with emphasis on generating new technologies appropriate to factor endowments in the LDCs.

This discussion indicates that a wide array of policies act to distort factor prices in favor of using more capital-intensive techniques in African countries and, as a result, act as a constraint on labor absorption.

Rising Labor Productivity

In developed countries it is often assumed that an increase in GDP is associated with an increase in industrial and manufacturing employment. The relevance of this assumption for developing countries is being called into question by a growing body of research. Productivity increases in the industrial sector, and in some cases in agriculture, appear to be offsetting the employment effects of increased aggregate output. In Puerto Rico total employment fell between 1950 and 1960 in spite of an average annual rate of growth in GDP of 5.2 percent. Reynolds attributes this to autonomous increases in labor productivity due to improvements in the quality of the labor force and improved management (101). A rapidly rising wage level provided the stimulus to improve labor efficiency.

Frank documents substantial increases in labor productivity in the extractive industries in Nigeria, Ghana, and Zambia and in railways in both Nigeria and East Africa for 14-year periods prior to 1964 (48). Norbye reports that between 1954 and 1964, manufacturing output in Kenya rose by 7.6 percent per year (current prices) while employment fell by 1.1 percent (81). These results are corroborated by similar studies in Kenya by Ray (93) and Ghai (50) and the 1970 Economic Survey (99). Zambia experienced a similar pattern of decline in employment in a period of rising manufacturing output (115). Such rapid increases in productivity were only partly explained by an increasing capital/labor ratio. Other explanatory factors include scale economies, a fuller utilization of existing capacities of employed labor,

on-the-job training, and increased labor efficiency arising from experience. The conclusion is that there is little reason to assume that increases in GDP in Africa will be significantly associated with increased industrial and manufacturing employment. On the contrary, high GDP growth rates may lead to uneven development, widened gaps in income distribution, and a declining industrial labor force. In this context the burden of urban labor absorption is placed on the government and traditional service sectors.

Increasing Gap Between Rural and Urban Incomes

We now turn to a comparison of rural and urban real incomes, an issue which has an important bearing on rural to urban migration, unemployment, and incentives for investment in agriculture. Caldwell (19) has documented the central role played by rural-urban income differentials in stimulating migration from rural to urban areas and converting disguised underemployment into open unemployment. Frank warns that

For the typical African country, neither high rates of growth in the modern urban sector nor an attempt to resort to labour-intensive techniques in that sector is likely to have much effect on the magnitude of the urban employment problem. The answer, if one exists, to the problem of urban unemployment must be sought through examination of urban-rural income differentials and the distribution of public goods and services between urban and rural areas (48, p. 251).

Rural-urban income differentials in Africa are a result of two major forces: a) government taxes on export and import substitution crops--which depress real incomes received by farmers producing these crops, and b) government wage policy which adjusts money wages for government workers every few years.

In many countries rural incomes are constrained by restrictive agricultural and fiscal policies in addition to the distinct urban bias in the provision of social amenities discussed in the next section. Marketing board pricing policies in many cases are still extractive in nature while at the same time investments financed through their surpluses have often led to "white elephant" projects. In addition, prices paid by farmers for farm inputs and consumer goods are often inflated by excise taxes, import duties, and other protectionist devices designed to encourage (urban) industrial expansion and employment.

In many African countries discrimination against the rural sector cannot be justified on a priori grounds that African farmers are unresponsive to incentives.

The phenomenal growth of agricultural exports in the past decade in the Ivory Coast, Tanzania, Kenya, Nigeria, and Malawi, offer ample evidence that they are responsive to profitable investment opportunities (65, 120, 99). It is true, however, that export crop expansion is often confined to limited geographical areas within countries and, as a result, the very process of export-led growth may widen employment and income differentials between geographical areas. This may actually be counter-productive from a political point of view.

While rural incomes are constrained by restrictive agricultural policies, especially marketing board pricing policies, wages in the modern sector continue to increase for reasons already explained. Rising real wage rates in the urban modern sector not only discourage employment expansion, but at the same time encourage migration from rural to urban areas. As a result, the supply of labor to the non-unionized urban, traditional sector is increased. This process tends to depress real wages in the traditional sector and acts to reduce the real incomes of those who customarily supplement their agricultural incomes with offseason employment in the urban traditional sector.^{1/} Kilby indicates that this process has been in operation in Nigeria where the real wage rate in the unionized (modern) sector has risen by over 50 percent since 1953, while it has actually fallen in the urban traditional sector (69).

Although other evidence suggests that the case cited by Kilby is not representative of all African nations(18), it is nonetheless clear that government wage and pricing policies are critical determinants of the size of rural-urban income differentials. Any long-run solution to the problem of open unemployment in urban areas and disguised underemployment in rural areas will require serious attention to both wage and pricing policy variables.

Recently Todaro and Harris have generated several models of migration (58, 59, 116, 118) which have grown out of the environment of rising unemployment in East Africa. These models incorporate the probability of finding a modern sector job as a major determinant of rural to urban migration. Within the Todaro-Harris framework it becomes rational to migrate to urban areas even if there is only a 50 percent or even a 33 percent probability of obtaining a job because the average wage in the modern sector is two or three times the average agricultural income.

^{1/}Wages in the urban traditional sector are generally regarded as perfectly competitive since this sector lies outside the effective purview of labor legislation. An increase in the supply of labor would then, ceteris paribus, decrease the equilibrium real wage in that sector.

The contributions of the Todaro and the Harris-Todaro models are their insights into the relationships between employment probabilities, intersectoral real income differentials, and rural-urban migration. Their analysis reveals a paradox in coping with urban unemployment. Attempts to reduce the size of the urban unemployed labor force through employment expansion programs in the modern urban sector without a concentrated effort to make rural life more attractive are likely to be thwarted because rural to urban migration will actually be encouraged by the increased probability of securing urban employment. Standard solutions to urban unemployment--expansion of job opportunities in the industrial sector through labor subsidies or direct government hiring in accordance with a profitability criterion based on a shadow price for labor^{2/}--will induce more rural to urban migration and fail to eliminate urban unemployment. The phenomenon of urban unemployment with induced migration points out the need to improve incentives in agriculture in order to discourage out-migration of agricultural labor.

Kenya is an example of an African country trying to cope with its urban unemployment problems through urban solutions. In 1964 Kenya introduced a tripartite scheme which required both the government and private firms employing more than 10 workers to increase employment by 10 percent. This scheme failed on account of a number of problems, including inadequate government financing (57). Nevertheless, in May 1970, the President of Kenya reintroduced the tripartite scheme and announced that government and private firms would again be required to increase employment by 10 percent (99). Since the tripartite "solution" to unemployment is essentially an urban solution, the result may be counterproductive as it could--following the Harris-Todaro model--induce a flood of rural to urban migrants. In summary, Todaro and Harris demonstrate quite clearly that closing the gap in relative incomes between the sectors by raising agricultural incomes is a sine qua non for alleviating employment problems in both sectors (58).

^{2/}Harris and Todaro (58, 59) show that when a probabilistic income framework is used to evaluate rural to urban migration, the shadow price for labor to the urban industrial sectors is not zero, regardless of the amount of urban unemployment prevailing. Rather, the shadow wage should include the marginal value product of any labor induced to migrate as well as the cost of transferring that labor to the urban sector. To this we would add the cost of providing new migrants with the usual differential complement of urban amenities, not a small item when the foreign exchange component of such amenities is approximately shadow priced.

Urban Bias in the Provision of Social Services^{3/}

One of the incentives for out-migration from agriculture is the differential quantity and quality of social amenities--water supply, education, health services, access to radio, television, newspapers, etc.--in urban as compared with rural areas. The urban bias in social services is partially a legacy of colonial policies which invested heavily in the development of capital cities such as Dakar, Abidjan, Nairobi, etc., as well as a complement to the "industrial fundamentalism" of the 1960's. Zolberg notes that in Mali industrial development and the expansion of government buildings in urban centers were viewed by political leaders as part and parcel of the process of the building of a nation-state and the "symbols of sovereignty" (130).

The urban bias in the provision of social services has two undesirable consequences for agriculture: 1) out-migration is encouraged to urban areas in excess of job opportunities and 2) it is difficult to attract and retain qualified civil servants--physicians, agricultural agents, teachers, etc.--to work in rural areas. Conventional project appraisal techniques contain a built-in urban bias because they do not include the social costs of providing a differential package of amenities in urban as compared with rural areas. However, the urban social service bias will be countered only through political decisions at the highest level. Also, improved social services for rural areas will require greatly improved rural public administration. Even if the bias in the provision of social services to urban areas were checked, the spatial and logistical problems in rural areas will often mean that social services will be less well-managed and less comprehensive in rural as compared with urban areas. For these reasons improved rural public administration is an important ingredient in a program of improved social services to rural areas.

Relatively few governments in Africa have made much headway in checking the urban bias in the provision of social services. In the preparation of Nigeria's 1962-68 Plan, Stolper emphasized the need to shift the tax burden away from the farmers to the urban people who benefitted by the social expenditure in the cities (110). Nigeria's First Six-Year Plan explicitly attempted to point out the inequities resulting from subsidized urban housing, water and telephone service. Tanzania is in the forefront in developing approaches to make rural life more attractive through a program of nine regional growth centers, regional plans, etc.

^{3/} An excellent discussion of planning for social services in Africa is found in Stolper (110).

For example, Tanzania's nationalized banking system has been directed to establish banks in rural areas even though the expected profits will be smaller than if additional banks were established in urban areas. This is an implicit recognition that in the longer run, externalities may have a more important impact on growth and development than direct economic benefits (123).

Unbalanced Education Expansion

Unemployed school-leavers received attention in the early 1960's when it was observed that "school-leavers" (graduates of primary and in some cases secondary schools) had difficulty in finding employment. The rapid expansion of schooling from roughly 10 percent to 30 percent of the school-age population enrolled in primary schools resulted in school-leavers being unable to find jobs consistent with their expectations or unwilling to accept "inferior jobs" or lower salaries. W. A. Lewis contends that the disequilibrating effects of the quantum jump in the supply of primary and, in some countries, secondary school graduates has contributed to the unemployment problem (76).

At the 1961 Addis Ababa conference, African Ministers of Education adopted targets of universal primary education by 1980; it is an understatement to say that the employment implications of massive expansion of investment in education were given only token consideration in the early days of post-independence. For example, the Ashby report on educational development in Nigeria noted that its recommendations for a quantum increase in educational enrollments in Nigeria were "massive, unconventional, and expensive" (56, p. 393). The Ashby Commission declared: "We propose a rate of investment in education which far-outstrips the probable growth of Nigeria's economy by 1970" (56, p. 393). However, Harbison noted that by 1966, "the annual compound growth rate of recurrent expenditure on education (in Nigeria) was averaging about 15 percent, as compared with a GDP annual growth rate of about 4 percent" (56, p. 394). Abernethy documents the problems of attempting to implement universal primary education in Southern Nigeria in the late 1950's and early 1960's (1). In this area of Nigeria with a population of 25 million in 1966, the popular goal of universal, free primary education was nearly attained for a few years but financial deficits, rapid growth in enrollments, and regional and political rivalries soon forced imposition of fees. Abernethy concludes that on balance the educational expansion of this period had "a disintegrative (political) effect on the country (Nigeria) as a whole" (1, p. 277).

