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Kamrany, Nake, M.; Tremblay, Rodrigue; Stern, Joseph J.; Kazmi, Anwar H.; McCormick, Barry; and McQuigg, James D.

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9. ABSTRACT
This annex has two parts. In Part I, three types of interrelated diagnoses have been attempted. First it is pointed out that the region is plagued by many economic constraints. These include the climate, monetary system, population growth, and heavy dependence upon foreign aid. Second, we have identified certain gaps and distortions such as in savings, foreign exchange, and absorptive capacity. Included in the analysis are such policy parameters as taxes, interest, wages and pricing.

In the Appendices specific case studies are presented including (A) a technical discussion of macroeconomic projections, (B) aspects of fiscal policy in Senegal, and (C) variability of precipitation in the Sahel-Sudan region of Africa. Although generalizations for the region cannot be drawn from these specific studies, we believe that the information and analysis contained in these studies provide valuable data base and insight into the problems and prospects of the region.

In Part II, selected economic data are presented. These data have been collected from secondary sources, mostly from publications of international agencies.

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A FRAMEWORK FOR EVALUATING LONG-TERM STRATEGIES
FOR THE DEVELOPMENT OF THE SAHEL-SUDAN REGION

Annex 1

ECONOMIC CONSIDERATIONS FOR
LONG-TERM DEVELOPMENT

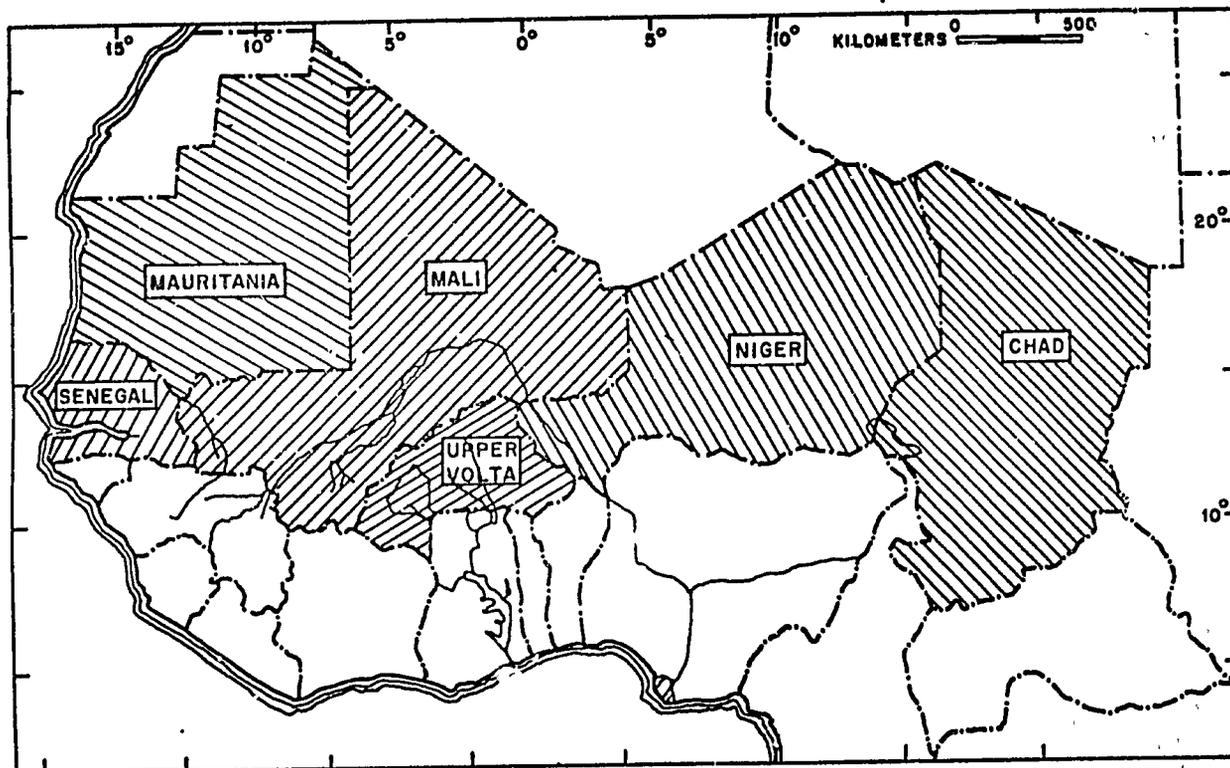
Nake M. Kamrany
Rodrique Tremblay
Joseph J. Stern
Anwar H. Kazmi
Barry McCormick
James D. McQuigg

Center for Policy Alternatives
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139



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Volume 1. Summary Report: Project Objectives, Methodologies and Major Findings

Volume 2. ISYALAPS, A Framework for Agricultural Development Planning

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The contents of this report reflect the views of the Sahel-Sudan Project at the Massachusetts Institute of Technology and do not necessarily reflect the official views or policy of the Agency for International Development.

FOREWORD

This report results from a one-year effort by a multidisciplinary team of analysts to establish a framework for evaluating long-term development strategies for the African Sahel-Sudan area.

By June 1973 it had become evident that the suffering caused by the drought was the most severe the area had experienced in the last half century. A meeting of donor organizations and U.N. agencies, called by the U.N., was held in Geneva to discuss the problem. It was clear that, while the area required immediate assistance to meet the problems of drought relief, there was also need for long-range assistance if the region were to become self-sustaining and begin an era of positive economic development and widespread improvement in the quality of life of its people. The U.S. delegation offered to undertake the first steps necessary to "identify the methodology, the data requirements and the possible alternative lines of inquiry from physical, economic, social and cultural points of view" on which to base "a comprehensive examination of technical problems and the major alternative development possibilities" for the region.* The United States Agency for International Development (A.I.D.) offered to take responsibility for this task and determined that it should enlist the assistance of the academic community in carrying out the work. A.I.D. then approached M.I.T., and a study effort was formally initiated with the signing of a contract covering the period September 1, 1973, through August 31, 1974. This contract was subsequently extended to January 1, 1975.

The goal of the U.S. effort is to develop a methodology for evaluating long-term development strategies for the Sahel-Sudan region. The

* Final Report on the Meeting of the Sudano-Sahelian Mid- and Long-Term Programme 28-29 June, 1973, Geneva. Special Sahelian Office, United Nations, New York. Statement by Donald S. Brown.

specific focus of the M.I.T. study has been on the development of an effective framework within which to appraise specific projects and programs. The term framework, in this context, refers to the accumulation, development, organization, integration, and analytical evaluation of information on the natural resources, economic resources, and human resources, including the social and political institutions, of the region. The framework is constructed in such a way that alternative strategies for the region can be identified and evaluated, in terms of both their requirements and their impacts, intended and unintended. The M.I.T. study has not been oriented toward detailed sector studies, prefeasibility studies, or project studies. Nevertheless, in the process of developing a methodology we have examined many kinds of information and a number of specific projects and have identified areas requiring further research to fill information gaps that impede long-range planning and evaluation of specific development proposals.

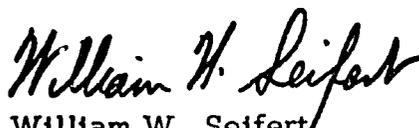
It is hoped that this framework will assist decision-makers in the Sahel-Sudan countries and in donor organizations in arriving at informed judgments concerning strategies for the long-term (20 to 25 years) social and economic development of the region.

The study was conducted under the direction of the M.I.T. Center for Policy Alternatives and was carried out by a multidisciplinary group. The Summary Report and the volume on agricultural development planning have drawn upon a number of working studies on specialized aspects of the problem prepared by the staff, i.e. (1) Economic Considerations for Long-Term Development, (2) Health, Nutrition, and Population, (3) Industrial and Urban Development, (4) Socio-Political Factors in Ecological Reconstruction, (5) A Systems Analysis of Pastoralism in the West African Sahel, (6) Technology, Education, and Institutional Development, (7) The Role of Transportation, (8) An Approach to Water Resource Planning, (9) Energy and Mineral Resources, and (10) Listing of Project Library Hold-

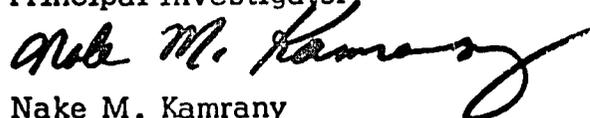
ings and Organizations Contacted. The basic elements of these studies have been drawn together in the two volumes of the final report.

In addition to M.I.T. personnel, individuals from a number of other organizations participated in the effort. Participants from the University of Arizona, in particular, made major contributions; they had primary responsibility for developing the analysis of the agricultural sector strategy. Professor John Paden of Northwestern University was a major contributor to the work on socio-political factors. Members of the Société d'Etudes pour le Développement Economique et Social (S.E.D.E.S.) in Paris provided valuable insights into various aspects of the Sahel-Sudan area. Several members of the Centre de Recherches en Développement Economique (C.R.D.E.) in Montreal developed sections on monetary policy, urbanization, and relationships between Niger and Nigeria. A list of individuals who participated in the study is included in Volume 1 of this report.

Numerous other individuals acted as consultants to the project, provided advice as the study progressed, and reviewed draft material for the reports. Help and advice were given by officials of the governments of the Sahel-Sudan countries, the Comité Permanent Inter-Etats de Lutte Contre la Sechêresse dans le Sahel (C.I.L.S.S.), members of United Nation organizations, members of the International Bank for Reconstruction and Développement, and, especially, officials of the Secretariat d'Etat and various socio-economic and technical study groups in France. Finally, representatives of A.I.D. arranged meetings in Africa and reviewed the the progress of the study. All this assistance is gratefully acknowledged.



William W. Seifert
Principal Investigator



Nake M. Kamrany
Project Manager

Contributors to this Volume

- Nake M. Kamrany** Ph.D., Research Associate, Center for Policy Alternatives, M.I.T.; Project Manager, Sahel-Sudan Project
- David L. Cohen** Master's degree candidate, Sloan School of Management, M.I.T.
- Oldrich F. Dittrich** Doctoral degree candidate, Department of Economics, Tufts University, Medford, Massachusetts; Research Assistant, Harvard Institute for International Development, Harvard University, Cambridge, Massachusetts
- Everett E. Hagen** Ph.D., Professor Emeritus, Department of Economics, M.I.T.; Consultant, Sahel-Sudan Project
- Edmond C. Hutchinson** Ph.D., Formerly Senior Vice President, American Technical Assistance Corporation, McLean, Virginia; Consultant, Sahel-Sudan Project
- Anwar H. Kazmi** Doctoral degree candidate, Department of Economics, M.I.T.; Research Staff, Center for Policy Alternatives, M.I.T.
- John M. Letiche** Ph.D., Professor, Department of Economics, University of California, Berkeley; Consultant, Sahel-Sudan Project
- Subodh Mathur** Doctoral degree candidate, Department of Economics, M.I.T.
- Barry McCormick** Doctoral degree candidate and Research Assistant, Department of Economics, M.I.T.
- Gustav Papanek** Ph.D., Chairman, Department of Economics, Boston University; Consultant, Sahel-Sudan Project
- Pierre Paul Proulx** Sc.D., Director, Centre de Recherches en Developpement Economique, Universite de Montreal; Consultant, Sahel-Sudan Project
- Kashi P. Singh** M.A., Special Student, Department of Urban Studies and Planning, M.I.T.

Joseph J. Stern Ph.D., Associate Director for Research, Harvard
Institute for International Development, Cambridge, Massachu-
setts; Lecturer, Department of Economics, Harvard University,
Cambridge, Massachusetts; Consultant, Sahel-Sudan Project

Rodrique Tremblay Ph.D., Chairman, Departement des Sciences Econo-
miques, Universite de Montreal; Consultant, Sahel-Sudan Project

Pavel Turcan Ph.D., Professor, Departement des Sciences Economiques,
Universite de Montreal; Consultant, Sahel-Sudan Project

Thomas Uguru Doctoral degree candidate and Research Assistant,
Department of Urban Studies and Planning, M.I.T.

Kimon Valaskakis Ph.D., Associate Professor, Departement des Sciences
Economiques, Universite de Montreal; Consultant, Sahel-Sudan
Project

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Abstract

The aim of the economic annex is to provide a diagnosis of the major economic constraints and bottlenecks of the Sahel-Sudan countries. Moreover, this annex contains a great deal of data base that are useful for evaluating the region's options and strategies for the rehabilitation and long-term development of the area. Aside from the work of the Montreal team the information-base consists primarily of secondary source materials (international agencies, etc.) and is incomplete and subject to inaccuracies. Consequently, this analysis points to certain plausible diagnoses and orders of magnitudes rather than specific quantifications and assertions. For this reason we caution against assuming prognoses without further analysis, except for the most obvious cases. Moreover, no field trips or other first hand observations have been carried out in the preparation of this volume. Nor have the findings been discussed or validated with the respective African countries in the public sectors, the private sectors, or the academic community.