Kenya offers another example of the difficulties of expanding primary education under circumstances of rapid population growth as described in the following discussion:

. . . if fertility were to remain unchanged, it is likely that the number of illiterate children of primary school age would double in the next 25 years, in spite of present plans to improve and expand education (97, p. 4).

The African ministers who attended the 1968 Nairobi Conference on Education (122) modified the 1961 Addis Ababa target of universal primary education by 1980 to a target of universal primary education "as fast as possible." Since African nations view improved education as a route to social and economic progress and political stability, it is understandable why they express an urgency in expanding education in the 1970's. The desire for free, universal primary education was recently linked to political stability in Nigeria by Chief Awolowo who noted that "unless education was free at all levels it would be difficult to devise a generally accepted formula to ensure equal progress which was essential unless inequality was once again to poison inter-state and inter-tribal relations" (128, p. 249).

Although universal "free primary education" is a high priority social objective, the experience of the 1960's suggests that "massive, unconventional and expensive" approaches to educational planning can be misguided and that the buildup in education can increase the ranks of unemployed. Educational planners simply did not have the foresight in the early 1960's to recognize that money spent on education might be money wasted if complementary resources were not available to employ the graduates, and that massive expansion of enrollments without quality considerations can be counterproductive (110).

Tied Aid

Another cause of unemployment can be traced to "tied aid" which fosters imports from developed countries, including mechanical technology.^{4/} The reasons why some aid donors offer tied aid are well known. The impact of tied aid--especially when it is tied to the importation of mechanical technology from developed countries--often leads to the replacement of manual labor in African countries. Since world R and D expenditures are also concentrated in developed countries, one of the outcomes of this concentration is the development of a package of mechanical technology

^{4/}For a discussion of the "technology trap" see item 12 on page 40.

which is inappropriate to the factor endowments of African nations. This analysis leads to the conclusion that tied aid should be liberalized and that donor countries should help African countries achieve a quantum jump in their R and D activities in order that mechanical technology can be developed within Africa or a geographical area with a similar factor endowment.^{5/}

Political and Ethnic Barriers to Migration Within and Between Nations

Historically, labor migration between African nations has been remarkably open--as compared with Asia and Latin America--and of major significance in mining, trading, and agricultural occupations. Migration has helped both to alleviate seasonal labor shortages and satisfy temporarily longer-term shortages in the receiving countries. Generally, local labor has not been displaced and migration has increased aggregate output in both the source and receiving countries.

More recently, increasing industrialization and rising unemployment in African nations have led to African migrants competing with local labor for industrial and trading jobs and have created intense political problems in some countries. As a result, numerous African countries are both curbing in-migration from neighboring countries and in some cases asking noncitizens to leave the country. For example, Ghana's recent decision to expel thousands of noncitizens in order to provide jobs for Ghanians may lead to a chain reaction whereby Ghanians are expelled from other African nations and so on.

Recent measures to reduce the number of Asians in East Africa is another manifestation of political pressure to provide employment opportunities for Africans. Dahomey faces a difficult problem in reabsorbing many of its citizens who had formerly been employed by the French as civil servants in the rest of West Africa.

There are also political and ethnic barriers which restrict internal migration and prevent the development of a national labor market in many African countries. Nigeria is a case in point. The reconstruction of Nigeria will require imaginative steps to move once again to a national labor market. In an insightful article Stolper stressed policies to facilitate labor mobility in Nigeria as one of the cornerstones of the reconstruction period (108). The subtitle of Stolper's article "On Growing Together Again" notes that internal labor mobility is needed in order to achieve the geographical specialization of production in a nation which has wide differences in natural and human resources.

^{5/} See discussion of subsidized tractor mechanization, pp. 20-27.

Ecological Constraints

In Africa, urban as well as rural unemployment is integrally related to ecological constraints, especially the seasonal nature of African agriculture. The term, seasonal unemployment, encompasses a wide variety of situations from one to two months for tree crop farmers to five to six months for grain farmers in the drylands of North Africa.

The nature of the problems that seasonal unemployment and underemployment present are varied. During the dry seasons of North Africa and the savannah regions of sub-Saharan Africa farmers and agricultural laborers flock to urban areas seeking employment. Some are hoping for modern sector employment but many simply enter the traditional service sector or swell the ranks of the unemployed. Others remain in their rural setting, engaging in various tasks related to maintenance and village crafts including such activities as home and equipment repair, processing of agricultural materials, pottery, and transport. However, such tasks typically occupy only a fraction of the time available for work and represent a sort of seasonally disguised unemployment. Demand for the types of services and products produced in this setting is inadequate in relation to the potential supply at existing prices--prices which in many ways can be considered institutionally determined with little or no downward flexibility.

During the dry season in parts of West Africa, large numbers of farmers migrate from their savannah homeland to the tree crop areas of the Western coast. This symbiotic relationship between savannah migrants and coastal farmers has been an important mechanism in alleviating seasonal unemployment in the savannah areas.

In North Africa, however, opportunities for off-farm employment or seasonal migration are more limited relative to the available labor supply. Widespread open unemployment is common during the dry season, and dealing with it has become a major regional problem as Higgins has recently pointed out (61).

In addition to the agricultural cycle of the savannah and arid zones, other ecological causes of unemployment in Africa include soil and wind erosion--a major problem in North Africa; saline water supplies preventing the development of irrigated agriculture, sometimes resulting from the interaction between tidal flows and flat river basins as in Senegal and The Gambia; blood parasites and insect-borne diseases for both man and animals which effectively remove vast areas of land from cultivation or pasture, and others. Clearly such uncomplementary interaction between man and his environment represents an important obstacle to alleviating unemployment and underemployment in African agriculture today.

Summary

Without delving into precise quantitative estimates or the special problems associated with measuring unemployment, we have pointed out several of the more common causes of unemployment in African economies--some related to labor supply, others more related to labor demand.

That unemployment is a serious problem in Africa goes without saying. One has only to observe urban slums in the middle of a working day or rural towns and villages during the slack season in agriculture. Our analysis clearly points to the agricultural sector rather than to urban areas as the key to expanding employment opportunities.

In addition, Harris and Todaro (58) have shown that preoccupation with employment generation in the industrial sector in the face of open unemployment will likely be a misguided policy because this policy itself will induce additional rural to urban migration.

III. AGRICULTURAL POLICIES AND EMPLOYMENT GENERATION: PRESENT POLICIES AND NEEDED MODIFICATIONS

Since there is a marked heterogeneity of natural and human resource endowments within and between African nations, the causes of, and solutions to, unemployment problems will vary widely from nation to nation and from one time period to another. Also, an analysis of unemployment in agriculture must go beyond an analysis of agricultural policies and include economic and social policies and the policies of external donors. For these reasons, we have summarized in Table I the major policies--economic, social, and agricultural--which affect unemployment and under-employment in African agriculture and migration from agriculture to urban areas.

Two points stand out in Table I. First a range of poor policies--economic, social, and agricultural--can contribute in a major way to unemployment and under-employment. Second, approaches to planning, such as the ad hoc project approach and maximum growth rate plans, often sidestep unemployment problems. A third point, not included in Table I, is the crucial role of enlightened political leadership in aggressively supporting rural development and employment generation in agriculture. Improved agricultural policies, improved policy coordination, and improved approaches to planning will be to no avail if political leaders lay down a monolithic strategy of development through import substitution industrialization which is financed by supplier credits and surpluses from farmers.

The reader should note that Table I contains a list of general economic and social policies which have already been discussed in Part II. In this section we shall focus on agricultural policies which directly or indirectly exacerbate unemployment or inhibit employment generation in agriculture. We shall then demonstrate how improved agricultural policies--in combination with improved economic and social policies, improved policy coordination, and improved approaches to planning--are key steps which African nations can take to develop an efficient and consistent strategy for agricultural expansion and employment generation.

In contrast to Latin America and Asia, Africa does not have major land tenure problems which require public action and land reforms. Africa's land tenure system of smallholder production is remarkably capable of absorbing labor, provided incentives are available at the farm level.^{1/} Even when there is not a clearly defined

^{1/}The emphasis is on the absence of "major" land tenure problems of the sort which exist in Latin America. Obviously, there are land tenure problems in some North African countries, in Kenya, and to a minor degree in Tanzania.

TABLE I. Some causes of unemployment and underemployment in African agriculture and migration from agriculture.

Types of Policies and Approaches to Planning Pursued by African Governments				Policies of External Donors
General Economic Policies	Social Policies	Agricultural Policies	Approaches to Planning	
1. "Industrial fundamentalism" of the 1960's	1. Colonial legacy of developing capital cities	1. Subsidized tractor mechanization	1. Overemphasis on comprehensive plans under conditions of comprehensive uncertainty (102)	1. Emphasis on projects rather than <u>assisting</u> in developing consistent economic policies for the agricultural sector
2. Minimum wage legislation and social service benefits which are extended to plantations and estates	2. Unbalanced educational expansion	2. Anti-export policies	2. Overemphasis on single target--high growth rate plans	2. Trade barriers to LDC exports
3. Capital investment allowances for adopting capital-intensive technology in processing and in farming	3. Urban bias in social services	3. Self-sufficiency food policies which may raise consumer prices and induce higher minimum statutory wage rates	3. Overemphasis on project approach and on financial rather than economic returns	3. Tied aid--e.g. tractors
4. Fiscal policies which tax agricultural exports and increase the gap between rural incomes	4. Educational curriculum oriented to modern urban industrial careers	4. Lack of attention to key role of producer incentives	4. Lack of attention to agricultural sector planning	4. Token emphasis on financing local cost components--especially labor--of projects
5. Import substitution industrialization which often raises the price of farm inputs	5. "Wait and see" attitude to family planning	5. Overemphasis on government direct production schemes which are capital intensive a) irrigation b) state farms c) land settlements	5. High level manpower requirements computed to meet the needs of urban/industrial sector	5. Token support for local research on technology appropriate to local factor endowments
6. Statutory wage rates which raise the price of manual laborer above the real cost to society of employing him	6. Political and ethnic barriers to the development of a national labor market	6. Lack of national R & D systems which are development-oriented and geared to the factor endowments of the nation		6. Emphasis on single target--high growth rates (Pearson report 6% target for 1970's)
	7. Housing subsidies in urban areas			7. Token support for development of farm management research and experimental types of farm organizations--nucleus plantations, cooperatives

land market, Uchendu's recent study points out that there is surprising evidence that land bottlenecks will "yield" in East and West Africa when profitable investment opportunities are forthcoming (120).

Some of the major causes of unemployment in agriculture in African countries are linked to poor agricultural policies. These policies are summarized as follows.

1. Subsidized (big) tractor mechanization
2. Anti-export agricultural policies
3. Self-sufficient food policies which may raise consumer prices and induce higher minimum statutory wage rates
4. Overemphasis on direct government production schemes which are capital intensive--(a) state farms, (b) land settlements, (c) irrigation
5. Lack of national R and D policies and programs which are geared to the factor endowments of the nation

We shall first discuss each of these major policies which retard employment expansion in agriculture and then suggest modifications which will lead to employment generation. We shall conclude by discussing the special case of employment expansion through rural public works programs in North Africa.

Subsidized Tractor Mechanization^{2/}

African governments have experimented with a number of tractor mechanization schemes and tractor hire services. Tractor mechanization has been generally connected with large-scale farming schemes such as state farms, land settlements, etc. Many of these large-scale mechanized systems of farming have generally failed after a few years or have experienced so many problems that they have been curtailed to the extent that it has been politically possible. Some of the more famous, unsuccessful large-scale agricultural schemes are government plantations in Sierra Leone, state farms in Ghana, farm settlements in Southern Nigeria, Nigeria's Mokwa scheme and settlements in Tanzania during its First Plan. Also, tractor hire schemes have been generally inefficient in Tanzania, Uganda, Ghana, Morocco, and Nigeria and other countries when appraised from an economic point of view rather than from the financial profitability of the scheme itself.

^{2/} Tractor mechanization is defined as relatively large tractors--40, 50, 60 horsepower--and associated equipment.

Tractor mechanization schemes in Africa have been less than successful for a number of reasons.^{3/}

1. The short life of tractors and equipment due to corrosion and poor maintenance and operation (34)
2. Poor management
3. A low degree of utilization
4. Equipment inappropriate for African soils and diverse ecological conditions, and
5. Problems associated with poor land clearance and size of fields

These are problems as viewed by individual farmers, firms, or government agencies operating tractor hire schemes. In addition, if tractor schemes are carefully scrutinized from a national or economic point of view we observe that

1. Tractor schemes are often subsidized by government by means of a number of direct and indirect methods such as capital investment allowances, rebates on petrol, subsidized training centers for tractor drivers, subsidized repair centers, etc.
2. Tractor schemes require large amounts of foreign exchange for new equipment, extensive inventory of spare parts, fuel, etc.
3. The employment effect of tractor schemes is often ignored.

In light of these problems and considerations, the question arises as to why tractor schemes are endorsed by so many African governments and aid agencies and why tractor schemes continue to be promoted and subsidized by African governments. There are many reasons for this continuing appeal of tractor (big) mechanization.

1. Prestige--Tractors and mechanized farming are equated with modern farming in developed nations.
2. Inadequate methods of appraising mechanization projects--Tractor mechanization projects are usually appraised on a technical or financial basis rather than an economic or national basis. Even when mechanized projects are appraised within an economic framework, important secondary considerations, such as employment, are often ignored.
3. Tied aid--In numerous cases implicit or explicit support for mechanization can be traced to "tied aid policies" of donor nations.
4. Alternatives to unresponsive African smallholders--Although research has shown that African farmers are "economic men" to a remarkable extent,

^{3/} An excellent bibliography of African mechanization can be found in Kline, et al. (71). Among the few sound economic studies of mechanization in Africa are Baldwin's evaluation of the Niger Agricultural Project (6), Purvis' "A Study of the Economics of Tractor Use in Oyo Division of the Western State (Nigeria)" (91), and deWilde's "Implements and Machinery," Chapter 6 (34).

there are still many government civil servants, especially technical agriculturalists, who see mechanized farming as a shortcut to the tedious process of helping small farmers improve their farming systems.

5. Timeliness--In numerous countries physical soil conditions allow only a few days between plowing (after the rains begin) and sowing. Since present animal power systems can plow only from 1/2 to 3/4 acre per day, the cultivated land area is limited. Thus, a prima facie case is established for tractor mechanization.

The fact that rainfall patterns and soil conditions permit only a few days between plowing and sowing in a number of African countries might warrant subsidized mechanization despite widespread rural unemployment and underemployment. An African case which tests this proposition is "Operation Plow" in Morocco reported by Van Wersch (126). Operation Plow was started in Morocco in 1957 when the government made available the services of 1,000 tractors to farmers. Planners justified the substitution of labor-saving machinery for peasant labor because soil conditions do not permit plowing with animal power before the rains, thus allowing only a few days for sowing. However, the draft power of a team of weak animals (oxen, mules or camels), can plow no more than one-third of a hectare (0.8 acres) per day. The limited time for tilling, inadequate draft power, and the limitations of the traditional wooden plow result in an underutilization of land. A combination of problems brought the scheme to a halt several years after it was started. Problems included the wrong choice of plowing depth in some areas, inclusion of marginal wheat farming land, crop failures caused by poor weather, and poor management problems of maintenance of equipment, etc. (126).

Improved techniques of appraising mechanization projects are urgently needed in order to check the current enthusiasm for subsidizing tractor mechanization in Africa. Appraisal of mechanized projects should be undertaken from two points of view: 1) financial, i.e., the profitability of mechanization to the farmer or agency (such as a private or government tractor hire service) and 2) economic, i.e., the impact of the project on the national economy, including secondary costs and benefits such as the impact of the project on employment, foreign exchange, and other national aggregates.

Appraising tractor schemes from only a financial point of view often supports inefficient and counterproductive tractor mechanization. Financial returns are essentially returns calculated at prevailing market prices for inputs and outputs. As such, they usually do not allow for a number of artificial incentives--capital investment allowances, foreign exchange requirements, supporting equipment, spare

parts, fuel, etc.--and as a result lead to an exaggerated advantage of using machinery to replace manual labor. In addition, the administrative and training costs of mechanization schemes are often not included in the cost of the scheme. Moreover, crops which lend themselves to mechanization--e.g., wheat and sugar-- may benefit from producer prices which are enhanced by high levels of protection. As a result these schemes will often be financially profitable to the producers of these crops but may be difficult to justify from the viewpoint of national output. In essence, financial returns are little indication of the project's contribution to national income (economic returns).

An economic appraisal, on the other hand, is mainly concerned with the impact of a project on national aggregates such as real income, employment, foreign exchange balances, etc. Prices are corrected for the imperfections discussed above, and investments in mechanization schemes can be compared with alternative investments. It should be clear, therefore, that mechanization schemes should be appraised from both the financial and economic (national) viewpoints in order to determine whether schemes which are financially profitable to the firm or agency are also sound from a national viewpoint.

Remarkably few external donors use a rigorous cost/benefit approach in appraising tractor mechanization projects from both a financial and a national point of view. They often rely on agricultural engineers to appraise mechanization projects, who, unfortunately, sometimes justify mechanization in terms of horsepower per unit of land area. For example, a recent report notes that

There is a shortage of farm power in Equatorial Africa, over 99 percent being derived from human effort. A human being has been rated at about 1/10 horsepower, while the minimum power requirement for an efficient agriculture has been estimated at about 1/2 horsepower per hectare (71, p. 1-1).

Rules of thumb such as 1/2 horsepower per hectare are useless from a practical as well as a planning point of view. The planner needs to know how the rate of return on the investment in a tractor scheme compares with investments in irrigation projects, feeder roads, smallholder credit schemes, plant breeding programs, etc.

One of the few mechanized projects in Africa that has been appraised from both a financial and an economic point of view is the Shashemene Agricultural Project in Ethiopia (51). This project calls for the investment of \$5 million to help establish 140 Ethiopian farmers in mechanized units of either 40-, 80-, or 200-hectare farms. The mechanized farms are subsidized inasmuch as the 140 farmers do not pay for the overhead costs of the project of about \$2.8 million of the \$5 million total

cost of the project. The financial rate of return to the farmers on each of the three farm sizes and the economic rate of return are considered to be favorable. The internal rate of return on the project to the Ethiopian economy is approximately 20 percent. Although there are several key assumptions which can be questioned--such as tripling crop yields within five years of the project--the Shashemene project is significant for including both the financial and economic rates of return on the project. However, this project appraisal can be faulted because it makes only passing reference to such key factors as the impact of the project on employment and on the incomes of nonparticipating farmers throughout the country. On employment, the appraisal states

The project is unlikely to displace labor. It will probably increase employment in the Shashemene area, which is presently a labor deficit area. While it is expected that mechanization will reduce demand for hired labor for plowing, this will be offset by increased labor requirements due to increases in production, increases in land area cultivated, and the adoption of labor-intensive improved practices, e.g., spraying and weeding. Employment will increase as the participating project farmers shift from the traditional crops to more labor-intensive higher-value crops such as seed potatoes, chillies, pulses and oil seeds. Additional employment may also be created by the eventual establishment of new agro-industries in the Shashemene area (51, p. 27).

Undocumented speculation of this sort reveals the shortcomings of an economic analysis which emphasizes the internal rate of return of an investment to the economy and does not quantify secondary costs and benefits such as employment, foreign exchange, and income effects for both participating and nonparticipating farmers.

Now that we have made a case against subsidized tractor mechanization in Africa let us explore alternatives. Two areas should be explored: first, animal power, and second, the need for a substantial increase in expenditures on research and development, within Africa. Alternative forms of mechanical technology such as improved animal-powered systems and small tractors--10 to 20 horsepower--should be studied.

In tropical Africa animal power is a relatively recent form of mechanization.^{4/} Even today animal power is not widespread, in part due to its late introduction in

^{4/} For a review of animal-powered mechanization in Africa see Kline, et al., (71).

most African countries, the distribution of the tsetse fly, and the general separation of cattle herding and crop farming. Government efforts to promote animals for draft have generally included only token expenditures on research and development of animal-powered equipment as compared with emphasis on promoting the use of animals to perform one task--plowing.

We believe that animal power can be a good alternative to tractor mechanization in a number of African countries. Some researchers have reported that animal power enables farmers to extend their cultivated area. Laurent (74) suggests that animal power in Northern Nigeria has the potential to extend cultivated area 3 to 4 times. In The Gambia, farmers trained at one of the Mixed Farming Centers were able to extend their acreage in groundnuts by 30 to 40 percent (86). In the Mwanza and Shinyanga Districts of Tanzania the ox-plow has made it possible to extend the area under cultivation by 80 percent compared to traditional methods (29 and 30).

The introduction of animal power has the potential for decreasing underemployment primarily via land extension which will require more man-days for weeding and harvesting. The marginal returns from additional acreage could provide sufficient incentive to increase family and hired labor for weeding and harvesting. In countries or regions where animal power is justified, domestic manufacture of implements--ox carts, donkey carts, plows, etc.--can help generate local employment and reduce foreign exchange requirements.

Other potential advantages of animal power have been reported, such as yield increases, easing the drudgery associated with handhoe methods, adaptability to smallholdings, incorporating cattle into the farming system, modest foreign exchange requirements, and being within the managerial and economic capacity of many smallholders.

In general, it appears that farmers adopting animal power have been able to extend the area under cultivation and increase farm incomes. Animal power appears to us to be a more feasible approach^{5/} to improving the welfare of smallholders than tractor mechanization in many African countries, given their present stage of development and the existence of pervasive underemployment problems. Our judgment is based upon the following hypotheses:

^{5/}We are aware of animal-powered schemes that have failed. However, most of these schemes were not solidly supported by local R and D on the full range of animal-powered equipment.