Thus, we have attempted to put together a data base for bringing to focus a number of distinguishing economic characteristics of the region, to improve our understanding of the region's economic environment, and to provide certain diagnostic observations.

This annex has two parts. In Part I, three types of interrelated diagnoses have been attempted. First it is pointed out that the region is plagued by many economic constraints. These include the climate, monetary system, population growth, and heavy dependence upon foreign aid. Second, we have identified certain gaps and distortions such as in savings, foreign exchange, and absorptive capacity. Included in the analysis are such policy parameters as taxes, interest, wages and pricing. The above constraints have been considered in providing preliminary projections under alternative sets of assumptions. Certain policy options could be discerned from the above exercise. Third, an attempt is made to conceptualize these constraints into three interrelated vicious circles. Although a great deal more work is required to quantify these relationships, we are led to believe that the breaking of these vicious circles provides the necessary and sufficient conditions for the region to reach economic viability.

In the Appendices specific case studies are presented including (A) a technical discussion of macroeconomic projections, (B) aspects of fiscal policy in Senegal, and (C) variability of precipitation in the Sahel-Sudan region of Africa. Although generalizations for the region cannot be drawn from these specific studies, we believe that the information and analysis contained in these studies provide

valuable data base and insight into the problems and prospects of the region.

In Part II, selected economic data are presented.

These data have been collected from secondary sources, mostly from publications of international agencies.

Annex 1: ECONOMIC CONSIDERATIONS FOR
LONG-TERM DEVELOPMENT

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1. INTRODUCTION

The aim of this annex is (1) to bring to focus a number of distinguishing macroeconomic characteristics of the Sahel-Sudan countries (Chad, Mauritania, Mali, Niger, Senegal and Upper Volta), (2) to improve our understanding of the region's economic environment, (3) to provide certain diagnostic and interpretive observations, and (4) to provide an economic information base that would be useful for assessing prospective development strategies of the region.

Aside from the work of the Montreal team (North-South Relations and Urban Framework), the economic data and most of the information have been obtained mainly from the various international agencies. No field trips or other first-hand data collection operations have been conducted for the purpose of this economic analysis. Therefore, the analysis is developed primarily on the basis of selected secondary materials and it should be interpreted with this fact in mind. The accuracy of the data must be regarded as questionable, hence quantitative validation of the analysis is impossible. Rather, a certain plausible diagnostic conceptual framework is hypothesized. Moreover, this analysis is primarily of a macroeconomic nature, microeconomic aspects have not been treated. This omission, however by necessity, further limits the scope of this annex.

It should be noted at the outset that in view of the limited resources of the area (domestic as well as donors) choices will have to be made among alternative development strategies. However, development strategies carry with them important explicit and implicit assumptions and costs/benefits that have enormous implications for national directions, institutional frameworks, political stability, social organization, and human lives. In other words, the choice of any development strategy contains both explicit costs and opportunity costs--i.e., the foregone opportunities of doing other things. For instance, adopting a strategy of rural development means that other alternatives such as exclusive concentration on urbanization, industrialization, or tourism will receive limited attention or are foregone. The choice of a particular strategy implies not only an assumption of certain existing conditions and comparative advantages at present and in the future, but also a degree of commitment for the next several decades and beyond.

1.1 Distinguishing Economic Characteristics

The six countries of the Sahel-Sudan region share many of the same problems as those faced by the other less developed countries of the world. Four of the six countries were included in the United Nations' list of the 25 least

developed countries. The most distinguishing characteristics of these countries which have major bearing upon economic development of the region include the following:

-- A chronic susceptibility to ecological destruction where a history of ecological degeneration has prevailed with concomitant conditions of drought, famine and destitution.

-- Concomitant with the above factor is an absence of human development and the lack of an indigenous skilled and professional labor force who could effectively carry out a major development effort. In spite of over a decade of independence, many of the senior and junior positions in the private and public sectors are filled by a cadre of foreign technicians. These conditions necessitate a development strategy whose orientation is from the top down and create further constraints for devising and implementing development strategies. Moreover, the policies (education, economic, development, etc.) that have been followed in the past have been unfavorable to a majority of the people living in the traditional sector and have contributed to a seasonal and secular outmigration.

-- The relatively small and sparse population of the area (2/3 the size of the U.S. containing about 10 percent of the U.S. population) has created small markets which do not lend themselves to favorable growth prospects.

The situation has created unusually high costs for rendering government services and developing infra-structure.

-- The region's orientation and experience with development has created an unusually high degree of dependence on foreign assistance. Over the last decade the relative shares of imports and investments financed by foreign aid have increased substantially and the region's per capita aid now stands higher than the rest of the developing countries. Foreign aid, in some parts of the world, has played an effective role as a catalyst for economic development. However, there is no evidence that foreign aid by itself has been effective. Certain local ingredients are also necessary. In view of the absence of a definitive connection between foreign aid and economic growth and in view of the prospects for further increase in the dependency quotient upon foreign aid by these countries in the foreseeable future, prospects for economic growth appear bleak, especially when it is observed that a major mass-elite gap exists making implementation efforts very difficult.

-- The above conditions have created a number of vicious circles of development which are discussed later in this report. These are:

- (1) The Ecological/Agricultural Circle
- (2) The Human Opportunity Circle

(3) The Modern/Traditional Circle

-- Except for the colonial experience, these six countries never existed as a single federation by themselves. Major differences exist in terms of their present positions and future prospects.

1.2 Major Differences Among the Countries

There are a number of static and dynamic differences in human and resource endowment as well as the performance of the six countries of the Sahel-Sudan region. For instance, the 1970 per capita income of Senegal (\$178) and Mauritania (\$154) was substantially greater than that of Chad (\$70), Mali (\$100), Niger (\$82), and Upper Volta (\$60). If Upper Volta's rate of per capita income grows at 2 percent per year (a relatively optimistic assumption in view of past performance), it will take it 55 years to reach Senegal's 1970 level of per capita income. Likewise, Senegal has reached a much higher level of industrialization (16 percent of GDP in 1970) and urbanization (30 percent of 1970 population) as compared to a range of 2 percent to 10 percent of industrialization and a range of 5 percent to 12 percent of urbanization for the rest of the countries. In terms of annual growth rate during the decade of 1960-1970, no consistent trend can be discerned. Mali (4.4

percent) and Mauritania (4.5 percent) substantially outstripped the rest whose annual growth rates for the same period ranged from -2.0 percent to 2.3 percent. Although it is very difficult to measure the rate of gross domestic savings in the area since most of it is in the traditional non-monetized form, during 1968-1970, data for domestic savings ranged from 2.8 percent (for Chad) to 23.0 percent (for Mauritania). The 1971 per capita values of exports for Mauritania and Senegal were at \$75 and \$31, respectively, while they ranged from \$3 to \$9 for the rest. Likewise, the per capita value of imports in 1971 ranged from \$54 for Senegal down to \$9 for Upper Volta. Aside from Mauritania (1.17 million), the population of the remaining countries are in close proximity of each other, ranging from 3.64 million in Chad to 5.38 million in Upper Volta in 1970. In terms of total area, Senegal (197 km²) and Upper Volta (274 km²) are smaller than the other four-- Chad (1,284 km²), Mali (1,205 km²), Mauritania (1,079 km²), and Niger (1,268 km²). However, Senegal's GDP for 1970 (\$706 million) was more than twice the size of any of the remaining five countries in the same year: Chad (\$233 million), Mali (\$244 million), Mauritania (\$189 million), Niger (\$300 million), and Upper Volta (\$245 million).

The existence of the above significant differences, especially between Senegal and the rest of the countries,

have contributed in part to (1) differences in colonial experience (Senegal was used as the center of colonial administration), (2) differences in level of industrialization, (3) differences in per capita productivity of labor, (4) differences in per hectare yield of land, and (5) differences in ecological/geographical position--only 21 percent of the area in Senegal lies in the Sahara and Sahel regions while the remaining countries have more than 60 percent (except for Upper Volta) of their land in the Sahara and Sahel regions.

In spite of the above differences, these six countries share a number of fundamental economic problems and prospects. These common features lead to certain generalizations.

1.3 Common Features of the Economies

In spite of the differences among these economies, there are a number of economic constraints that represent common elements among these economies and provide the basis for some economic diagnosis of the region identifying significant bottlenecks. Professor Everett E. Hagen has eloquently described this situation in a trip report after he briefly visited Upper Volta:

"The beginning of wisdom in the analysis of the problem is the recognition that there may be no answer. That is, there may be no intervention by men which brings about the

results which they desire, because important causal forces are not subject to their control. To recognize this is the beginning of wisdom, because unless it is recognized, deductions may be drawn from the explicit facts which are erroneous because they ignore implicit facts which are not known. The continuation of wisdom is the acceptance of chaos for a time. Intellectual advances are not made by men who are made uncomfortable by chaos and insist upon closure too soon.

I suspect that these principles are as applicable to the study of Upper Volta as to any other intellectual problem."¹

It is our contention that the entire Sahel-Sudan region is subject to certain forces hitherto beyond their present control. In order to change the economic picture of the region, it will be necessary to bring as many of these economic variables and parameters under control as possible and neutralize their pervasive effects upon development.

In the following pages a number of these constraints are discussed. Some of these constraints are natural phenomenon such as variability in precipitation. Others are institutional--or man-made factors such as monetary policy or overgrazing. We are led to believe that these constraints and dimensions will have major bearing

1. Everett Hagen, "Upper Volta: What I Think I Learned, What I Think I Knew Before I Went, and Other Comments." Trip Report, 4-6 December, 1973 (a working report of the MIT study project).

upon any development strategies that countries in the region may choose for themselves either individually or collectively. They are discussed in the following order:

- (i) The Climate -- A factor that has major bearing upon economic development in the region.
- (ii) The Monetary System
- (iii) Aspects of International Trade
- (iv) Aspects of Fiscal Policy
- (v) Population and Human Resources Constraints.
- (vi) Aspects of Economic Development and Performance.
- (vii) The Vicious Circles

Moreover, a number of macroeconomic projections are made under alternative sets of assumptions in order to gain some perspectives of the time, resources, and certain macroeconomic relationships required for future economic viability.

2. CLIMATE AND WEATHER AS AN EXOGENOUS FACTOR

The factor of climate and weather has not been adequately treated by development economists.¹ Yet, in this part of the world, especially in the Sahel zone, climate is perhaps more important than any other factor of production. It is now clear that the weather variability of the region can cause major fluctuation in agricultural production, exports, balance of trade and payments, government revenues, migration, and so on. The secondary impact of climate and weather variability is felt in industrial growth (since most of the industrial inputs are from agriculture), tourism, and foreign private investment. Since the drought hits the traditional/rural sector harder than the modern/urban areas, weather can and has influenced the distribution of income and wealth in favor of the modern/urban sector. In view of the fact that the majority of employment and GNP of the region originate in agriculture, and the fact that this sector is more susceptible to weather variability, the climate must be integrated as an explicit variable in any assessment of the long-term economic options of the region.

In addition to the above impact of the climate upon

1. W.J. Maunder, The Value of the Weather (London: Methuen and Co., Ltd., 1970).

the macro indicators, its micro influence needs to be understood. What are the economic and psychological responses of individual farmers and herdsmen toward such an uncertain climate? What are the impacts upon farm diversification, use of fertilizers, machines, and other technologies? And what are the impacts upon risk taking and investment opportunities in the agricultural sector? These questions need to be studied. Moreover, what macro mechanisms and public measures could be effectively employed by the governments of the region and by donors to reduce or minimize the adverse micro impacts of the climate and its associated risks?

Yearly variability in precipitation is a common feature of the entire area. Whether the current drought has ended or may end soon, or whether it may be a manifestation of a shift in climate, the element of risk and uncertainty about the weather will remain in the region over the next several decades.

The available meteorological data clearly portray the variability of precipitation in this large region. This variability has been shown by three methods:

- (1) Presentation of the "raw" data series for each station in matrix form.

- (2) Presentation of these same data in terms of

percentage of the long-term average for each particular location.

(3) Fitting a formal frequency distribution (the mixed incomplete gamma) in tabular and mapped form for the .10, .25, .75 and .90 quartiles.²

For illustrative purposes, let us examine the data from Agadez, Niger. The "raw" data shows very clearly the monsoon character of the precipitation at Agadez, plus the great amount of variability in the time of onset of the monsoon. The cumulative precipitation (January-June) ranges from .002 to .637 of the average annual total (168.2 mm). It is not unusual to have two consecutive years with less than .01 of the average annual total by the end of June. At this station, most of the annual total has fallen by the end of September. The cumulative precipitation for the first nine months at Agadez ranges from .238 to 1.737 of the average annual total.