1. The acquisition price of oxen and equipment is within reach of many more small farmers.
2. The purchase of animal-drawn equipment will require less expenditure of foreign exchange per unit of output than tractor mechanization (tractors, equipment, spare parts, fuel, etc.).
3. Animal power will require less investment in supportive services and skilled manpower.
4. Returns on investments in animal power are less sensitive to yield and price fluctuations.
5. The costs of failure for an animal-powered mechanization scheme will be less because of higher relative salvage prices for the inputs.
6. Animal-powered mechanization is less sensitive to poor management than tractor mechanization.

Promoters of tractor mechanization are often harsh critics of animal-powered mechanization. Such critics often contend that once farmers have an opportunity to see tractors in their area, they will want to bypass the animal-powered stage and move from the handhoe to the tractor stage. This criticism is partially valid if one compares subsidized tractor mechanization with unsubsidized animal-powered schemes. For example, if an Ethiopian farmer can join the highly-subsidized Shashemene mechanization scheme (51), why should he pursue animal-powered mechanization? However, the Shashemene project will cost \$5 million and benefit 140 farmers. The opportunity for Ethiopian farmers to participate in this scheme can be compared with a lottery game. The relevant comparison of animal vs. tractor mechanization is between unsubsidized tractor mechanization and animal-powered mechanization.

Critics of animal-powered mechanization also assert that animal-powered mechanization simply extends the land area under cultivation and generates a weeding bottleneck because suitable animal-powered equipment for weeding has not been developed. This criticism is generally valid. Numerous studies reveal that farmers who adopt animal-powered land preparation techniques are faced with labor shortages during the weeding period.^{6/} This problem points up the need to expand R and D on weeding devices which can be attached to animal-powered tool bars. There is remarkably little being done in many African countries to draw on the backlog of R and D on animal-powered mechanization in countries such as India, Pakistan, Senegal, and The Gambia.

^{6/} David Norman reports this problem in a study of labor utilization in Northern Nigeria (82).

In summary, the case for subsidized tractor mechanization in Africa should be critically reconsidered on a country-by-country basis in light of the general failure of tractor schemes, widespread underemployment and unemployment and the potential unfavorable impact of mechanization on employment, foreign exchange, etc. Much of this process of subsidization goes unnoticed by the technical agricultural agents, politicians, and donor countries who are promoting tractor mechanization. For example, capital investment allowances, training facilities for tractor drivers, repair centers, etc., and the claim on skilled government manpower have usually not been considered by the agents who are promoting and evaluating these schemes.

For these reasons, increased attention must be directed to appraising proposed mechanization projects from a financial and economic point of view, including in the economic analysis the impact of the proposed project on employment, foreign exchange, income distribution, etc. There is a limited role for unsubsidized tractor mechanization in some areas of Africa. However, there is a larger scope for animal-powered mechanization than is commonly believed. There is an urgent need to develop the R and D capacity within Africa to design the mechanical technology appropriate to the factor endowments of each country and for varying ecological zones within countries.

The challenge for donor agencies in the 1970's is to shift their attention from the importation of mechanical technology from Western and Eastern European countries to assisting African nations in the design and adaptation of mechanical technology appropriate to local factor endowments. The design of mechanical technology so as to complement labor use rather than substitute for it is a high priority area of research in Africa in the 1970's.

Anti-Export Agricultural Policies

One of the important causes of unemployment in African agriculture arises from poorly conceived and inconsistent policies for exploiting Africa's potential to compete in world agricultural export markets, and thereby generate employment and increased effective demand in agriculture.

Fiscal policies which tax agricultural exports have helped widen the rural-urban real income gap in a number of African countries. Although export taxes are administratively tidy, they frequently depress producer incomes, promote rural to urban migration, restrict the rise of rural land values, and hold down the growth in effective demand among farm people.

Another common anti-export agricultural policy is the requirement that estates and plantations pay statutory wage rates. When the Morgan Report on wages was accepted by the Nigerian government in 1964, government wage rates were increased 20 percent and private estates and plantations increased their wage rates and quietly reduced their labor force. One private estate in Nigeria, for example, responded to higher wages by laying off 400 workers and substituting chemical spraying of weeds for the machete technique.

Other measures which hold back specialization in export crops are the uncritical acceptance of gloomy export projections. Eicher and Johnson contend that a nation should determine the emphasis it should place on export crops only after careful computation of payoffs on a crop-by-crop basis; they suggest that substantial attention must be focused on how a nation can reduce its cost of production (40). Myint has noted that

In spite of the arguments that international trade cannot provide an engine of growth for LDCs, during the 1955-63 period, the value of total exports from Africa increased by 42 percent while those from Latin America and Asia increased by 22 and 10 percent respectively. The implication of this analysis is that each LDC must assess the demand conditions for and the profitability of its particular export products rather than assuming exports from agriculture are doomed (80).

Unfortunately there are few carefully documented studies of the potential payoffs from export crops in African countries. Many African countries uncritically accept the UNCTAD conclusion that export crops are doomed and proceed to shift from export to food crop production, including patches of pineapples, mangos, fishponds, etc. The CSNRD report on Nigerian agricultural development--1969-1985--offers insights into how to examine the payoffs on export crops on a crop-by-crop basis with careful attention being given to world market projections, new technology being used by competing nations, and new technology that may become available from local research stations (65).

Expanded agricultural export earnings are a major potential source of growth and employment expansion. Although iron ore or bauxite may employ a few thousand workers in Guinea or Liberia and may generate high GDP growth rates, the impact of expanded bauxite or iron ore production on employment generation is negligible as compared with policies which affect the investment decisions and allocations of labor on hundreds of thousands of smallholdings in these same countries. Unfortunately, few African countries--especially the smaller nations--have the analytic

expertise to develop payoffs on exports and to develop export crop production campaigns which are based on physical and financial data.

Africa has shown that it can be a low-cost producer of agricultural exports in world markets. The dramatic inroads that African countries have made in the world coffee and tea markets in the past two decades^{7/} suggest that African export agriculture can be an important means of earning foreign exchange, absorbing labor in agriculture, and generating effective demand among farm people to enable them to purchase a higher protein diet, industrial products, etc.

Self-Sufficient Food Policies

Self-sufficient food policies are a common feature of almost every African plan. In marked contrast to many Asian nations, most tropical African countries are virtually self-sufficient in staple foods. Dalton analyzed the structure of food imports in Africa for the 1963-65 period and concluded that

1. Only a quarter to a third of food imports (as of 1963-65) effectively could have been supplied by African farmers, on their own, or helped by marketing, transport and extension actions.
2. Foreign exchange gains from easily available import substitution foods are relatively small in terms of need.
3. Food imports are largely a matter of new demands (for wheat flour bread, tinned milk, processed fish), special demands of foreign communities, and of government policy.^{8/}

Since the world price of most cereal products is expected to decline in the 1970's following expanded output of food grains in Asia, it is necessary to examine the merits of pursuing self-sufficiency in food production in African countries--especially crops such as wheat, dairy products, and processed foods such as tinned milk.

Autarkic food policies in many African countries have been combined with rising import duties in order to protect local producers of some crops such as sugar, wheat, etc. As a result, consumer food prices have risen in many countries (73). The combination of rising food prices and trade union pressure has induced statutory rises in government wage rates which are usually adopted by private estates and plantations

^{7/}We should point out to the reader that a number of African countries benefit from discriminatory entrance into a number of European markets vis-a-vis Latin America. India's failure to modernize its tea industry has reduced its comparative advantage in world tea markets vis-a-vis East Africa.

^{8/}Jack Dalton, "Food Imports and African Agricultural Development," unpublished draft, ECA, December, 1968.

employing agricultural labor. In Tanzania, for example, statutory money wages rose 80 percent from Independence to 1961 to 1965-66 (63, p. 4). Rises in statutory wages have often led to the replacement of labor on estates with capital equipment.

Overemphasis on Direct Government Investment Schemes

Another cause of unemployment problems has been the rush into direct government production of agricultural products on large irrigation schemes, state farms, and land settlement schemes. Settlements in Uganda, Eastern and Western Nigeria, Tanzania, Sierra Leone, etc., and state farms in Ghana have almost all turned out to be capital-intensive schemes lacking adequate technical and economic feasibility studies and subject to political pressure. In many cases they have been poorly managed. Also, these large schemes have often been supported by subsidized tractor mechanization.

Large-scale irrigation schemes dot Africa, especially in the North and the Niger and Nile river basins. It has been estimated by some scholars that the extent of irrigation in Africa could be substantially expanded, partly by extending the present schemes and partly by bringing new areas under production. Much of the potential area consists of perennial or seasonal swamps; if such immense areas are ever to be reclaimed, large-scale pumping and drainage facilities will be required. Needless to say, such programs will be expensive. Unfortunately, successful large-scale irrigation schemes in Africa south of the Sahara are few and far between. This, in turn, is related to difficulties experienced with tractor mechanization. A glaring exception to both of these generalizations is the Gezira scheme in the Sudan.

The major problem with large-scale irrigation schemes of any type is the large capital expenditure required and the relatively few people affected by them. This aspect can be improved by postponing the construction of drainage facilities until salinity or waterlogging become problems. Hydrologists tend to view this as poor policy because of the higher costs of reclaiming waterlogged or saline soils, assuming such exploitation is not carried too far. It is not at all clear, however, that it is less profitable to do so if discount rates, which reflect the opportunity cost of capital, are applied to present versus future investments, i.e., drainage versus reclamation. Proper layout, furrow irrigation, and paddy cultivation can further reduce investment costs by avoiding the need to level the land or by shifting the burden to farmers.

Large-scale irrigation schemes also require a considerable degree of coordination--from the engineers who build the pumping station and the dam to the agency that distributes the water through the canals, to the extension specialists who must train the farmer. Management is a critical ingredient which unfortunately is not always available in the amount required.

We have pointed out above that large-scale irrigation schemes have generally been unproductive in tropical Africa. Also, the FAO's Indicative World Plan for Agricultural Development suggests that irrigation will cover less than one percent of the arable land in Africa south of the Sahara by 1985 (45, p. 67). However, we believe that there is long-term potential for small-scale irrigation to absorb labor in agriculture in Africa through constructing and maintaining irrigation systems and through multiple cropping.^{9/}

Before we analyze the potential of smallholder irrigation in tropical Africa it is important to point out that the substantial irrigation infrastructure in Asian countries such as Taiwan, Pakistan, and the Philippines was established over the past three or four generations. Also a vigorous research program on irrigation has been a standard component of government research for a number of years in Asia. Because of the lack of such an infrastructure in tropical Africa there is no reason to be optimistic about any major expansion of smallholder irrigation within the next few years. However, the potential of employment generation is so great that steps should be taken now to expand R and D on smallholder irrigation.