Using again the data for Agadez, Niger, the data for each calendar month are arrayed in ascending order:

(1) By the end of June, in 18 out of 28 years, less than 10 percent of the annual average total has fallen.

2. For details see: James D. McQuigg, "Variability of Precipitation in the Sahel-Sudan Region of Africa" (June 1974), Appendix C to this report.

(2) By the end of September, in 5 out of 24 years, there had been less than 60 percent of the average annual total precipitation.

While it is quite proper for climatologists and others concerned with the question of climate change to look for evidence of change over many centuries, or over millenia, and to be concerned with hypotheses explaining such change, some of the policy questions that need to be answered require consideration of yearly weather variability. The following observations illustrate this point:

Rapid growth in human and animal population, together with the introduction (and apparent success) of new crop technology, and changes in the societal political structure of the Sahel-Sudano regions were observed during the two decades following World War II. It is interesting to note that, with some comparatively minor exceptions, these were also decades with annual precipitation near (or above) levels regarded as "normal."

In the years since 1965, many places in the Sahel-Sudano region have received less than 80 percent of expected

3. Figures 2 and 3 show simple arithmetic averages of the annual precipitation (1951-1972) expressed in terms of the ratio of precipitation for a particular year to the long-term expected value. Detailed values for particular sample locations are shown in the second table for each situation.

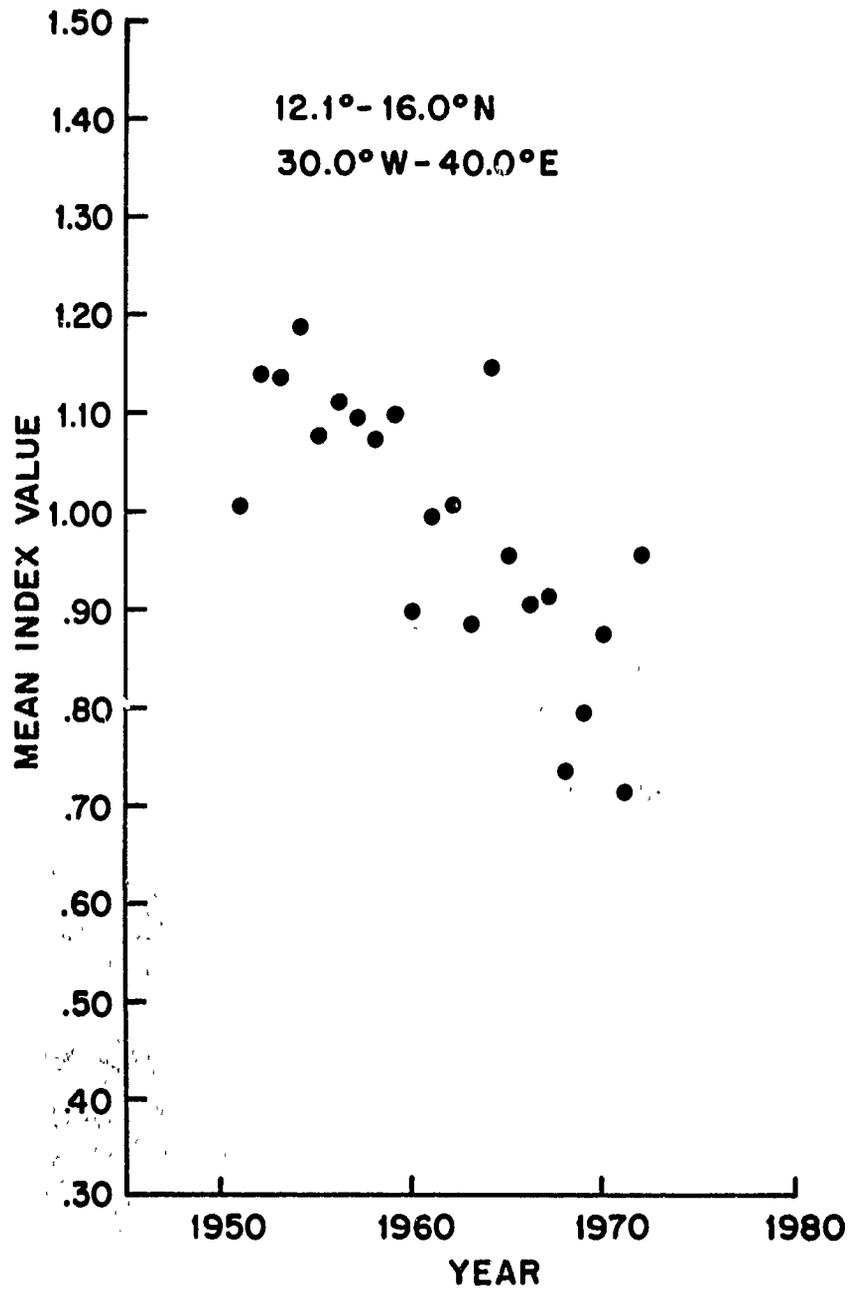


Figure 2: PRECIPITATION PATTERNS

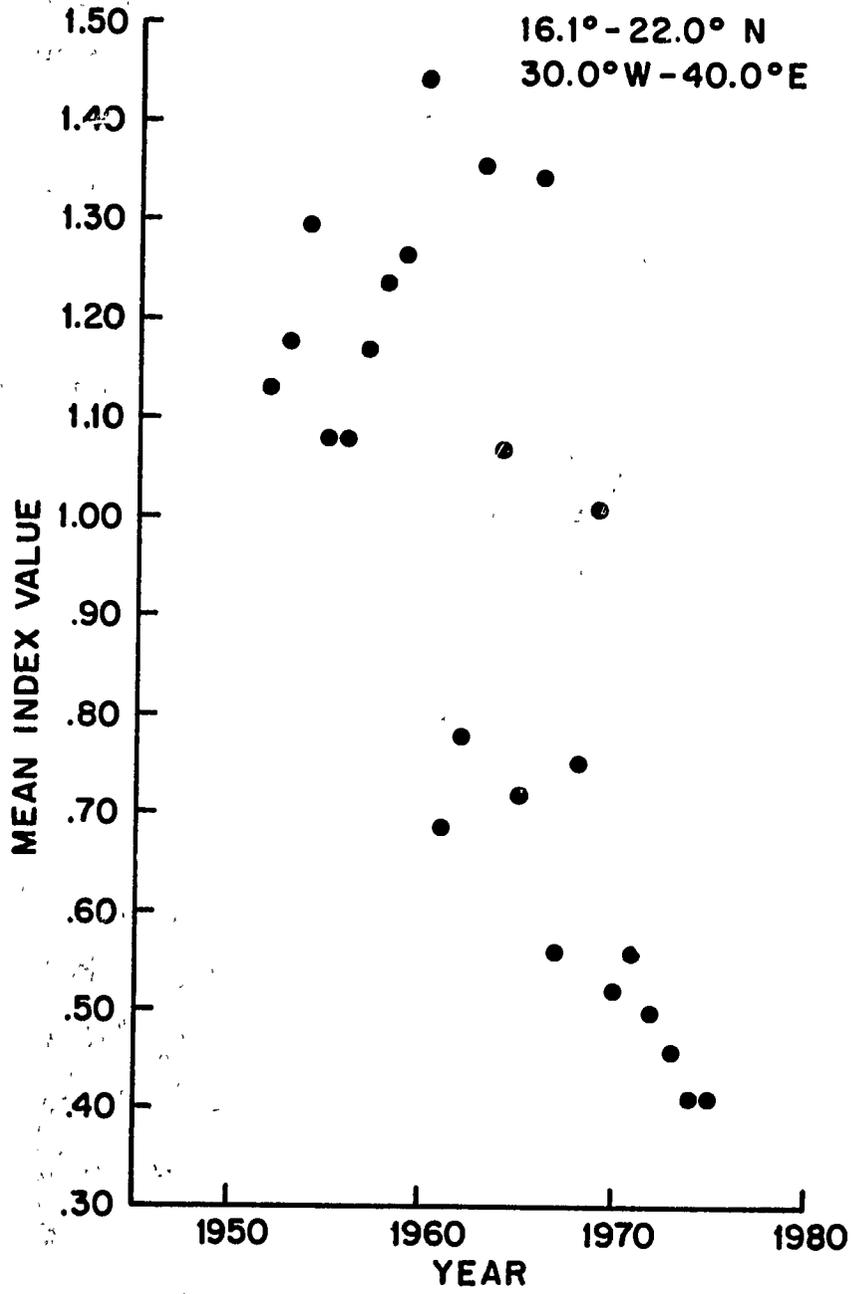


Figure 3: PRECIPITATION PATTERNS

annual precipitation (with some places getting less than 50 percent).

It could be that the introduction of technology during the favorable period of precipitation was planned and executed on a perception of the climate as (1) having only a minor impact, or (2) being fixed at some level close to the most recent years of experience.

However, our analysis shows that planning for future years must take climate into account, especially weather variability as a dominant feature. Further introduction of, or changes in technology, must clearly allow for the kind of variability that is apparent over as long a record as it has been possible to assemble.

At present weather modification technology is in its infancy. Even under the best circumstances, cloud seeding cannot affect the amount of rainfall more than 10 percent to 20 percent. Environmental conditions favorable to the application of such technology do not exist in the Sahel. Moreover, the economic cost of the application of technologies for climate modification in this area are prohibitive. The unique features of variability in the precipitation of the area are their:

-- Frequency - there appears to be a preponderance of the drier over the wetter years.

-- Severity - the droughts have caused great losses of livestock, ecology, and famine in the past.

Statistically, the prolonged droughts of the kind that last between 7 to 8 consecutive years take place once in a century. However, even the shorter ones of 1 to 3 years have been severe and have caused substantial losses.

-- Fluctuations in production (crops and livestock).

These fluctuations create great uncertainties for:

+ Individual farmers - their employment, livelihood, income and mode of production.

+ The economy in general - since the economy's general dependence upon agriculture is very high, and the industry's major inputs originate in agriculture.

+ Export earnings - due to heavy dependence upon agriculture for exports (except Mauritania); and,

Table 2.1. Dependence on Agriculture of the Sahel-Sudan Countries

	<u>Percent of Exports</u>	<u>Percent of GNP</u>	<u>Percent of Employment</u>
Chad	95	46	92
Mali	66	44	91
Mauritania		38	87
Niger	80	58	93
Senegal	50	30	80
Upper Volta	70	49	87

+ Negative impact of drought upon distribution. The drought hits the farmers (or the traditional sector) harder than the modern sector thereby increasing maldistribution of income.

+ Negative impact of drought upon investment. The risk and uncertainty surrounding the drought creates unfavorable conditions for both domestic and foreign investment, especially in the traditional sector.

+ Negative impact of the drought upon risk-taking by individual farmers. Survival and sustenance dominate people's thinking and, as a result, diversification of investment in agriculture and new experimentation suffer.

+ Negative impact upon national cohesion, since drought exacerbates traditional antagonism between herdsmen and herdsman, herdsmen and sedentary farmers, and sedentary farmers over grazing rights, water rights, and competition for other scarce resources.

3. MONETARY SYSTEM AS AN EXOGENOUS FACTOR

3.1 An Overall View

Six west African countries (Senegal, Niger, Upper Volta, Ivory Coast, Togo, and Dahomey) have been part of a double monetary union since November 1, 1962.¹ Among themselves, they form the West African Monetary Union (l'Union Monetaire Ouest Africaine) and are both bilaterally and individually members of the franc zone. This monetary system is itself both original and a continuation of the French colonial monetary system in Africa which was first established in 1853 with the Banque du Senegal and centralized in January 1909 into the Banque de l'Afrique Occidentale, a private bank which obtained the exclusive right to create currency.

The present system of a double monetary union for these countries has two main and interconnecting characteristics. First, the money supply mechanism is very strictly controlled, with special emphasis on a tight fiscal constraint for each participating government. Second, there has never been any implementation of an independent African exchange rate policy, and the C.F.A.

1. All the constituting treaties and conventions establishing this union have been amended and re-approved on November 14, 1973.

franc is chronically overvalued in regard to both the currencies of neighboring countries and those of the rest of the world. A curiosity among developing countries, the countries of the West African Monetary Union have a fully automatic convertible currency and one of the lowest rates of economic growth.

Such a monetary arrangement is bound to have a fundamental impact on the direction and type of economic development in the region. Indeed, it can be demonstrated that the entire system is geared toward fulfilling one main economic objective: maintaining a fully convertible and stable African currency within the franc zone, with emphasis on unimpeded capital and trade credit flows. Therefore, priority is given to relaxing the foreign exchange constraint through the capital account for the area as a whole, at the cost of exacerbating the saving constraint and establishing a tight fiscal constraint for each participating government.