A substantial amount of rural unemployment and underemployment in Africa is seasonal in nature. Farmers are unoccupied for periods of one to seven months each year. While it is true that during the slack season homes are repaired, implements are manufactured, clothes are made and petty trading takes place, some of the labor undoubtedly represents disguised unemployment--i.e., the same work could be performed by a much smaller labor force. Irrigated agriculture can productively utilize farm labor during slack periods, as well as increase yields

^{9/} For example, Lester Brown reports that Taiwan moved from 18 percent of the total land area under multiple cropping in 1946 to 89 percent in 1966 and by 1969 virtually all crop land was producing two crops per year, and has contributed to a significant increase in rural employment. Brown also reports that farmers in Mysore state in India are producing three crops of hybrid maize every 14 months, and scientists at Los Banos, the Philippines, are now regularly harvesting three crops of rice per year (17).

on crops grown during the normal cultivating season. The net result of irrigation should be a significant increase in agricultural output, incomes, and employment.

Irrigation is not new to Africa. It has been practiced in North Africa for thousands of years. However, Africa south of the Sahara at least, is conspicuous for its lack of smallholder irrigation. Flood plain cultivation of river banks and shorelines of lakes where the water table is sufficiently close to the surface to provide adequate moisture is quite common. Yet even in areas of land scarcity usually little effort is made to dig shallow wells on land slightly farther from water sources.

In addition to smallholder irrigation schemes, there appears to be widespread potential for smallholder irrigation on traditional holdings. Both the paddy system and shallow lift pumps have widespread applicability. Hanson (55) indicates that the success of Taiwanese demonstrations of paddy production of rice in West Africa has been modest. Reese, et al. (94) are more optimistic and suggest that it may be catching on. In other areas, the Casamance of Senegal, for example, low-land rice is cultivated only during the rainy season in spite of the fact that farmers have little to do during the dry season at which time the water table is less than two meters from the surface. Bucket-lifts or the Egyptian shadufs^{10/} could be used with paddy cultivation to produce another crop, if not of rice, then something else.

River or stream irrigation also has potential. Flood water storage dams and inlet canals can be combined with primitive devices or even modern pumps to move water high enough to irrigate large tracts of land on either side of a number of rivers. Storage dams can be used in the more hilly areas while inlet canals have potential in some of the wide, flat river valleys such as the Senegal or the Gambia basins.

Whether smallholder irrigation can be successful in Africa is a crucial question which requires a substantial R and D input and substantial farm management experimentation. Some irrigation from shallow wells is being done in Chad,

^{10/}This usually consists of two upright poles joined by a crossbeam at a point 8 to 10 feet above the ground. A long pole is attached at right angles to the crossbeam. On the one end of the pole is hung a rope supporting a skin or bucket; at the other end is a mass of clay or a heavy weight to act as a counterbalance. The rope is pulled down manually and the bucket dipped into the stream or well. The counterbalance then lifts the container of water.

the Cameroons, and spots of Nigeria and is quite widespread in North Africa. Irrigation from mountain streams is being done in northern Tanzania. But these are still pockets of promise in an area of what appears to be vast potential. Feasibility studies on smallholder irrigation are needed for East and West Africa, both from a technical and an economic point of view. The potential of smallholder irrigation for increasing incomes and expanding employment in the dry season needs to be assessed. It will also be important to determine why such techniques have not been adopted.

Lack of National R and D Policies and Programs Geared to Local Factor Endowments

We have already mentioned that roughly 95 percent of the R and D in the world is concentrated in North America, Europe, and Japan. Furthermore, with the exception of simple hand tools, relatively little R and D in agriculture can be transferred from temperate climates of North America and Europe to Africa. The UK allocated only a little over 1 percent of its aid budget to R and D in the LDCs in 1968 (104, p. 7). However, there are several bright spots for R and D in Africa. The first is the impressive research network for export crops that was developed by colonial governments years ago. Second, Mexican dwarf wheats are doing well in Morocco and Tunisia and have been tried on a small scale in Algeria. Third, hybrid maize is booming in Kenya and the (Kenya) hybrids have been transferred to Njombe^{11/} district of neighboring Tanzania. Fourth, the outlook for R and D is promising in Nigeria, which is the site of the newly-established International Institute for Tropical Agriculture.

Donor agencies can assist the development of agricultural research in tropical Africa by taking some of the following points into consideration (38).

1. In tropical Africa a few nations have developed a critical mass of talent for high-level agricultural research. The nations include the Ivory Coast, Nigeria and Kenya.
2. Technical agricultural research in most African countries is dominated by government research institutes and liaison between the government researchers and extension workers leaves much to be desired. Universities are primary teaching centers and occupy only a footnote position in the research environment.

^{11/}Njombe district is in Southern Tanzania at an altitude of 5,000 to 7,000 feet, which is similar to Kitale, Kenya. Adaptive research on the Kenya hybrids was carried out by a private firm in Njombe district--the Tanganyika Wattle company.

3. The bulk of social science research is tucked away in the universities, is modest in size as compared to expenditures on technical research, and is generally making a token contribution to the solution of high priority development problems.
4. Agricultural economics research is of high priority, yet only about 15 agricultural economists are working as researchers in the 15 countries in West Africa. The staff of 15 researchers for West Africa--a land area only slightly smaller than continental United States--is about equivalent to the number in one state in the United States such as Washington or Oregon.
5. In order to improve agricultural research, high priority should be given to the following:
 - a. Each African nation should devote attention as soon as possible to the development of a preliminary framework for a national system of agricultural and rural development research, with emphasis on how national research systems are linked into regional research units and into the international scientific community.
 - b. Development of national research systems should incorporate the potential contribution and cross-fertilization of both government research institutes and university faculties of agriculture.
 - c. A small number of African universities should develop plans to move aggressively into post-graduate training in faculties of agriculture with the aim of training the bulk of Africa's agricultural manpower at the MA level by about 1977-1980.
 - d. Analyze how to overcome bottlenecks in the upward flow of information about local agricultural problems to researchers and downflow of information to change agents, including extension agents, missionaries, school teachers, credit agents, and private input firms (seed and fertilizer).
 - e. Analyze how improved flow of scientific knowledge can be communicated between French- and English-speaking nations in Africa.
 - f. Analyze how small nations can tap the research which is generated in larger nations and in regional research institutes while small nations concentrate on adaptive research.
 - g. Analyze how long-term funding can be secured to retain qualified expatriate researchers in Africa for another 10 to 15 years.
 - h. Consider setting up several African research centers to concentrate research on
 - 1) Protein problems (technical, economic, and social aspects),
 - 2) Intermediate technology, with emphasis on ox-equipment, small tractors and small farmer processing equipment, and
 - 3) African trade problems.

The Special Case of Employment Generation
Through Rural Public Works Programs
in North Africa

Public works programs utilizing PL 480 food aid for wages in kind have been in operation in Tunisia since the late 1950's and in Morocco and East Pakistan since the early 1960's. The general objective of the programs is to alleviate unemployment and underemployment and, in the process, contribute to economic and social development. Investments under the rural works program are labor intensive and include land and water development, physical infrastructure and community development projects. Investment per worker is generally quite low as compared with investment per worker in industry. Direct output effects depend very much on the kinds of projects undertaken.

Project selection is a crucial determinant of the economic value of a public works program and the speed with which the unemployed can be absorbed into the permanent labor force. Topography and ecology are major determinants of the profitability of projects. In Tunisia the need is for relatively large earthworks in central and southern areas to hold the sparse rainfall on the soil and to prevent the flooding which results from the infrequent but torrential rains. Reforestation is also required in order to control soil and wind erosion. In East Pakistan new and improved waterworks and flood control projects have a direct impact on agricultural production because of damage caused by annual monsoons (112). In all three countries, however, too great a proportion of works expenditures have been on roads, other physical infrastructure, and community projects and not a large enough proportion on land and water development projects of the kind described. Pressures of time, limited technical assistance, local interest groups, and geographical immobility of unemployed labor were the primary causes of the unfavorable proportions (3).

The techno-political framework in which public works programs are cast is also important. The more successful program in East Pakistan has built from the locality upward. Project identification and selection is on the local level, subject to the approval of technicians. Local importance of the work is directly perceived and people in the villages are required to manage their own projects (112). In Tunisia, local participation was stimulated by working through the national political party (3).

Lack of effective technical back-up appears to be a major factor preventing a more economically desirable project mix in all three countries. In spite of

general scarcities associated with skilled manpower in developing countries, employment at the work centers is on a rotated basis in two of the countries in order to distribute wages to a larger number of workers. This has caused difficulties in training workers and increased the need for supervisory and skilled field personnel. The lack of such qualified people has become the major constraint on the Moroccan program.

Unlike industrial employment, rural works programs can be tailored to the slack season in agriculture. A successful program requires well-developed local planning and administrative capabilities with good technical resource people. Rural works programs on a considerably smaller scale than those undertaken in the countries discussed might be better-planned and better-selected for their economic profitability. In areas with large rural populations that are essentially unemployed for 4 to 6 months a year, labor-intensive land development programs could make a substantial contribution toward increasing agricultural output and incomes. There would also be substantial carryover into the crop season, especially where irrigation development or feeder roads promise to alleviate existing bottlenecks.

It is virtually impossible to arrive at a judgment of the profitability of the rural works programs in Tunisia, Morocco, and East Pakistan from the available research to date. Conflicting conclusions are often published amid charges that the facts are misrepresented. There is, however, some reason to believe that the burden of proof falls on the programs' supporters. But to speak only in terms of profitability when evaluating public works or food for work programs misses the point. Economics is more than production, and welfare more than output. Certainly, public works programs must be viewed in a rigorous opportunity cost framework and their contribution to agricultural output assessed. Proper planning, project selection, and technical back-up can improve their profitability. Yet from the point of view of national governments, the primary purpose of rural works program is to provide employment opportunities in order to alleviate serious income and nutritional deficiencies and social and political problems. It may be more appropriate to measure the benefits of such programs in relation to their marginal cost over and above a least-cost welfare program. For certainly, even though the output effects may be dubious, the employment effects are certain.

IV. SUMMARY AND IMPLICATIONS FOR EXTERNAL DONORS

The purpose of this section is to summarize the major points of the paper and to discuss the implications for external donors who are assisting African nations.

Summary

1. Rising unemployment in Africa is a major social, political, and economic problem. A convergence of forces, including the population explosion, has led to rising rates of unemployment which are expected to increase in the 1970's. Only a modest percent of the increase in population will be able to find jobs in Africa's urban centers. There is now a consensus of opinion among researchers that over the next 10 to 15 years solutions to employment generation in Africa will have to be found to a large degree in the agricultural sector. However, with the exception of a few countries such as Tanzania, the Ivory Coast, and recently Nigeria,^{1/} African political leaders have not made an all out commitment to employment generation in agriculture. Likewise, most African political leaders have adopted a "wait and see" attitude to checking the population growth rate through family planning as they perceive there are few short-term political gains from launching a family planning program.

2. The decision to reduce the size of the labor force in the late 1980's must be taken today as the size of the labor force for the next 15 years (1970-1985) is already determined by living children. For these reasons family planning policy should be considered as an integral part of a nation's long-run strategy for coping with employment problems.

3. A consensus has now been reached by researchers on the following common causes of unemployment in African economies.

- 1) population explosion
- 2) factor price distortions
- 3) rising labor productivity
- 4) increasing gap between rural and urban incomes
- 5) urban bias in the provision of social services
- 6) unbalanced educational expansion
- 7) tied aid
- 8) political and ethnic barriers to internal and external migration
- 9) ecological constraints

^{1/} For example, Nigeria's population is rising by about 1.5 million per year while even optimistic estimates suggest that industry will require only an additional 20,000 workers per year over the next twelve years (128).