Thus, the banking system in sub-Sahara west Africa does not play an effective role toward capital accumulation, since its operating rules are basically aimed at financing trade flows and capital repatriations, rather than at stimulating monetization, savings, and local investments. Because the monetary and banking sys-

tems in French West Africa are biased against indigenous savings and investment, they perpetuate the past system of economic production and are among the major institutional bottlenecks which limit indigenous opportunities in the region, especially in the traditional sector.

3.2 The Monetary and Banking Framework in west Africa

Before considering the monetary and financial obstacles to development in West Africa, it is useful to outline the basic rules that govern monetary and banking policies within the West African Monetary Union (U.M.O.A.). The area forms a monetary union in the sense that there is a common currency and a single currency board, and that external reserves are centralized. The monetary unit is the C.F.A. franc which has a fixed par value of 0.02 French francs.

Since November 14, 1973 this parity could theoretically be modified without France's authorization (Article 5 of the new cooperation treaty between France and each member state). However, since west African external monetary and banking rules must always remain "harmonized" with the French rules (Article 6 of the above), such a parity change is highly unlikely. In fact, this parity has not been changed since October 17, 1948, when the C.F.A. franc was revalued from 1.7 old francs to 2 old

francs.²

The central element of the monetary system is a network of treaties and conventions that each member state signed with France. By these agreements, France "guarantees" the C.F.A. fixed parity in return for agreed monetary and banking rules that the U.M.O.A. must follow within the franc zone in order to maintain free convertibility and transferability. In order to implement these arrangements, on May 12, 1962 and later on November 14, 1973, each member state signed a cooperation treaty with France by which it was agreed (new Article 3) that accumulated foreign reserves of the Central Bank (B.C.E.A.O.) would be deposited in a special account (compte d'operations) at the French Treasury.³ This account could theoretically show a negative balance (Article 6 of the "compte d'operations" convention) and could therefore constitute an unlimited support of the C.F.A. currency by the French government. In fact, the account has never been negative mainly because France's guarantee was conditional upon

2. The introduction of a new franc in 1960 accounts for the actual 0.02 parity.

3. The details of cooperation of this account were outlined in a special convention between the French Minister of Finance and the U.M.O.A. Central Bank on March 20, 1963, and reviewed on December 4, 1973.

tying monetary rules to the level of resources.

The following provisions were agreed to by the signatories:

First, it was established that the French government would be represented on the Central Bank's board of administrators by two representatives (Article 10 of the new cooperation treaty).

Second, the Central Bank was placed under obligation to confiscate all foreign reserves held by public or private institutions within the Union and to draw on their IMF borrowing rights before relying on the automatic lending provided by the French Treasury (Article 20 of the new November 1973 treaty creating the U.M.O.A.).

Third, to remove the possibility that the Central Bank would ever run out of franc reserves and be compelled to borrow from the French Treasury, the bank's statutes were amended so that the bank would be obliged to retain minimum reserves equal to at least 20 percent of its short-term liabilities (Article 51 of the new B.C.E.A.O. statutes). If this ratio should fall below 20 percent for three consecutive months, the Central Bank's president must convene the board of administration to consider raising the discount rate, lowering the discount ceilings or take any other action to correct the situation.

Fourth, with a mixture of the "currency principle" of adjusting the money supply through changes in the balance of payments (trade) and of the "banking principle" of increasing the supply of money through the discounting of "legitimate" commercial paper⁴, a set of banking rules was devised to tie the issue of money to external reserves and discounted credit, and to exclude government securities as a base for monetary expansion. Indeed, the discount operations of the Central Bank in regard to governments are strictly limited to advances not exceeding 20 percent of the government's previous year fiscal entries (new Article 16 of the new B.C.E.A.O. statutes). As a result, the governments of the Union have negligible domestic public debts. They are, in fact, creditors of the Central Bank, which invests part of their surplus funds abroad. Moreover, the banking activities of development and commercial banks are tightly and selectively controlled and centralized by the Central Bank. Each bank must maintain a 75 percent "liquidity" coefficient (discountable credits on short-term liabilities). Through such a high coeffici-

4. The commercial-loan theory of credit on which this principle is based tries to prove that money created through granting short-term loans on goods in process would neatly follow the trade volume and thus constitute an ideal supply of money. The "real-bills" doctrine does not provide a satisfactory criterion for central banking.

ent, the Central Bank can control selectively the volume and direction of credit, since it establishes, for each enterprise, individual credit limits and, for each bank, discount ceilings. The ceilings are allocated by each national monetary committee within the overall discount ceilings established for each country.

The net result of these treaties and rules is a monetary system oriented in its operations toward the maintenance of the external stability and convertibility of the currency at all costs.

The monetary and banking rules were devised in such a way as to make it unnecessary to introduce parity changes or to borrow external reserves from the French government. We can obtain an indication of the tight grip that the Central Bank has on the money supply within the U.M.O.A. when we consider that the bank discount rate remained fixed at 3.5 percent from the foundation of the U.M.O.A. on May 12, 1963, until January 1973. Actually this fixed discount rate had existed since October 15, 1956, when the Central Bank was then l'Institute d'Emission d'Afrique Occidentale. It was finally raised to 5.5 percent in January, 1973. As a consequence, the monetary and banking systems of the U.M.O.A. are only marginally involved in the African process of development. They perpetuate a situation of monetary constraint in

French West Africa, and by and large, they have a retarding influence on development because of their biases against African financial intermediation and hence against African savings and investments.

3.3 Money as an Instrument of Development in West Africa

3.3.1 The missing monetary instruments

As the monetary and banking systems presently operate in west Africa, many strategic instruments of monetary policy are out of the reach of government authorities who might wish to influence their domestic economic development without relying entirely on foreign aid and capital.⁵ First, the rate of expansion in money supply cannot respond to government borrowing but is statutorily linked to trade and commercial activities. Second, interest rates do not reflect the opportunity cost of investment funds, but are replaced by a rigid system of credit allocation with quantitative and selective controls. Third, the exchange rate of the C.F.A. franc can hardly be adjusted to reflect the internal and external economic

5. For a comprehensive discussion of these policy instruments see Rodrigue Tremblay, ed., Africa and Monetary Integration (Montreal: Holt, Rinehart & Winston, 1972).

conditions of the U.M.O.A. countries; rather, its parity responds to the same economic pressures as the French franc.

3.3.2 The distortions introduced by the lack of monetary instruments

The distortions that the existence of such a policy straitjacket imposes on an economy are easily predictable and are all too evident in west Africa. They are part of a vicious circle which can be described as: low monetization → low savings → low-productivity investments → overvalued currency with pro-import and anti-export biases → substitution of foreign capital for domestic capital → a low rate of income growth.

Probably the most serious drawback of the system is its neglect of the financial intermediation process that would be required in that part of the world in order to launch a cumulative and self-generating process of development instead of relying almost exclusively on contributions from abroad. The argument is often used in west Africa, as elsewhere, that per-capita income in these countries is too low to allow them to save and to accumulate capital. This static argument is unsound; income is not equally distributed and consequently does give rise to savings. When monetization and the financial system are not well-developed or are badly managed, these

savings are invested in commodities or in low-yield projects and consequently do not result in a higher rate of income growth. Moreover, even though per-capita income is low in west Africa, profits are nevertheless being generated, and it is the role of a well-organized financial system, together with appropriate monetary policies to prevent these profits from being dissipated on luxury goods and from being exported abroad.

A banking system that maintains artificially low interest rates and is lukewarm about increasing the degree of monetization and of financial intermediation in the economy can have a disastrous effect on the propensity to save, on the quality of investments being undertaken, and inevitably on the rate of income growth. Indeed, in the absence of proper incentives, to accumulate savings and to invest in equipment and land improvement, those with financial resources prefer naturally to invest in gold, cattle, or land or to invest their funds abroad instead of holding bank deposits and undertaking self-financed, "lumped," or relatively important investments. When credit is as underdeveloped as it is in the Sahel-Sudan countries, the odds are high that the economy will also be underdeveloped and its rate of income growth fairly low.

Table 3.1 indicates the ratio of the money supply (M_2) to gross national product and thus illustrates the evolution of the financial structure over time in less-developed, in semi-industrialized, and in industrialized countries. A high correlation exists between the size of the monetary system and the rate of income growth. In fast-growing countries such as Japan, Germany, Korea, and Taiwan, real growth has been accompanied by successful financial policies and real monetary expansion. Usually, financial growth has meant that demand deposits and currency have grown with output, which is normal, but, above all, liquid time and savings deposits have tended to increase at a faster rate than GNP. This has meant that the banking system in those countries has assumed an ever-expanding role as an intermediary within the economy by encouraging savings and by stimulating high-productivity investments. For such development to occur, real rates of return on time and savings deposits have to be high enough to encourage that form of saving -- which is to say that nominal interest rates have to be higher than the rate of inflation.

The same financial growth has not taken place in west Africa, where the financial structure either has remained stagnant or is growing only marginally. Such a situation is understandable, considering the proclivity

TABLE 3.1

THE FINANCIAL STRUCTURE OF INDUSTRIALIZED, SEMI-DEVELOPED AND AFRICAN COUNTRIES

Ratio of currency, demand deposits, time and savings deposits (M_2) to G.N.P.

Year	Japan	Germany (Including bank bonds)	France	United States	Argentina	Turkey	Korea	Chad	Taiwan	Mali	Mauri- tanie	Niger	Ivory Coast	Senegal	Upper Volta	Togo	Dahomey
1953	0.567	0.342	--	0.61	0.45	0.20	--	--	0.1118	--	--	--	--	--	--	--	--
1954	0.585	0.386	--	0.65	0.48	0.22	--	--	0.1300	--	--	--	--	--	--	--	--
1955	0.633	0.361	--	0.63	0.48	0.22	--	--	0.1288	--	--	--	--	--	--	--	--
1956	0.689	0.369	--	0.62	0.46	0.24	--	--	0.1331	--	--	--	--	--	--	--	--
1957	0.686	0.394	--	0.61	0.42	0.24	--	--	0.1574	--	--	--	--	--	--	--	--
1958	0.793	0.422	--	0.66	0.42	0.21	--	--	0.2014	--	--	--	--	--	--	--	--
1959	0.856	0.455	--	0.63	0.29	0.19	--	--	0.2041	--	--	--	--	--	--	--	--
1960	0.878	0.433	0.47	0.63	0.29	0.20	0.1135	--	0.1976	--	--	--	--	--	--	--	--
1961	0.885	0.448	0.51	0.66	0.28	0.21	0.1395	0.1196	0.2519	--	--	--	--	--	--	--	--
1962	0.868	0.461	0.52	0.67	0.24	0.20	0.1483	--	0.2737	--	0.1143	0.0916	0.1962	0.2248	0.1078	--	0.1531
1963	0.948	0.490	0.53	0.69	0.26	0.20	0.1129	0.1247	0.3135	--	0.0996	0.0955	0.1934	0.1825	0.1125	0.1292	0.1462
1964	0.926	0.511	0.53	0.70	0.28	0.22	0.0913	--	0.3440	--	0.0741	0.0870	0.2124	0.1649	0.1110	0.1420	0.1439
1965	0.981	0.522	0.55	0.71	0.24	0.24	0.1205	--	0.3574	--	--	0.1012	0.2116	0.1563	0.1137	0.1627	0.1328
1966	0.994	0.540	0.56	0.68	0.25	0.25	0.1506	--	0.3959	--	--	0.0989	0.2149	0.1389	0.1137	0.1532	0.1346
1967	0.974	0.600	0.59	0.71	0.27	0.26	0.2035	0.1124	0.4266	--	--	0.1003	0.2176	0.1341	--	0.1605	0.1310
1968	0.952	0.638	0.60	0.70	0.29	0.27	0.2596	--	0.4074	--	0.0933	0.0818	0.2294	0.1442	0.0963	0.1476	0.1423
1969	0.975	0.636	0.58	0.66	0.29	0.29	0.3276	--	0.4297	0.1850	--	0.0965	0.2558	0.1500	--	0.1694	0.1551
1970	0.969	0.635	--	0.70	--	--	0.3499	--	0.4668	0.1872	--	0.0981	--	--	--	0.1761	0.1646

of the banking system to shun local saving and entrepreneurial efforts and to rely on a centralized and selective system of credit allocation. Because there are no capital markets as such in these countries, the role of the banking system becomes even more important in raising saving propensities and in encouraging investments. If this role is not fulfilled, large trading enterprises maintain access to cheap foreign trade credit from the banking system, while small local entrepreneurs are condemned to resort to insufficient self-financing or to usurious moneylenders. At the same time net savers are forced to hoard low-yielding commodities with negative rates of return. In such an environment, agriculture and small-scale industries are discouraged from borrowing and investing in improved technology and from increasing the scale of enterprises.

3.4 Policy Implications

3.4.1 The banking system

The centralized system of credit allocation within the U.M.O.A. countries is detrimental to income growth primarily because it fails to encourage local savings and investment and maintains interest rates and lending policies that can only encourage a flow of savings to

external capital markets.⁶ A banking system that allocates credit to favored borrowers at low real rates of interest perpetuates the existence of foreign urban economic enclaves and exacerbates the requirements for foreign aid and capital. This absenteeism of the banking system in the domestic economy is doubly costly to small farmers and indigenous urban industrialists who are compelled to rely on inefficient savings vehicles and who have access to only a trickle of the "subsidized" credit reserved for large importing and exporting enterprises. If farmers are to be able to invest successfully in new seeds or fertilizers or in an improved breed of cattle and if small entrepreneurs are to enlarge the size of their enterprises and adopt new technologies, they must not be financially isolated but should be able to rely on the banking system to encourage saving and provide financing. For this to occur, a fundamental reorganization of banking and monetary policies would be required in west Africa.

6. For example, the Caisse des depots et consignations of Paris had the responsibility until December 31, 1968, to invest in French capital markets the funds accumulated by the Caisse d'Epargne Postale of Niger. Since, then, this role has been filled by a domestic development bank, the B.D.R.N.

3.4.2 The exchange rate

Unfortunately, a simple monetary reform in west Africa will not be enough to accelerate economic development if the tax that the overvaluation of the currency imposes on domestic investment opportunities is not removed. Indeed, exporters and the rural sector (i.e., most of the economy) are doubly disadvantaged in the region. First, because of the tight fiscal constraint imposed by the monetary system on national treasuries, the tax structure is severely skewed toward export and import taxes, although the ease of collection and the high yield of such taxes are important factors also. However, unlike importers, exporters are penalized by the artificially low official price of foreign currency. A currency devaluation would allow raising rural producer's prices in domestic currency, while government marketing boards could channel part of the increased export earnings to government purposes. Because the correction in the overvaluation of the currency would raise rural earnings relative to those of the urban areas, such a move would be bound to stimulate savings and investments.

3.5 Conclusion

Tentatively, it can be said that the west African monetary experience does not necessarily suggest

inflationary financing as a way of putting a stop to economic stagnation.⁷ Rather, it shows that exclusive reliance on external aid alone is no recipe for income growth when domestic economies are caught between financial restraints on the one hand and exchange rate overvaluation on the other. The experience of a monetary union and of a common Central Bank is not, however, to be rejected in west Africa, even though it has meant a relatively tight budgetary situation for participating governments and has been accompanied by a relatively slow rate of economic growth. Monetary and exchange rate policy reforms could rectify the imbalance that the actual system imposes on west African economies by releasing domestic saving and investment efforts and by aligning the exchange rate on African economic needs rather than on the maintenance of the franc zone in its present form.

7. This is not to say that some outstanding domestic public debt must necessarily be excluded, considering the relatively high investment in foreign reserves by the U.M.O.A. countries.

4. INTERNATIONAL TRADE

Although the relative importance of the external sectors varies considerably among the six Sahel-Sudan countries, a number of characteristics are common to all. In all six countries the commodity and geographic concentration of trade, exports as well as imports, is high. This together with the fact that much of the exports are agricultural products whose supply tends to be highly variable, leave the economies of the Sahel-Sudan potentially open to externally induced fluctuations. While data are lacking on which to base firm conclusions it seems that fluctuations in the foreign trade sectors have not been matched by changes in total production. This no doubt reflects the lack of integration of the foreign trade sectors with the rest of the economy since most exports represent unprocessed raw materials and the bulk of imports are final products or semi-finished products rather than raw materials.

A crude measure of the 'openness' of the Sahel-Sudan economies is the foreign trade ratio, the ratio of total trade, imports plus exports,¹ to GNP (or GDP). The available data, summarized in Table 4.1, are of course subject

1. We exclude estimates of unrecorded trade from the analysis because such data are usually highly subjective and generally not comparable across time or countries.

to the usual distortions and vagaries typical of international data converted at official exchange rates. It nevertheless provides a relative measure of the importance of trade. The low trade proportion for Upper Volta may reflect certain special factors dominating that economy's external sector while the high trade proportion of Mauritania is caused by its large export volume of iron ore and concentrate.

Table 4.1
Ratio of Foreign Trade
(Exports plus Imports) to GNP/GDP

<u>Country</u>	<u>Trade Ratio</u>	<u>Year</u>
Chad	37%	1970 (*)
Mali	44	1972 (*)
Mauritania	75	1972 (**)
Niger	28	1969 (**)
Senegal	40	1970 (**)
Upper Volta	15	1968 (**)

Uganda	31	1971 (**)
Ghana	40	1970 (**)
Nigeria	34	1970 (**)

Sources: * U.N. Sources
 ** International Financial Statistics,
 (Vol. XXVII) No. 10, October 1974

Of perhaps greater interest is that despite the importance of trade to some of the Sahel-Sudan countries (e.g., Senegal, Mauritania, Mali) there is little consistent relationship between external sector developments and general economic performance. As shown in Table 4.2, the often contradictory performance of growth in GDP and in exports and imports seems to indicate that the external sector is not yet integrated into the economic growth process.

Table 4.2
Growth of Imports, Exports and GDP
(Per Cent per Annum)

Country	Period	Growth Rate ¹		
		Imports ²	Exports ²	GDP
Chad	1961-67	9.1	2.8	0.9
	1967-68	-7.3	10.2	0.9
Mali	1961-67	-1.1	2.9	2.8
	1967-68	-17.7	-1.9	1.7
Mauritania	1961-67	-2.7	37.4	9.0
	1967-68	21.4	1.6	6.0
Niger	1961-67	12.7	11.3	3.1
	1967-68	n.a	n.a	-
Senegal	1961-67	-0.4	1.3	2.4
	1967-68	9.4	8.5	3.6
Upper Volta	-	n.a	n.a	-

Notes: ¹Compound growth rates for period indicated.
²Goods only

Sources: IRBD, World Tables, 1971.

While the above data are fragmentary², they provide some support for the contention of a weak link between trade and growth. Although a thorough understanding of this phenomenon will require detailed study, it appears clear that future development policies, if they are to lead to self-sustaining growth, need to focus not only on the development of the export sector, including policies aimed at export promotion and diversification but should also ensure that growth in exports sustains developments in the rest of the economy.

4.1 Exports

The commodity composition of exports from the Sahel-Sudan countries, as well as their geographic concentration discussed below, increases the vulnerability of the external sector to supply-demand fluctuations. Table 4.3 summarizes the commodity composition of exports. Seven commodities account for over 85 percent of all exports in five of the six countries under analysis and three commodities account for over 80 percent of total exports. The exception is Senegal whose exports reflect its more developed and diversified economy. Moreover there has been re-

2. We have also refrained from trying to update the information by using various disparate sources in order to maintain a degree of comparability between the observations.

Table 4.3

Commodity Composition of Exports, 1969
(Percent)

SITC #	Item	Chad	Mali	Mauritania	Niger	Senegal	Upper Volta
001	Live animals	8.7	48.2	-	14.3	-	36.9
03	Fresh fish	1.1	14.1	5.8	-	7.0	-
081.3/221/ 421/2	Oil-seeds, oil nuts, oil cakes ground nut oil	-	18.3	-	65.2	55.1	17.9
211/611	Hides and skins and leather	0.6	1.2	-	3.3	1.1	2.4
2631	Raw cotton	82.1	10.0	-	4.8	-	27.8
65	Textiles	-	0.9	-	0.5	3.4	1.0
281	Iron ore and concentrates	-	-	87.0	-	-	-
	Total above	92.5	92.7	92.8	88.1	66.6	86.0
	Other commod- ities	7.5	7.3	7.2	11.9	33.4	14.0
		100.0%	100.0%	100.0%	100.0%	100.9%	100.0%

Source: United Nations, Yearbook of International Trade Statistics, 1969, New York, 1971

latively little change over time in the concentration pattern again with the notable exception of Senegal. The high commodity concentration is matched by a pattern of high concentration in terms of geographic areas. The commodity and geographic coefficients of concentration³ for the periods 1963-65 and 1968-70 are shown in Table 4.4. Note that the concentration ratio has an upper limit of 100, if only one commodity were exported or in the case of the geographic concentration ratio, there is only one trading partner. The lower limit of the measure is given by $100 (1/N^{1/2})$ where N is either the number of commodities (for the commodity concentration index) or countries (for the geographic index). Using the 3 digit SITC definition of commodities, 150 possible commodities are identified, so that the lower limit for the commodity concentration index is 8.2. For the geographic index, 27 possible trading partners were specified (i.e., N = 27) so that the lower limit is 19.2.

3. The commodity concentration index for exports, is defined as:

$$I_{cj} = 100 \left(\sum_i \left(\frac{X_{ij}}{X_j} \right)^2 \right)^{1/2}$$

where X_{ij} = exports of commodity i from country j

X_j = total exports from country j

The indices for geographic concentration (and for imports) are similarly defined.

TABLE 4.4
Concentration Coefficients: Exports

	Commodities ^{a/}		Geographic Area ^{b/}	
	1963-65	1968-70	1965	1969
1. Chad	79	80	49	83
2. Mali	46	44	43	47
3. Mauritania	90	88	41	38
4. Niger	66	64	61	65
5. Senegal	51	39	81	62
6. Upper Volta	<u>60</u>	<u>50</u>	<u>55</u>	<u>44</u>
Average	65	61	55	57

7. Pakistan		40		30
8. Nigeria		44		57
9. Ghana		70		39
10. Philippines		41		61
11. Argentina		30		34
12. India		28		35

^{a/} Range is 8.2 - 100.

^{b/} Range is 19.2 - 100.

Source: lines 1-6: Calculated from UN trade data.

line 7: Joseph J. Stern, "A Note on the Structure of Pakistan's Foreign Trade," Pakistan Development Review (Vol. IX) Summer 1969, pp. 212-223.

lines 8-12: B. F. Massell, "Export Concentration and Fluctuations in Export Earnings: A Cross-Section Analysis," American Economic Review (Vol. LIV) March 1964, pp. 47-63.

By comparison with the results for the Sahel-Sudan economies, the export commodity concentration index for "small" developing countries averaged 53, while the geographic coefficient averaged 21.⁴ Not surprisingly, given the colonial heritage of the Sahel-Sudan countries, France and franc area countries constitute well over half the export market. One consequence of the high geographic concentration is, that with few trade connections, the exporter is open to monopsonistic buying practices. The high commodity concentration, with the high concentration in agricultural products, increases the risk that variability in weather will sharply affect exports. In fact this has happened. Table 4.5 compares the share of exports in agricultural products for the years 1969 to 1971. As a result of the drought, exports of agricultural products declined both absolutely and relatively to other exports. It seems likely that a policy which encourages efficient export diversification, both in terms of commodities and markets, will yield substantial benefits by reducing fluctuations in earnings and increasing the growth of exports.

4. See M. Michaely, Concentration in International Trade, (Amsterdam: North Holland Publishing Company, 1962).

Table 4.5

<u>Share of Agricultural Exports</u> (per cent of total exports)				
<u>Country</u>	<u>Commodity</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
Chad	Live animals	8.7	2.3	4.2
	Raw cotton	82.7	69.1	65.5
Mali	Live animals	48.2	34.3	26.8
	Fresh fish	14.1	7.7	6.1
	Oil nuts	18.3	16.1	26.6
Niger	Live animals	14.3	15.8	18.5
	Oil nuts	65.2	65.9	43.9
Senegal	Oil nuts	55.1	53.3	36.2
Upper Volta	Live animals	36.9	31.2	36.4
	Raw cotton	27.8	25.7	18.9

Source: Calculated from United Nations, Yearbook of International Trade Statistics, New York (various issues)

One potential for export development is regional trade among the Sahel-Sudan countries. At the present time exports to other Sahel-Sudan countries, and even to other west African countries, are relatively unimportant. The exceptions are Mali and Upper Volta which have considerable cattle exports to neighboring African states. This phenomenon is not surprising since the economies of many west African countries are roughly similar in their productive structures. Encouragement of regional trade will undoubtedly

ly call for a unified approach to development so that future import substituting industries create economic structures that allow each country to have the advantages of economies of scale while creating the potential for regional trade.