4. The paradox of migration from rural to urban areas in the light of open unemployment in urban areas and positive labor earnings in agriculture can be explained by several recent models of migration. In these models it becomes rational to migrate to urban areas even if there is only a 50 or 33 percent probability of finding a job because the average wage in the urban areas is two or three times the average agricultural income. The theoretical insights of these models of migration suggest that--although paradoxical--the urban unemployment problem can partially be alleviated by expanding employment opportunities in agriculture. Policy-makers who are preoccupied with finding an urban "solution" to unemployment problems can expect their policies to induce more migration from rural to urban areas. Therefore, an efficient strategy for coping with urban unemployment problems must address itself to employment generation in agriculture.

5. Approaches to planning such as high growth rate (GDP) plans and the ad hoc project-by-project approach often sidestep the employment problem. Project selection criteria should be expanded so as to come to grips with employment generation. Present techniques of investment analysis contain a built-in urban bias because they usually do not include as a social cost the differential complement of urban amenities involved in creating employment in urban as compared with rural areas.

6. We have pointed out that Africa's smallholder land tenure system is remarkably labor-absorptive provided incentives are available at the farm level. Even though there is not a clearly identified land market in many countries, there is substantial evidence of land tenure bottlenecks "yielding" when sufficient incentives are available at the farm level. For these reasons we contend that there is little need in most African countries--as contrasted with many countries in Latin America and Asia--for direct government action to modify land tenure systems in order to make them more labor-absorptive.

7. Unemployment in agriculture and premature rural to urban migration in many African countries has been abetted by poor and inconsistent government agricultural policies. Policies which have inhibited employment generation in African agriculture include:

- a) subsidized tractor mechanization
- b) anti-export agricultural policies
- c) self-sufficiency food policies which raise consumer prices and induce higher minimum statutory wage rates
- d) overemphasis on government direct production schemes which are capital intensive. Such schemes include large-scale irrigation, state farms, and land settlements.

One of the major findings of this paper is that poor and inconsistent government policies are major barriers to employment expansion in African agriculture. A summary of these poor policies--agricultural, social, and economic--is found in Table 1, page 19.

8. Attempts by African governments to use direct public sector investments to expand agricultural output and employment have generally met with disaster. There is little reason to expect much improvement in the 1970's. Directly productive government investment schemes such as large-scale irrigation, land settlements, state farms, and youth brigades will likely be ineffective in efficiently generating employment. They may, in fact, have adverse effects on employment. The big government schemes may utilize mechanical technology which will replace labor.

9. The key to employment generation in African agriculture in the 1970's lies mainly in the selective use of indirect measures such as improved and better coordinated internal policies--economic, agricultural, and social--and improved and better coordinated policies of external donors.

10. Even though improved policies--economic, agricultural, and social--are fundamental in designing an efficient strategy for employment generation in agriculture, we find that relatively few African nations are pursuing an efficient set of policies and strategies for developing their agriculture. Most African countries do not have political leadership firmly committed to seeking significant employment generation in agriculture. An efficient strategy for agricultural development and employment generation most likely will not be forthcoming unless there is high-level political support. A drastic reorientation of the political leadership is required in many African countries to recognize that the relative emphasis in planning in the 1970's should shift from urban/industrial to rural development and from a "wait and see attitude" to family planning to expanded demographic research, pilot family planning programs and the introduction or expansion of nationwide family planning programs when it is politically and administratively feasible.

11. Agricultural planning in many African countries is a mechanical exercise which includes public sector projects to expand agricultural output, and the mere listing a string of investment projects for possible funding by external donors. Only modest attention is usually paid to interrelating economic, social and agricultural policies to facilitate the expansion of smallholder production which has been the "dynamic" of African agricultural development. Implementation of agricultural projects is spotty and the manpower, recurrent and capital budgets are usually not integrated.

The above shortcomings in agricultural planning are partially a result of the difficulties in planning for agriculture under conditions which Stolper describes as "comprehensive uncertainty" (102) and partially the result of token research on agricultural policy and micro-level problems. Only a few countries have amassed sufficient studies of payoffs on agricultural investments to begin to assemble a reasonably efficient agricultural sector strategy. Nigeria is among the few African countries which--after ten years of agricultural economics research--can proceed to develop an efficient agricultural strategy which is supported by facts (65). Most African countries therefore require substantial high-level assistance in agricultural policy research and micro-level rural development research during the 1970's so they can develop improved agricultural strategies as the decade progresses. Also, African nations need to step up substantially project appraisal training courses in Africa.

12. African countries are "locked into" the use of technology--particularly mechanical technology--from developed countries. This "technology trap" makes it virtually impossible to develop mechanical technology appropriate to the labor surplus conditions in African agriculture for the following reasons. First, almost all--95 percent--of the world's R and D expenditures originate in developed countries. Second, this technology is invariably developed to solve problems in developed countries and is inappropriate to the factor endowments in African countries. Third, although much of this technology is inappropriate it is exported to developing countries under "tied aid arrangements." Fourth, much of the mechanical technology which LDCs import under tied aid agreements is "subsidized" by African governments as we have discussed in some detail in the section on subsidized tractor mechanization (pp. 20-27). The combination of the above four factors produce a "technology trap" and leads to a pessimistic outlook for African countries in developing the technology--particularly mechanical technology--which is appropriate to its factor endowments.

13. If the above steps are taken to develop improved policies and if improved approaches to planning are introduced, a number of African countries can begin to develop a more efficient strategy for their agricultural development. If a more efficient strategy for agriculture is developed and implemented, we contend that substantial employment generation can take place in smallholder agriculture which will reduce the need for special government employment generation programs. However, the government has a major role to play in promoting pilot rural development schemes, expanding R and D which is relevant to local factor endowments, providing

subsidies for new inputs for limited periods of time, experimenting with new types of farm organizations, and aggressively searching for new markets in Africa and overseas.

Implications for External Donors

Instead of beginning by suggesting how external donors can help Africans cope with unemployment problems we prefer to begin by suggesting that the starting point for external donors working in Africa is to reexamine their assumptions about the major constraints on African development in the 1970's and what modifications are needed in their policies and procedures. First, the fixation on capital as a limiting factor in Africa's development should be reassessed. Capital is not the limiting factor in agricultural development and employment generation in many African nations even though many development plans play up capital as the critical constraint. Documents such as the Pearson Report are naive in suggesting that LDCs can achieve a 6.0 percent global target growth rate in the 1970's if the rich countries increase their official government aid from the present \$6 billion to \$16 billion by 1975 (87). The Pearson Commission's fixation on a 6 percent growth rate and a lump of capital simply misreads the nature of Africa's development problems which include: a) overemphasis on comprehensive planning under conditions of comprehensive uncertainty, b) limited absorptive capacity, c) weak implementation capacity, and d) poor and inconsistent government policies. How will a "lump of capital" solve these problems? Second, as Albert Waterston has so forcefully pointed out "operational planning" should replace much of the current emphasis on the preparation of strings of medium-term plans which are too seldom implemented (127). Third, the connection between growth in per capita income and in employment should be reexamined. Fourth, the project approach should be modified so as to include employment generation as a major objective, equal in importance to economic returns. Fifth, the role of external donors in the "technology trap" should be examined. The "technology trap," of which "tied aid" is one component, effectively prevents the development of technology appropriate to factor endowments in African nations.^{2/}

Major effort should be made by external donors to focus the attention of African political leaders on seeking solutions to employment generation in agriculture. While other sectors--trading, industry, services and manufacturing offer some scope for labor absorption--the dominance of agriculture in most African economies leads to the obvious conclusion that agriculture holds the key for

^{2/} For a discussion of the technology trap see item 12 on page 40 and pages 20-27.

significant labor absorption. In addition it is important that Africa's political leaders recognize that their "wait and see attitude" to family planning may be counterproductive as the population explosion will make it more difficult to meet social service objectives--universal primary education, improved housing, and water supplies. The position that donors take in financing population studies in Africa could play a key role in influencing political leaders' positions on family planning.

Our analysis suggests the following specific measures which can be taken by external donors in helping African nations generate employment in agriculture.

1. Population Studies. Policies of external donors in the area of family planning must be tempered by African political indifferences or opposition to family planning. Haste on behalf of external donors may jeopardize prospects for long-run family planning aid to African governments. External donors can assist African nations a) expand African demographic capacities by adding demographic research centers in governments or universities, b) establish more pilot family planning programs and c) extend existing family planning programs. We contend that the right way to convince leaders and the public of the importance of the demographic variable in economic development is by supporting research on the subject in Africa. For example, the initiation of a population policy in Ghana in 1969 was purely a national phenomenon, without prodding from outside, and it was partially the outcome of a decision taken ten years earlier (1959) by the Population Council to finance a chair of demography in the Department of Sociology at the University of Ghana and to support a program of research on various aspects of population. Caldwell's book on migration in Ghana is one outcome of this research program (19).

2. Pre-investment Studies in Agriculture. There is likely to be a shift in emphasis among external donors away from the project approach as the problems involved in using the project approach to deal with nationwide problems such as unemployment are taken into account. Nevertheless, a more efficient agricultural strategy cannot be developed in most African countries until there is a substantial increase in micro-level studies which focus on payoffs and the employment generation aspects of potential agricultural investment projects. For these reasons external donors should make research grants to African scholars and institutions in order to develop a body of solid micro-economic studies.

3. R and D Assistance. Most donor agencies are now sold on the need for expanded technical agricultural research in Africa. However, research on income

distribution, employment generation, uneven development, and market development is also needed and cannot be done by experts such as plant breeders in African research institutes. A major expansion of technical, social, and economic research capacities within Africa is necessary in order that Africans can develop technology which is compatible with local factor endowments as well as analyze how to cope with employment generation, income distribution, and uneven development. Such research should include research on population, and the relationship between population growth, population density, and employment generation.

Bilateral aid agencies have demonstrated remarkably little sensitivity in guiding African nations in the mechanization of their agriculture. Labor displacing mechanization has been promoted by some foreign advisors and indirectly through some tied aid projects. Agricultural economists should play a more active role in advising African governments on mechanization strategies. However, agricultural economists who evaluate mechanization schemes need to ensure that both financial and economic considerations are included, including aspects such as employment, foreign exchange, etc.

4. Food Aid and Rural Works Programs. Rural works programs using food aid are one of the few methods which external donors can use to assist employment generation in agriculture in a major way. Although the food aid in Tunisia and Morocco has been difficult to justify along the lines of strict economic criteria, the income distribution and employment generation aspects of these programs are significant and important. Rural works programs should be accelerated in some countries in the 1970's.

5. Local Costs. Some smallholder agricultural projects have significant built-in employment generation features. However, in many cases they contain a high percentage of local costs. Regulations of external donors on local cost should be reconsidered in light of their desire to help Africans generate employment in agriculture. They should be prepared to help finance the local costs of selected smallholder projects.