4.2 Imports

Turning to the import side, the same high level of commodity and geographic concentration as noted in regard to exports is present. The relevant data are summarized in Table 4.6. As is usual, the degree of commodity concentration on imports is less than on the export side. Nevertheless, in terms of international comparison it remains high. In part this reflects the low level of development and the absence of any significant industrial structure whose operation would call for a variety of imported inputs. It should be noted that the geographic concentration on the import side nearly matches that found for exports although with an apparent downward trend. As before the relatively high geographic concentration is caused by the continued predominance of France as a supplier or imports. Unless such a high reliance on one supplier reflects the operation of comparative advantage its effect is to reduce the potential gains from trade. Undoubtedly the reliance on France as the major import supplier has a number of causes: historical ties and the financial-

Table 4.6

Concentration Coefficients: Imports

<u>Country</u>	<u>Commodity Concentration a/</u>		<u>Geographic Concentration b/</u>	
	<u>1963-65</u>	<u>1968-70</u>	<u>1965</u>	<u>1969</u>
1. Chad	28	24	49	38
2. Mali	29	25	38	42
3. Mauritania	40	29	54	43
4. Niger	32	30	53	48
5. Senegal	26	27	54	42
6. Upper Volta	23	25	56	50
Average	30	27	51	43
7. Pakistan		22		38.5
8. Nigeria	24		51	
9. Ghana	21		51	
10. Kenya	23		53	
11. Argentina	24		27	

Notes: a/ The possible range is 8.2-100

b/ The possible range is 19.2-100

Source: lines 1-6: Calculated from UN trade data

line 7: J. J. Stern, op. cit.

lines 8-11: Michael Michaely, op. cit.

monetary system ties. It is also probable that an unwillingness to devote time and resources to developing new supplier relations has been a factor as well.

Table 4.7 shows the commodity composition of imports. As might be expected food import form a high percentage of total imports, nearly 20 percent, and have increased as a result of the drought imposed need to import additional food supplies. Raw material imports form a small proportion while the machinery imports represent, to a large extent, transport equipment, including private cars. On the whole over the five-year period covered by the data little apparent progress has been made in developing import substitutes. The extent to which efficient import substitution is possible, the areas in which import substitution might occur and the best mix policy instruments to foster such a development remains to be studies. Even so, it seems apparent that unlike most other developing countries the Sahel-Sudan countries, with the exception of Senegal, have not yet made any significant progress in shifting away from their traditional import commodity composition.

4.3 The External Sector: Summary

Over the decade of the 1960's, the Sahel-Sudan countries, with one exception, have run deficits on their trade accounts. Only Mauritania, with its large volume of iron ore exports had a surplus. Table 4.8 reports the

TABLE 4.7

Composition of Imports
(percent)

SITC #	Item	Chad		Mali		Mauritania		Niger		Senegal		Upper Volta	
		1966	1971	1966	1971	1966	1971	1966	1971	1966	1971	1966	1971
0	Food and live animals	9.4%	15.6%	19.4	25.7%	13.0%	21.8%	10.3%	9.6%	35.3%	29.2%	24.3%	17.6%
1.	Beverages and tobacco	3.3	2.9	1.5	1.8	1.2	0.9	3.7	2.7	1.7	1.9	3.4	2.9
2.	Crude materials, inedible	2.9	2.6	6.5	6.1	0.7	3.3	4.2	2.3	4.5	3.3	10.9	6.4
3.	Mineral fuels	14.8	16.6	6.4	9.5	5.9	6.5	8.5	8.5	2.6	6.2	5.9	8.8
4.	Animal, vegetable oils and fats	-	0.8	0.5	1.7	0.5	1.2	0.2	0.7	0.4	0.9	0.6	1.2
5.	Chemicals	6.7	7.9	6.5	7.9	6.4	4.8	5.0	7.7	8.2	7.7	6.8	8.7
6.	Manufactures	25.9	19.2	39.5	18.1	20.0	16.9	36.3	29.2	25.1	20.9	23.8	22.7
7.	Machinery	23.0	25.1	15.4	23.4	49.1	41.1	21.7	29.8	16.3	23.8	16.9	26.2
8.	Misc. manufactures	9.7	6.7	4.2	4.9	3.2	3.5	6.7	5.4	5.8	5.5	7.4	5.2
9.	Commodities, nes.	3.4	2.6	-	0.9	-	-	3.4	4.1	-	0.4	-	0.4
	Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: United Nations, Yearbook of International Trade Statistics,
New York (various issues)

regression equations for exports, and imports, against time over the period 1961-68. Note that not all the results are significant and that in any event the posted relationship is to simply yield some insights or provide some indication of future prospects.

In nearly all cases the growth rates were around 5 percent per annum, below the average for all developing countries (1962-73: 11.8 percent) and even below the average for African developing economies (1962-73: 12.1 percent). All these data are based on current price data and thus tend to overstate the real rate of export growth. Mauritania's exports increased dramatically (by over 180 percent) in 1964 with the beginning of large-scale iron ore exports. Upper Volta's export growth rate is exaggerated because it is measured from a very low base. While imports also grew at moderate rates, the import levels already exceeded exports in 1961 so that the trade gap worsened or remained unchanged in most cases.

The pattern of resources used to finance the trade gap is brought out in Table 4.9 which brings together data on the structure of debt and recent borrowing. As with most developing countries the external debt for six Sahel-Sudan countries has risen in recent years. At the same time, as noted above, the economies debt servicing capacity has not improved. With the exception of Chad and Mauritania nearly

Table 4.8

Summary of Regression Results

1961 - 1969

1.	<u>Chad</u>	a. Imports:	$\log M = 5.6 + 0.054 t^{**}$ (3.600)	$R^2 = .649$
		b. Exports:	$\log X = 5.2 + 0.054 t^{**}$ (3.680)	$R^2 = .659$
2.	<u>Mali</u>	a. Imports:	$\log M = 9.6 - 0.009 t$ (-0.608)	$R^2 = .501$
		b. Exports:	$\log X = 7.3 + -.012 t$ (0.433)	$R^2 = .261$
3.	<u>Mauritania</u>	a. Imports:	$\log M = 6.5 + 0.037 t$ (0.886)	$R^2 = .101$
		b. Exports:	$\log X = 21.0 + 0.458 t^{***}$ (4.697)	$R^2 = .759$
4.	<u>Niger</u>	a. Imports:	$\log M = 1.8 + .11 t^{**}$ (6.418)	$R^2 = .855$
		b. Exports:	$\log X = 4.0 + 0.072 t^{**}$ (3.093)	$R^2 = 0.578$
5.	<u>Senegal</u>	a. Imports:	$\log M = 9.1 + 0.023 t^*$ (2.653)	$R^2 = .501$
		b. Exports:	$\log X = 9.0 + 0.022 t$ (1.941)	$R^2 = .350$
6.	<u>Upper Volta</u>	a. Imports:	$\log M = 6.3 + 0.044 t^{**}$ (3.760)	$R^2 = .669$
		b. Exports:	$\log X = -3.8 + .182 t^{**}$ (5.004)	$R^2 = .782$

Notes: * = significant at 10% confidence level

** = significant at 5% confidence level

TABLE 4.9

Structure of External Debt and Borrowing

Item	Chad		Mauritania		Mali		Niger		Senegal		Upper Volta	
	1968	1971	1968	1971	1968	1971	1968	1971	1968	1971	1968	1971
1. Debt outstanding (\$ millns)	\$26	\$34	\$20	\$27	\$188	\$236	\$14	\$21	\$62	\$95	\$16	\$20
2. Supplied by (%)												
(a) Private	9%	26%	46%	29%	4%	2%	6%	5%	3%	18%	1%	1%
(i) Suppliers' credits	9	22	42	29	4	2	6	5	3	12	-	1
(ii) Private banks	NA	NA	4	-	-	-	NA	NA	-	-	1	-
(iii) Others	-	4	-	-	NA	NA	-	-	-	6	-	-
(b) Public	91%	74%	54%	21%	96%	98%	94%	95%	97%	82%	99%	99%
(i) Int'l orgs.	2	5	4	21	-	3	3	10	3	14	68	80
(ii) DAC	88	69	50	43	24	18	85	85	94	66	NA	NA
(iii) East'n Bloc country	NA	NA	-	7	58	66	NA	NA	-	2	31	19
(iv) Others	1	-	-	-	14	11	6	-	-	-	-	-
3. Debt outstanding (end '71) per capita (\$)		11.6		76.3		61.5		16.7		42.3		6.2
<u>New Lending 1969-71</u>												
1. Average amount (\$ millions)	7.4		5.4		17.0		7.8		20.0			2.7
2. Average interest rate	4.0%		4.2%		0.4%		3.8%		4.2%			2.4%
3. Average grace period (yrs)	4		5		7		5		6			3
4. Average maturity (yrs)	19		12		20		20		19			15
5. Grant equivalent ^{a/} (\$ millions)	2.9		1.7		11.8		3.3		8.2			1.1
6. Grant equivalent of loans and grants (\$ millions)	16.0		8.6		23.3		18.9		42.0			15.0
7. New lending per capita (\$ (average 1969-71)	0.8		16.3		2.8		2.2		4.5			1.0
8. Rank among 81 LDC's												
(a) Av. loans and grants	61		60		54		53		37			56
(b) Av. per capita loans and grants	60		18		63		57		30			66

^{a/} at a 10% discount rate.

Note: - = negligible
NA = not available

Source: IBRD, World Debt Tables, 1973.

all the debt obligations were with public lending agencies. And, except for Mali where Eastern bloc aid sources played an important role, the primary source of assistance has been Western donors.

In terms of new lending over the period 1969-71, the six Sahel-Sudan countries received new loans on average⁵ terms of 3.0 percent interest, 6 years grace period and nearly 20 years maturity. Such terms are about equal to those obtained by the average of all LDC's.⁶ As subsequently noted in this volume, the level of external resource flows to the Sahel-Sudan countries does not seem to have been a bottleneck to development. Rather it appears that growth was hampered by a lack of investment projects offering high returns.

There is reason to suppose that over the medium-term the Sahel-Sudan countries can capture the benefits of substantially increased export growth. The international prices for beef, hides and skins, groundnut oil and iron ore are expected to rise between 1970 and 1980 (and for some commodities up to 1985) above their 1967-68 level, in constant 1974 dollar terms, in some cases by substantial

5. Weighted by average amount of new lending.

6. The average for all LDC's is a 2.4 percent interest rate, 7.6 years grace period and 31.5 years maturity. Source: World Bank, Annual Rpt 1974.

amounts.⁷ Over the same period the annual growth in the volume of world exports of beef is estimated at 3.6 percent and over 5 percent for iron ore, with more modest growth rates forecast for groundnuts and cotton. Since it is inevitable that economic development will give rise to a rapid growth of import demand this underlines the need for export development. In turn export growth will require an agricultural development effort with special emphasis on the development of livestock for the world market.

7. IRBD, Price Forecasts for Major Primary Commodities.
Washington, D.C., World Bank Report No. 467, June 1974.

5. ASPECTS OF FISCAL POLICIES

In general, fiscal policies represent important instruments for increasing domestic savings and for channeling these savings into viable development investments, thereby influencing the composition and rate of economic growth. Moreover, fiscal policies can be an effective means of promoting private savings, of correcting market distortions, of redistributing income, and of providing positive investment incentives. However, effective use of fiscal tools assumes some degree of monetization, a relatively high level of per capita income, an efficient bureaucracy, and a viable investment strategy. With the exception, perhaps, of Senegal, these conditions do not exist in these countries. As it is shown in Appendix B, except for Chad and Senegal, the tax base for these countries is quite low, and most of it is in the form of indirect taxes. Given the general economic conditions, exacerbated by the devastating effects of the recent drought, most of these countries will continue to require budgetary support.

For the purpose of exploring the fiscal system and its effectiveness, the case of Senegal is examined. The relative development of Senegal presents fiscal policy with somewhat more scope for the use of tax policies to

increase the total savings rate, and thereby to influence the rate of economic growth. The analysis examines the general issues related to fiscal policies such as growth, efficiency, distribution, etc., which are relevant to the remaining countries. However, the data and prognosis are specific to Senegal. The availability of data on Senegal's tax system provided the main reason for selecting it for examination. (For details see Appendix B, sections 1 and 2 of this annex).

The inequalities in income distribution, both between the rural-urban sectors and within urban areas, similarly presents options for consideration. We found the impact of the chosen policies to be generally sound, although several conclusions were reached which indicate that alternative approaches to specific problems may be possible. These conclusions are summarized here.

5.1 Fiscal Policy Alternatives in Senegal

The aim of this examination is not to look toward major increases in the overall tax level. Senegal already has a high tax effort, 17.8 percent of the GNP in 1971/1972. The bulk of current tax revenues is earned from indirect taxation, which, in the case of Senegal, we can assume to be generally progressive in nature. However, our analysis suggests two major tax

revenue changes which may be worth consideration.

First, revenues earned from the groundnut marketing-board surplus suggest a possible major distortion in the level of groundnut production and, therefore, in export earnings. The proportion of groundnut revenues secured by the government rose rapidly after 1968 and only became substantially lower when farmgate prices were raised in 1972. (Table 4, Appendix B, section 1). While there is no clear evidence on the price elasticity of supply, there is some casual evidence that marketed supply is responsive to producer prices. The distortion in output caused by this kind of "tax" is entirely dependent on the elasticity of supply. A high elasticity and a high tax would reduce severely the production of groundnuts. Until a more careful analysis of the supply elasticity has been made, especially in view of the current drought and rural depression, it can be assumed that the producer price of groundnuts will be close to the world price.