APPENDIX A

DIMENSIONS OF THE POPULATION EXPLOSION IN AFRICA AND
IMPLICATIONS FOR FAMILY PLANNING
AND EMPLOYMENT POLICIES^{1/}

Comparatively little demographic research has been completed in Africa to date. Although modest information is available on population size and distribution, little information is available on birth and mortality rates (125, p. 9). Available data indicate that most of Africa is currently in the early stages of rapid mortality decline while birth rates remain high and unchanged. Although the results of recent censuses and demographic surveys in Africa reveal a wide range in birth rates (varying from about 30 to 60 per thousand), current birth rates for the whole of Africa are close to 50 per thousand (125). These rates are among the highest in the world (21, p. 16). Mortality estimates, ranging from 15 to 40 per thousand, are even less reliable than birth rates. Life expectancy varies from less than 30 to over 45 years. It is likely that Africa's death rates are currently among the highest in the world, probably between about 20 and 30 per thousand.

Current population growth rates are around 2.3 percent per year in most African countries, and 3.0 to 3.5 percent per year in a number of countries, doubling the population every 20 to 35 years. Indeed, "the recent experience of other developing areas suggests that tropical Africa is in the early phase of rapidly accelerating population growth" (10, p. 186). In Kenya, for example, the 1969 census revealed that population had doubled from 1948 to 1969 and that the current population growth rate is 3.3 percent per year instead of the 3 percent previously assumed. Uganda's 1969 Preliminary Census reveals a 3.5 percent rate of population growth as compared with a 2.5 percent growth rate in 1959. Tanzania's 1967 census revealed a 2.7 percent rate of population growth which was about 0.5 percent higher than planners had anticipated. Botswana's population growth is in excess of 3 percent per year. Rwanda's rate of population growth is about 3.3 percent. This brief overview reveals that most African countries are experiencing very high rates of population growth and that planners have consistently underestimated population growth rates over recent years.

^{1/} For a global review of population problems and programs see the documents prepared for AID's May 11-13, 1970 Spring Review of Population Problems (2).

Population Projections

There is no reason to believe that fertility rates will decline during the next 20 years in most of Africa. On the other hand, the potential for continued rapid reduction in mortality rates in Africa is very large through mass public health campaigns, particularly in eliminating smallpox and malaria. The experience of Less-Developed Countries (LDCs) in general and Africa in particular suggests that further decline of mortality in Africa may be rapid, and that the potential for population growth is, therefore, large (125, p. 12).

We can say with near certainty that the population of Africa will increase by 50 to 70 percent by 1985 and will double in size within 20 to 30 years (125). A demographer, Etienne Van de Walle, has recently completed a detailed analysis of population projections in tropical Africa. One of his projections is presented in Table 1. Total population in tropical Africa^{2/} is expected to increase from about 214 million in 1965, to over 340 million by 1985.

Labor Force Projections

The number of working-age males in tropical Africa will increase by about 30 million between 1965 and 1985, as shown in Table 2. Nearly all this increase must be absorbed by the rural sector because it is clear that for most African nations the urban sector will not be able to absorb even as much as one-quarter of the total increase of 30 million workers by 1985. Table 3 reveals, for example, that nonagricultural employment (service and industrial sectors, both public and private) actually decreased in five of ten African countries over the 1955-64 period and in 7 of the 10 over the 1958-64 period.

Mortality rates can be expected to show a continuing gradual decline. Therefore, the male labor force can be projected for the next 15-20 years by adding the existing male labor force to the present male child population, and subtracting attrition in the interim due to old age and anticipated mortality. Thus, the likely lower limit to the size of the labor force for 1985 can be projected by applying current mortality rates to the 1970 male population. Similarly, the lower limit to the male labor force for the year 2000 can be projected by applying existing mortality rates to the projected male population in 1985, although with considerably

^{2/}The term "tropical Africa" refers to the entire African continent excluding only Spanish Sahara, Morocco, Algeria, Tunisia, Libya and the United Arab Republic in the north, and South Africa, Southwest Africa, Botswana, Lesotho, and Swaziland in the south (125, p. 10).

TABLE 1. Tropical Africa: Total projected population (in thousands), projected increase (in thousands and percent), projected vital rates (per thousand persons), and percentage annual increase, 1965 and 1985.*

Region	Year	Total Population	Increase 1965-85	Increase	Crude Birth Rate	Crude Death Rate	Rate of Natural Increase	Annual Increase 1965-85
		(000)	(000)	(percent)				(percent)
Western Africa	1965	87,350			48	28	20	
	1985	139,477	52,127	60	42	16	26	2.3
Central Africa	1965	30,871			40	27	13	
	1985	44,423	13,522	44	45	17	28	1.8
Eastern Africa	1965	95,644			48	25	23	
	1985	157,328	61,684	64	39	14	25	2.5
Total, Tropical Africa	1965	213,865			47	27	20	
	1985	341,228	127,363	60	41	15	26	2.3

Source: Adapted from Van de Walle (125, pp. 23-24).

*For the period 1965 to 1985, the underlying mortality assumption is that expectations of life will rise by one-half per year from 1965 to 1975 and by one full year per year from 1975 to 1985. A linear reduction in fertility of 10 percent every five years is assumed starting 1975 for Eastern Africa and in 1980 in Western Africa. Fertility can be expected to increase in Central Africa due to improved health services. "The prevalence of infecundity there has always been more a cause for concern than the population growth rate" (125, p. 20).

TABLE 2. Tropical Africa: Projections of working-age males (15 to 64 years), 1965-1985.*

Region in Africa	Working-Age Males			Annual Increase 1965-1985
	1965 Number	1985 Number	1965-1985 Total Growth	
	(000)	(000)	(percent)	(percent)
Western	23,414	36,222	55	2.2
Central	8,826	11,880	35	1.5
Eastern	25,181	41,270	64	2.5
TOTAL	57,421	89,372	56	2.2

Source: Adapted from Van de Walle (125, pp. 23-24).

*For underlying assumptions about fertility and mortality see footnote * Table 1.

more room for error due to uncertainties about mortality changes. As Van de Walle indicates, regardless of the progress made in family planning programs, we cannot expect fertility declines in most of Africa until after 1985 (125). Thus, if total population is expected to increase by 60 percent from 1965 to 1985 (or nearly 50 percent from 1970 to 1985), we can expect the male labor force to increase by at least the same percentage over the fifteen years from 1985 to 2000. The labor force will likely double between now and 2000, regardless of progress in family planning between now and then.

Projections of School-Age Population

The population explosion will also greatly affect the size of the school-age population and the required public expenditures for health and education. In 1965 less than half the children of elementary school age in tropical Africa were enrolled in school. Van de Walle's population projections of the number of elementary school-age population are shown in Table 4. The number of elementary school-age children can be expected to increase by about two-thirds in tropical Africa by 1985.

TABLE 3. Non-agricultural employment indices in selected African countries (1958 = 100).

Year	Cameroons	Ghana	Kenya	Malawi	Nigeria
1955	102	82	107	88	n.a.
1956	104	91	105	95	95
1957	100	95	105	98	100
1958	100	100	100	100	100
1959	95	106	100	99	99
1960	91	111	102	96	106
1961	94	122	98	93	89
1962	72	128	97	87	113
1963	91	132	91	87	94
1964	92	n.a.	111	n.a.	n.a.
Rate of Growth (percent)	-1.0	6.3	-0.5	-0.7	0.1

Year	Southern Rhodesia	Sierra Leone	Tanzania	Uganda	Zambia
1955	86	87	97	94	92
1956	92	87	104	93	100
1957	98	92	101	99	100
1958	100	100	100	100	100
1959	100	98	96	99	95
1960	101	101	98	99	93
1961	98	108	104	98	90
1962	95	112	101	93	88
1963	91	119	91	89	86
1964	90	125	95	89	91
Rate of Growth (percent)	0.2	3.0	-0.4	-0.1	-0.9

Source: Frank, Charles R., Jr. (48, p. 254).

TABLE 4. Tropical Africa: Projections of elementary school-age children (both sexes, 7 to 12 years), 1965 and 1985.*

Region in Africa	Elementary School Ages			
	1965 Number	1985 Number	1965-1985 Total Growth	1965-1985 Annual Increase
	(000)	(000)	(percent)	(percent)
Western	13,135	22,072	68	2.6
Central	4,195	6,291	50	2.0
Eastern	14,821	25,536	72	2.7
TOTAL	32,151	53,899	68	2.6

Source: Adapted from Van de Walle (125, p. 25).

*For underlying fertility and mortality assumptions see footnote * Table 1.

Current Status of Family Planning in Taiwan and India

In recent years there has been a sizeable amount of publicly-supported family planning activity in many less-developed countries and numerous countries have initiated nationwide family planning programs. Since family planning activities in Africa have been of quite recent origin and are limited to a few countries, we can gain some insights into some of the likely problems and opportunities for family planning in Africa by drawing on the experience of family planning in India and Taiwan.

In the 1950's India became the first less-developed country to embark on a large-scale family planning program. The program has achieved only token results in India over the past 20 years. India spent the first ten years attempting to improve the rhythm method (without success) before turning to other methods of contraception. Other reasons for the mediocre results to date include complex administrative problems and difficulties in mobilizing skilled manpower and other resources for a nationwide effort in family planning. Despite these disappointments, a recent attempt at measuring costs and returns to family planning in India indicated extremely favorable benefit-cost ratios.^{3/}

^{3/}The range of benefit-cost estimates was about 4:1 to 40:1 varying according to the underlying assumptions and evaluation criteria (106).

In the early 1960's a wave of optimism about the potential of family planning encouraged some countries to establish national family planning programs, including Taiwan, South Korea, Hong Kong and Singapore. In general the preliminary reports of these family planning programs were optimistic (85). Since about the mid-1960's, however, observers have generally become more cautious about generalizing on the basis of the short time span of family planning programs. Kingsley Davis has important doubts about the ability of family planning to reduce fertility levels (33). He contends that "family planning" by definition has only the limited objective of making it technically, socially and financially feasible for families to have the number of children they desire. Davis believes that family planning is unlikely to be as successful as its proponents claim, and that even if it is, the results will fall far short of what is desired or needed. He points out that even the optimistic family planning objectives of most national development plans still imply excessive rates of population growth over the next 15 to 25 years. He suggests that "population control" (i.e., fertility reduction by coercion) is the only effective means of achieving desired and necessary levels of fertility.

Taiwan's family planning program began in 1963 in Taichung, one of its principal cities. In 1964 the program was expanded to include all of Taiwan. In the early years the program concentrated on only one contraceptive, the IUD (intra-uterine device). After a few years a number of criticisms of the program emerged, including the following: only a small proportion of the eligible women were participating in the program; most of the women participating in the program were older and already had large families and were from an educated minority; many participants simply switched from some other form of contraceptive to the IUD; many participants dropped out of the program; and, finally, the program made little or no contribution to reducing the birth rate.