Second, the income tax structure is examined with respect to an increase in tax revenue. A comparison of tax rates across countries reveals that Senegal begins income taxation at an income level relative to mean income similar to other countries, but that the tax rates which apply are low by international comparison. This

suggests scope for increasing direct income tax revenues. The abolition of the Family Quotient system of allowances, and the adoption of fixed lump sum tax allowances for dependents, would increase the progressivity of the system, and for a reasonable set of allowances produce a considerable revenue increase. See Appendix B for details.

We have no major comments on fiscal policies regarding imported goods. Generally high tax rates are applied to luxury goods, and low or zero rates are levied on investment good items. However, the shift in the balance of imports away from consumer goods, and into investment goods has led to stagnation in the growth of revenues. The revenue implications of a low import-duty on capital goods was investigated.

The usefulness of tax revenues as an instrument to encourage economic growth depends heavily on sectoral allocation of expenditures. We regard this as an area of major concern. In Senegal, a fraction over 5 percent of the GNP is absorbed by administrative expenses. As indicated in Appendix B, section 1, this is high by international comparison. A large civil service dates from the time of French rule, when Senegal was the administrative center of a large French colonial empire in west Africa.

Following independence, the civil service was not reduced to fit its changing role. The level of expenditures on administration, as a proportion of total budget expenditures, has on balance tended to increase rather than decrease during the past decade. It is argued that a civil service reform could reduce the proportion of government expenditures on administration to a figure in line with those of similar countries. This would free resources on a far larger scale than could be expected from other fiscal reforms, without incurring losses in operating efficiency. The government has been successful in keeping increases in wages and salaries at a reasonable level over the past decade. A civil service reform, evolving over a period of several years may prove useful to release manpower for work in the developmental sectors of the economy while cutting the proportion of government expenditures absorbed by administration.

The first problem faced by such a reform is the political constraint which would forbid the redundancy of large numbers of skilled labor force. Since a large proportion of the expenditures saved on administration would be directed into investment projects, the demand for project management will increase. This demand would be met by those released from government administration. These policies are not expected to solve entire-

ly the problem of adjustment to a smaller civil service, but approaches along these lines seem plausible if the administrative costs are to be reduced within the political constraints.

Investment incentives are employed on a wide basis in many sectors. There are three groups of businesses which seem in special need of reconsideration for investment relief.

The underdevelopment of the monetary sector in the rural area, and the inapplicability of direct tax allowances as a form of investment subsidy, suggest consideration for the agricultural sector to receive investment support of a different kind. The current problems of the rural areas in Senegal suggest that direct support through subsidized input prices might be most appropriate.

Large businesses enjoy a preferential position in the system of investment incentives. The reforms, provided by the 1972 Investment Code, might be worth considering for application to smaller investments and businesses. Extending the system of incentives, currently offered only to large investments or to companies employing over 40 persons, would reduce the preferential position currently enjoyed by the large investor.

The magnitude of indirect taxes in total revenues

is sufficiently high, and the choice of high tax rated goods indicates that the tax system as a whole is progressive. However, income tax rates are low by international comparison. The abolition of the Family Quotient System of allowances, and the substitution of reasonable lump sum allowances, would further increase the progressivity of the system.

The presence of minimum wage laws has been partially responsible for the substantial inequalities between the rural and urban sectors. The distributional implications of wage rates within the urban sector exceeding those that would obtain under competitive allocation are probably extensive. A careful examination of the benefits of such legislation and a movement (similar to that in Tanzania) toward greater income equality between the rural and urban sectors, could substantially reduce unemployment and increase total welfare.

6. POPULATION AND HUMAN RESOURCES CONSTRAINT

6.1 Population as an exogenous Factor

Long-term projections of population are very sensitive to assumed growth rates. However, we have established no relationship between the population growth rates of the area and other factors such as income, family planning, nutrition, education, religion, etc. Such relationships need further examination.

The assumption made here is that over the next two to three decades, the rate of population growth will be independent of any measures which may be taken to influence it. As shown in Table 6.1, considerable divergence of opinion exists among various agencies concerning the rate of population growth in the area. At best, we can suggest the most likely ranges of maximum and minimum population growth. The sensitivity of long-term projections to even small changes in growth rates are illustrated in Table 6.2.

Whatever projections we accept, it is obvious that considerable improvement over the economic performance of 1960-70 (see Table 6.3) would have to be made in the next two decades in order (1) to maintain the 1970 level of per capita GNP, (2) to increase per capita GNP by 5 percent annum -- i.e., the U.N. development goals for the 1970's,

TABLE 6.1

Population Growth Rates
Different Sources

<u>Country</u>	<u>UNO¹</u> <u>ESA</u>	<u>EEC²</u>	<u>IMF³</u>	<u>IBRD⁴</u>	<u>UN⁵</u> <u>Eup. Pub.</u>	<u>Country⁶</u>
Chad	2.0	1.5	1.5	1.7	1.7	1.7
Mali	2.1	2.0	-	-	1.9	2.0
Mauritania	2.1	1.6	1.7	2.0	1.6	2.0
Niger	3.3	2.7	2.5	2.7	2.3	2.75
Senegal	2.3	2.2	2.2	2.5	1.8	2.2
Upper Volta	2.0	1.8	1.9	2.0	2.0	1.9

1. United Nations Office of Economic and Social Affairs, Population Division (1960-1970 average).

2. European Economic Community

3. International Monetary Fund

4. International Bank for Reconstruction and Development

5. United Nations European Publications

6. Country Sources

TABLE 6.2

Alternative Population Projections to the Year 2000

Country	Population 1970	Assumed Rates of Growth		Population 1980/000's		Population 1990/000's		Population 2000/000's	
Chad	3,600,000	2.0%	2.5%	4,577	4,806	5,580	6,153	6,801	7,876
Mali	5,022,000	1.75%	2.25%	5,973	6,273	7,104	7,836	8,457	9,789
Mauritania	1,020,000	1.75%	2.25%	1,391	1,461	1,655	1,825	1,968	2,280
Niger	4,050,000	2.5%	3.0%	5,184	5,442	6,636	7,314	8,494	9,830
Senegal	3,755,286	2.0%	2.5%	4,577	4,806	5,580	6,153	6,801	7,876
Upper Volta	5,076,000	1.75%	2.25%	6,037	6,340	7,181	7,921	8,541	9,894
TOTAL	22,523,286			27,939	28,710	33,004	36,398	39,887	46,189

TABLE 6.3

Average Annual Growth Rates (in percent)

Country	<u>Total Real Product</u>			<u>Per Capita Real Product</u>		
	1960-1970	1968-1971	1970-1972	1960-1970	1968-1971	1970-1972
Chad	0.5	1.0	2.7	-1.8	-1.3	0.2
Mali	5.2	5.0	3.5	3.0	2.8	1.2
Mauritania	6.9	3.8	5.2	4.6	1.6	3.0
Niger	2.4	-2.4	-5.0	-0.3	-5.0	-7.5
Senegal	1.0	-3.8	1.0	-1.4	-6.1	-1.5
Upper Volta	0.7	2.9	2.0	-1.4	0.8	0.0
Total of Above	2.3	0.1	1.5	0.0	-2.2	-0.9
Total of Developing Countries	5.1	6.0	5.5	2.5	3.3	2.7

and/or (3) to reach a target average per capita income, say, of \$500 or better by 1990, although prospects for the later appear unlikely for the region.

Assuming no distribution distortions, the level of per capita income is one of the indexes which reveals an area's capacity to adequately support certain levels of population under existing conditions of production (resources, technologies, capital). If the elements of production change (new resources, technology, etc.), the level of optimum population that could be supported would also change.

The preceding figures and relationships indicate that it is highly probable that the real per capita GNP in the area will go down since (1) The population growth rate will be autonomous and (2) the area's ability to increase the growth rate of GNP will be below its population growth rate, as was the case during 1960-1970, if the past trends continue.

6.2 Human Resource Constraint

It is fairly realistic to assume that in the early stages of development, human resource development accelerates the rate of economic growth. Though it is not possible to calculate accurately the amount or nature

of human resources required to achieve a given rate of growth, it is often possible to decide whether or not human resources are in such short supply as to create a bottleneck.¹

However, there is another relationship between human resources and economic development. This relates to the absorptive capacity of the economy. In the early stages of development, the capacity of the economy to produce skilled personnel is limited. In this region the problem is further compounded by the system of education.

We caution against the assumption that modern, Western-style education is required in order for people to effectively assume major responsibility for development efforts. This assumption is definitely restrictive. We realize that local skills and local leadership are extremely important, and that any policy which ignores these aspects is likely to fail. There are many instances where leaders with Western-style education have proved to be not only ineffective, but have actually hampered the process of growth, just as some of the well intentioned foreign technical advisors have done the same.

1. The Tinbergen-Correa-Bos model, however, uses the input-output approach to make exact calculations.

Before we examine the current situation in the Sahel-Sudan region we wish to point out that human resource development has a large gestation lag. Therefore, the present condition can be assessed in two ways: (1) by looking at the policies followed in the past, and (2) by examining the current education system.

The six countries under study obtained their independence very recently (1960). At that time secondary school enrollments were very low.

TABLE 6.4
Total Enrollment in Secondary Schools, 1960

<u>Country</u>	<u>General Schools</u>	<u>Vocational Schools</u>	<u>Total</u>
Chad	1,447	339	1,948
Mali	3,016	678	4,636
Niger	917	61	1,420
Mauritania	525	--	554
Senegal	8,713	2,867	12,422
Upper Volta	1,480	625	2,955

Source: AFRICA, Economic Growth Trends, AID, 1972

The above table shows that most of the students were in general schools, where the emphasis was on classical education. It is usual for these students to opt for an administrative career, and this has happened in the Sahel-Sudan countries. Thus, in 1970, fifty percent of

all salaried employment in Chad and Niger was in public administration; the figures for Mauritania and Senegal are 34 percent and 30 percent respectively. While a good administrative system is necessary for economic growth, such a system is not useful unless it is supported by professional and technical cadres. In that situation, a large bureaucracy tends to be parasitical. In fact, we do find this condition in some of these countries. For example, the problem is acute in Senegal where administration absorbs 5 percent of GNP.

Most of these countries reformed their educational system in some manner after 1960. The purpose of the changes clearly illustrates the human resource problems created by the past system. In Mali, for example, the two fundamental objectives of the reform were to offer mass quality education adapted to the needs and realities of Mali, and to offer an education which would decolonize the minds of the people. Clearly, we cannot expect all development responsibility to be absorbed by the few graduates of the earlier system.

Senegal probably has the best education in this region inasmuch as it was used as the administrative center by the French. A brief look at its occupational structure brings out the inadequacies. It seems reasonable to

assume that the other countries are in even less favorable circumstances.

According to a report by an international agency, employment in the modern sector in Senegal for 1970 can be divided broadly into three categories:

- (1) Civil Service and public sector employees (63,000).
- (2) Workers employed in industrial enterprises and modern services (85,000 out of which about 1,000 in liberal arts and 20,000 domestic servants).
- (3) Self-employed, casual family workers in workshops, petty trade and service activity (50,000).

Detailed information on the educational background of the labor force is missing. The level of education of the agricultural population is known to be extremely low, with an illiteracy rate estimated at well over 90 percent. Senior and middle staff (university level or equivalent experience, high and middle school level or equivalent experience) and skilled laborers account for about 5 percent. The percentage of the senior staff is estimated at about 1 percent of the total labor force, and the percentage of middle level staff at about 3 percent, out of which about half are non-Senegalese. Table 6.5 gives more detailed information.

TABLE 6.5: Breakdown of the Modern Sector Manpower (Senegal, 1970)

	<u>Public¹</u>			<u>Private</u>			<u>Total¹</u>		
	<u>Sen.</u>	<u>Non-Sen.</u>	<u>Total</u>	<u>Sen.</u>	<u>Non-Sen.</u>	<u>Total</u>	<u>Sen.</u>	<u>Non Sen.</u>	<u>Total</u>
Senior Staff	79.3	20.0	100.0	22.3	77.7	100.0	53.3	46.7	100.0
Middle Staff	98.0	2.0	100.0	78.2	21.8	100.0	91.0	9.0	100.0
Skilled/ Unskilled Staff	<u>100.00</u>	<u>0.0</u>	<u>100.0</u>	<u>92.5</u>	<u>7.5</u>	<u>100.0</u>	<u>95.5</u>	<u>4.5</u>	<u>100.0</u>
Total	96.8	3.2	100.0	82.6	17.4	100.0	89.6	10.4	100.0

¹Administration only.