In 1968 and 1969 Freedman and colleagues released detailed data on Taiwan's family planning results which refuted point-by-point each of the earlier criticisms of the program (49 and 88). Although it is clear that fertility rates had been declining before the program began, it now appears that the family planning program itself is making a significant contribution to reducing the birth rate in Taiwan. Freedman and his colleagues report that:

The birth rates for women participating in the IUD program in Taiwan have fallen sharply since their initial participation; these rates are between 68 and 78 percent below the rates that would have been expected had there been no IUD program. . . . What we are asserting with some confidence is that the several hundred thousand participants

in the Taiwan program have, since entering the program, dramatically increased their birth control practice and decreased their fertility (88, p. 852).

Although there is some reason to be moderately optimistic about Taiwan's family planning progress to date, we should remember that fertility decline was well under way before Taiwan launched its family planning program.

Family Planning Programs in Africa

To date six countries in Africa have initiated some type of family planning program. Morocco, Tunisia, and the U.A.R. established national family planning programs in the mid-1960's and Kenya, Ghana, and Rhodesia have taken the first steps in government support and/or encouragement of family planning activities (95 and 96). In addition, Sierra Leone has just decided to launch a major program in demographic research with the expectation that the results from this research will help guide government policy and action programs in family planning. Most of the remaining African nations are either officially indifferent or opposed to family planning and population limitations (10, 11, 90). This is especially true of most of the former French colonies with the notable exceptions of Morocco and Tunisia and, more recently, Algeria and Dahomey.

In Tunisia, the 1966 census revealed a population of 4.5 million, a birth rate of 46 per 1,000, death rate of 18 per 1,000, and a population growth rate of 2.8 percent per year (which doubles the population every 25 years). In 1964, Tunisia initiated a two-year experimental program in family planning, the first African country to do so. In July, 1966, the program was expanded to become a national program. To date actual achievement in reducing the birth rate has been modest.

Morocco's family planning program began in 1966. Analysis of the 1960 census had indicated that the birth rate was 50 per 1,000, the death rate 18 per 1,000, and the population growth rate was 3.2 percent per year. The Moroccan program is integrated with the existing health infrastructure in order to gain the full cooperation of the medical profession, to insure sound medical standards, and to avoid duplication and waste of resources. A major drawback of the program is its clinical orientation (thereby failing to reach women who do not have access to health clinics) and insufficient attention to the role of education in changing individual attitudes toward family planning. The program in Morocco has had no measurable effect on the birth rate to date.

Perhaps the country in Africa that has been most concerned with its population problems is the U.A.R. The U.A.R.'s population was 30 million in 1966 and projected to reach 52 million in 1985. In 1965 the birth rate was 42 per 1,000, death rate was 15 per 1,000 and population growth rate was 2.7 percent per year (doubling nearly every 26 years). In the U.A.R. severe unemployment (and/or underemployment) and a severe shortage of cultivable land are exacerbated by rapid population growth. Presently, there is 0.23 acre of cultivable land per capita and 70 percent of the landowners have less than one acre of land.

In the U.A.R. an organized family planning effort was initiated in 1953 and greatly expanded from 1958 to 1962. In November 1965, the Supreme Council of Family Planning was formed and the responsibility for family planning throughout the country was given to the Executive Board of Family Planning. In 1968 a working plan was developed with the goal of reducing the population growth rate from the 1968 level of 2.54 percent to 2.1 percent by 1971. Although a massive government effort has been marshalled in a few short years, as in Tunisia and Morocco, the program has not been operating long enough or effectively enough in the U.A.R. to have achieved a decline in the birth rate. An important dimension of the U.A.R. program is the emphasis placed on "cafeteria service," whereby a number of alternative contraceptive methods are available to potential female acceptors.

Limited family planning efforts are being formulated in a number of other African countries. In 1967 the Population Council made recommendations for a family planning program in Kenya. Free family planning clinics have been established in urban areas in Kenya. The government of Ghana has established family planning units in urban areas and may eventually expand their activities to a nationwide program. The government of Mauritius has recently accepted an IBRD plan of operation for a government-sponsored family planning program. Tanzania and Uganda are quietly feeling their way in family planning by allowing small programs to be developed in a few urban centers. However, neither government of Uganda or Tanzania has adopted a family planning policy. In addition, several KAP (knowledge, attitude, practice) studies have been conducted in tropical Africa which have indicated, as in most other less-developed areas of the world, a widespread interest, especially among women with four or more children, in limiting family size (60).

Preliminary Assessment of the Future
of Family Planning in Africa

Our discussion underlines the simple fact that fertility reductions affect the size of the labor force only after 15 to 20 years. It further points out the need to establish family planning programs in many African countries as soon as there is reasonable evidence of their acceptability and probable success. Unfortunately, most African nations are not ready for a concerted family planning drive. As Berelson points out (10, p. 5),

The political problem of population control, like many political matters of consequence, is a matter of timing. Political accommodation is typically a matter of several small steps with an occasional large one; and in this case it rests upon the seriousness with which the population problem is viewed.

Most African countries today simply do not consider population growth as a serious problem. In fact, if they consider it at all, they are more likely to view population growth as an asset for future political, social and economic development. Rwanda, for example, is reported to prohibit all publicity campaigns for family planning, while some countries oppose family planning programs by labeling them as attempts by neo-colonialists to keep Africa's population in check.

Berelson indicates the six best indicators of a nation's receptivity to family planning are 1) size of population, 2) level of education, 3) per capita income, 4) population density, 5) crude birth rate, and 6) crude death rate (7, p. 348). The critical levels at which family planning is generally not acceptable are populations under 10 million, less than 30 percent of the first and second level children enrolled in school, per capita income under \$100, density less than 50 per square mile, crude birth rate 45 or over, and crude death rate 21 or over. Most African countries currently fall within the limits of nonreceptivity for all six indicators and predictably tend to give official family planning low priority in public policy decisions.

Thus, despite the urgency of fertility reduction for alleviating employment and education problems, we cannot expect aggressive support of family planning programs by most African nations within the next decade or so unless there is a substantial increase in the knowledge among political leaders of the consequences of a "wait and see attitude" toward family planning. If family planning is to be successful on a large scale in Africa, it will require well-planned and timely introduction and implementation of programs which are tailored to specific local

or regional circumstances. Although a delay in the initiation of family planning in some African countries may be undesirable, it is important to avoid going too fast in establishing programs which cannot be properly administered and which might severely damage long-run prospects for success.

The following features should be incorporated into well-organized and administered family planning programs. These features generally apply to Africa as well as to other less-developed regions.

1. The program should take advantage of existing experience.
2. It must have an effective staff with well-trained personnel.
3. It should be tied to a program of health care improvement for mothers and children.
4. It should offer participants a range of choice in types of contraceptives ("cafeteria service").
5. It should be approached as a long-term commitment requiring a gestation period of a number of years before achievements will be forthcoming.
6. It should provide constant exchange and coordination of information.
7. It should provide for collection of solid demographic and statistical data for evaluation of programs.

SUMMARY

In summary, birth and death rates in Africa are among the highest in the world. Life expectancy is 30 to 45 years. There is no reason to believe that fertility rates will decline during the next 20 years. We can say with near certainty that the population in Africa will increase by 50 to 70 percent by 1985 and it will double in size by 1990 or 1995. The size of many African cities will double every decade. The population explosion is straining the ability of governments to finance social services; many African nations are being forced to revise downward their estimates of when universal primary education can be achieved, when adequate rural water supplies can be made available to rural areas, etc. For these reasons there is a clear need for expanded family planning activity in many African nations in order to reduce fertility rates. Family planning, however, should combine a wide range of approaches depending on the nature of the problem, the degree of political support for family planning and the administrative capacity of the country.

Our analysis has underlined the simple fact that even if family planning were successful in reducing fertility rates within the short run, the growth rate of the labor force would be reduced only after 15 to 20 years. Our analysis suggests that

there is overwhelming evidence to support aggressive policies to expand demographic research in Africa, to expand pilot family planning programs in some countries and to move the present pilot family planning programs into full-scale nationwide programs as soon as it is politically and administratively feasible. External donors have an important role to play by sponsoring major demographic research centers in four or five areas of Africa in order to undertake research on population studies (migration, fertility patterns, attitudes towards family planning, relationship between population growth and shifting cultivation). The important point is to emphasize a range of research studies broader than family planning studies. Population studies should be nurtured in a number of African centers. The output of these indigenous centers could have a major impact on improving the knowledge of African leaders on what policies should be adopted in the population field.

APPENDIX B

RESEARCH AGENDA

One of the immediate steps for improving agricultural policies for generating employment in African agriculture is simply gathering existing information and research results, translation of relevant reports, and disseminating the findings. In addition, the following are major areas of research which should be undertaken or expanded in order to deal with the problems involved in generating employment in African agriculture.

- I. IMPACT OF GENERAL SOCIAL AND MACRO-ECONOMIC POLICIES ON EMPLOYMENT GENERATION IN AGRICULTURE
 1. Population Studies
 - A. fertility patterns
 - B. determinants of migration
 - C. connections between population growth, land use, and migration patterns
 - D. attitudes to family planning
 - E. differential response of various subcultural groups to alternative ways of providing family planning materials
 2. Wage Policies
 3. Monetary and Fiscal Policies
 4. Export Taxes and Incentives
 5. Pricing policies which influence prices which farmers pay for consumer goods and agricultural inputs and the prices which they receive for their products
 6. Impact of rural amenities such as electricity, rural water supplies, etc., on holding people in agriculture
 7. Documentation and dissemination of information on low cost housing techniques
- II. POLICIES AND PROGRAMS TO INCREASE EMPLOYMENT IN AGRICULTURE
 1. Regional rural development programs--planning, implementation and evaluation of potential for development assistance
 2. Developing mechanical technology for local factor endowments
 - A. development of new animal-powered equipment suitable for the available draft power (camels, oxen and donkeys), soils and crops
 - B. impact of large tractor mechanization on breaking timing bottlenecks such as land preparation, planting, cultivation, and harvesting

C. potential of small tractors--10 to 20 horsepower--for increasing output and employment

3. Biological Technology

A. research on higher-yielding and earlier-maturing varieties

B. research to vary planting and maturity dates so as to reduce peak season labor demands

4. Smallholder Irrigation

A. documentation and dissemination of technical information on existing techniques of smallholder irrigation

B. development of irrigation equipment more adaptable to smallholders

C. potential of multiple cropping with early maturing varieties on irrigated land

5. Potential for Expanding Export and Import Substitution Crops

A. payoffs on major crops with attention to physical planning and inter-relationship between manpower, capital, and recurrent budgets for each crop

B. impact of export taxes on labor absorption

6. Diversification

A. tradeoffs involved in moving from labor-intensive export crops with gloomy market prospects--e.g., coffee--to less labor-intensive commodities--e.g., livestock--with good market prospects

B. market outlook for new commodities--within Africa and in other continents

III. NON-AGRICULTURAL EMPLOYMENT EXPANSION IN RURAL AREAS

1. Employment and output effects of village-level agricultural processing, farm implements, crafts, cottage industries

2. Potential of low cost housing for generating employment in towns and villages during the slack season in agriculture

3. Feasibility studies on the potential of rural public works for employment generation and output expansion in specific areas during the slack season in agriculture

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