The situation for the remaining countries of the region is more unfavorable. For instance in Mauritania, foreigners (in 1968) held about 85 percent of all managerial and supervisory positions, despite government efforts to reduce the number. For Niger, an international mission notes that one of the most important constraints on development is the shortage of skilled local manpower in all sectors of the economy.

The prospects for the near future are not bright, despite strong official efforts to make education available to the masses. One reason for this is the high cost, and the declining rates of growth of enrollment in 1965-70.

TABLE 6.6

Primary School Enrol'ments

Country	Annual Rate of Growth (in percentages)	
	1960-1965	1965-1970
Chad	17.2	-0.8
Mali	18.1	6.5
Mauritania	12.6	9.0
Niger	18.4	7.4
Senegal	11.2	3.8
Upper Volta	9.6	3.3

Source: "Education," Bureau du Sahel

The high rates of growth for 1960-1965 should be seen in the context of absolute enrollment. In Mali, in 1966-67, only 11 percent of the children in the 6-20 age group were in school.

TABLE 6.7

Enrollment Rates in Primary Schools, 1970

Country	Age Group	Enrollment Rate
Chad	7-12	29 %
Mali	7-12	26%
Mauritania	7-13	16%
Niger	7-12	15%
Senegal	6-11	42%
Upper Volta	7-12	13%

Source: "Education," Bureau Special du Sahel,

As mentioned before, retention rates are rather low; the ratio of secondary school enrollments to primary school enrollments varied (in 1969-1970) from 5 percent to 22 percent. An international agency mission to Niger noted that out of 1,000 children who enter primary school, only 283 graduated, and only 42 were admitted into secondary schools, 40 of whom chose general education. Only 20 of these graduated from the first cycle of secondary education, 8 were admitted to the second cycle and one

or two were expected to get the Baccalaureat.

Given the low quality of education, low enrollment rates combined with the high dropout rates, and the large expenditures required to improve the system, it is likely that the human resource gap will continue to impede the development efforts. And seasonal and secular migration could compound this problem.

Migration is a natural response to situations where human opportunities are limited. In those regions where human opportunities cannot be developed, migration presents a normative alternative. However, if potentials exist for the development of human opportunities, migration could deplete a region's human resources and stifle its chances for development. This factor is becoming critical in view of increasing restriction upon international migration and the risk which migrants assume under changing economic conditions in the host countries where the migrants are the first to be laid off and asked to return to their home countries.

7. ECONOMIC DEVELOPMENT CONSTRAINTS

Economic development constraints of the region are discussed with respect to (1) North-South dependencies; (2) the infeasibility of plan targets; (3) low priority of the agriculture and livestock sectors; and (4) heavy dependence upon foreign aid for development.

7.1 North-South Dependencies

The north-south dependencies, embodying political and economic elements, represent a special situation for the region. The southern coastal states provide markets, employment opportunities, and imports for the region. Over time, these relationships and/or dependencies have increased. While economic growth opportunities especially in Nigeria and Ivory Coast are overwhelming, they also pose certain threats to the autonomy and perhaps sovereignty of the region. Moreover, one cannot rule out the emergence of nationalistic reactions in the south which could be debilitating for the region. In a somewhat similar situation in 1971, Ghana ordered all non-Ghanian laborers to leave the country. It was not possible for us to undertake a full scale study of the North-South as well as East-West relations of the region. In view of the significance of the North-South relations and the fact that the Niger-

Nigeria relations have been studied by the University of Montreal team (a summary of the findings is available as a working document of the M.I.T. project)*, the complexity of the interrelationships and uncertainties of future groupings would not permit any generalization. What is important to note, however, is the fact that while the southern coastal states provide employment and market opportunities for the northern states, they also create competitive situations in the areas of industrial and non-traditional sectors for the northern states, further inhibiting their opportunities for diversification and for the growth of indigenous enterprises. Moreover, any prospective fusion of the Francophone-Anglophone countries in the foreseeable future appears to be speculative.

7.2 The Infeasibility of Plan Targets

A striking aspect of past planning in the Sahel-Saharan countries is a low plan realization rate. A comparison of the figures for proposed development expenditures with the record of actual disbursements invariably shows considerable discrepancy. For instance, the Senegalese Second Plan (1965/66-1968/69) called for a total investment of CFAF 84.2 billion in the public sector during the plan period.

*K. Valaskakis, "North-South Relations in West Africa: Lessons from the Case Study of Niger-Nigeria," June, 1974, Center for Research and Economic Development, University of Montreal (MIT Project Internal Working Paper).

actual public sector investments totaled CFAF 39 billion. Their Third Plan (1969/70-1972/73) proposed public sector investments totaling CFAF 125 billion. The actual investments made during the Third Plan period totaled CFAF 58 billion, or less than half the targeted public sector investment during the preceding plan. Similarly, the realization rate for the Nigerian Second Plan (1965-1968) was 38 percent (total public sector investment target: CFAF 33.3 billion; actual: CFAF 12.7 billion). The records for the other countries demonstrate a similar pattern.

What are the reasons for the disparity between the achieved vs. target levels of investment? Theoretically, a country could fail to achieve plan targets for three reasons:

(1) The target levels of investment were not set realistically. In other words, given the structural constraints on the economy--the savings constraint, the balance of payments constraint, and the constraint on the economy's ability to invest (the "absorptive capacity" or "skill limit" as it has been called by Chenery and Strout¹)--the target levels of investment could not be

1. H.B. Chenery and A.M. Strout, "Foreign Assistance and Economic Development", American Economic Review, September 1966.

achieved.

(2) The policy mix that was necessary to achieve them was lacking. By policy mix we refer to the set of monetary, market, and fiscal policies, and other policies designed to influence the behavior of domestic producers, foreign investors, etc.

(3) The targets were feasible given initial expectations about exogenous factors, but during the plan period these factors changed so as to make the attainment of targets impossible. For example, the prices of the country's important exports or imports changed unexpectedly, a civil war broke out in the country, or some natural calamity occurred, like a drought, an earthquake, or a flood.

Clearly the above three reasons are not mutually exclusive. They may, in fact, be reinforcing. Thus, targets that were infeasible to start with would fail to be realized by an even greater margin if an appropriate policy mix was not adopted, or if exogenous factors shift unfavorably. However, reason (2) is more applicable to private sector targets. It could also explain failure to realize public sector targets when investable resources-- domestic as well as foreign--are very limited. For example, a government can fail to realize its investment targets because it did not use its fiscal policy to generate

sufficient public savings. However, as in the case of the Sahel-Sudan countries during the last decade, where investable resources were not the binding constraint, non-adoption of a suitable policy mix ceases to be an important explanation of the failure to realize public sector investment targets.

For the countries of the Sahel-Sudan region, reason (1) seems to provide the most important explanation of why plan targets were not realized. Plan targets were not infeasible because of a lack of sufficient investable resources or of foreign exchange. There was ample foreign assistance available. The cause of infeasibility was the limited absorptive capacity of the economies. Given each country's endowment of skilled personnel, sufficient projects could not be prepared to meet the target level of investment.

A simple arithmetical exercise demonstrates that at least some of the plan targets were clearly infeasible. Let us recall our earlier statement that the target level of investment for the Senegalese Third Plan was more than double the actual investment made during the Second Plan. Also, as verified by the statistics given in the latter part of this paper, the Nigerian Second Plan called for investments totaling nearly three times the actual investment during the First Plan. Though precise numbers are

not available, it is known that their 1971-1974 Plan also called for investments three times larger than actual investments made in the preceding four years. Similarly, the 1967-70 Development Plan of Upper Volta, proposed investments more than three times the total investments of the preceding four years. Let us now try to examine the feasibility of such targets.

Suppose the maximum annual rate of increase of investment which a country can achieve is β . Initially let us suppose that β is constant. If the level of investment in the first year of the country's First Four-Year Development Plan is I_0 and if the maximum level of investment in each year of the First and Second Plans is attained, the total investments in the First and Second Plan are, respectively,

$$I_0 + I_0(1 + \beta) + I_0(1 + \beta)^2 + I_0(1 + \beta)^3$$

and $I_0(1 + \beta)^4 + I_0(1 + \beta)^5 + I_0(1 + \beta)^6 + I_0(1 + \beta)^7$

For the total investment during the Second Plan to be three times that in the First Plan, the condition turns out to be:

$$(1 + \beta)^4 = 3$$

This condition is fulfilled if $\beta = .32$. In

other words, for a country to triple total investment during the second plan, investment should grow by about 32 percent over the eight year period. Such a high value of β is not feasible for the countries of the Sahel-Sudan region. Chenery and Strout, in the article cited earlier, after examining data for a sample of 31 countries which included countries like India, Israel, Pakistan, Taiwan and Mexico, that can be regarded as relatively well endowed with skilled workers, conclude:

"The highest observed value for the skill limit (β) over any recent five-year period is about 20 percent per year, but few countries have sustained a growth of investment of over 10 percent for as long as ten years."²

Assuming β is not constant but increases over time as the economy's absorptive capacity increases, and putting the average value of β for the first plan period equal to .1, which is a fairly realistic estimate of the value of β for Senegal, Niger, and the other Sahel-Sudan countries, it can be seen by performing a little arithmetic that the average value of β during the second plan period would have to be about .40 for the second plan targets to be realized. Needless to say, expectations of such dramatic changes in the absorptive capacity are quite

2. Chenery and Strout, "Foreign Assistance", p. 686.

unrealistic.

Thus, it follows that the plan targets of the Sahel-Sudan countries were infeasible. Shifts in exogenous factors, for example, adverse weather conditions, outbreak of civil war in Chad and Nigeria, could also be cited as contributory factors. But, as mentioned earlier, such factors only caused actual levels of investment to fall short of the already infeasible targets by a greater margin and cannot be said to constitute the main reason for the failure to attain plan targets.

What are the underlying reasons in the Sahel-Sudan countries to consistently set infeasible targets in their plans? Generally, reasons for setting excessively high targets are that the plan itself may be used for propaganda purposes, or the planners may base their calculations on national aspirations or needs rather than on realistic national productive capabilities. Alternatively, planners may believe that foreign aid commitments are a function of the size of the plan. Whatever the rationale for aiming at infeasible targets, the fact remains that such a procedure negates the principal reasons for economic planning which are to guide policy and to assist decision makers in the private sector by indicating what the economic situation is likely to be a few years hence. If

targets are deliberately set at unrealistic levels, private decision makers who take them seriously are likely to be frustrated. W. Arthur Lewis aptly summarizes the dangers involved in setting such unrealistic targets:

"If the Plan bears little relation to what is likely to happen, it is not merely useless for control; it is also dangerous to anybody who takes it seriously. In practice, unrealistic Plans are not taken seriously by alert decision-makers. The document is not consulted because it is irrelevant. The planning authorities are unable to exercise influence. And foreign aid administrators take note that the government is not serious about development planning."³

7.3 Low Priority of the Agriculture and Livestock Sectors

Another significant aspect of development planning in the Sahel-Sudan countries is the low priority accorded to the agricultural and livestock sectors in terms of both absolute and relative allocation of development funds. To provide some perspective for the following discussion, we present in Table 7.1 some statistics which indicate the importance of these sectors in the economies of the six countries.

3. W. Arthur Lewis, Development Planning (London: George Allen & Unwin Ltd., 1966), p. 153.

TABLE 7.1

Country	1970 % of GDP con- tributed by agriculture & livestock sectors	1970 % of popula- tion dependent on agriculture & livestock production	1970 % of total exports con- tributed by agriculture & livestock sectors
Chad	45	90	94
Mali	50	n.a	100
Mauritania	36	92	24
Niger	60	90	100
Senegal	36	75	55
Upper Volta	48	94	90

Source: International Agencies.

The above figures clearly indicate the predominant position of the agriculture and livestock sectors in the economies of the Sahel-Sudan countries. The percentage of GDP contributed by the agricultural and livestock sectors ranges from 36 percent in Mauritania and Senegal to 60 percent in Niger. The other two indicators emphasize their importance even more strongly. Thus the percentage of population earning their livelihood in the agriculture and livestock sectors ranges from about 75 percent in Senegal to about 94 percent in Upper Volta, and the contribution of these two sectors to the exports of each

country varies from about 24 percent in Mauritania (which is, in this regard, an exceptional case) to almost one hundred percent in Mali and Niger.

While the governments of the Sahel-Sudan countries have repeatedly emphasized the importance of developing the agriculture and livestock sectors, such verbal expression has not yet been translated into higher allocations of funds for these sectors. Investments in the agriculture and livestock sectors represent only a small proportion of total investments in each of the six countries. Moreover, allocations in the current budgets for these sectors have been so inadequate that even the small investments that have been made have not been fully utilized. This is due to the lack of maintenance and of extension services. Mauritania, for example, actually contributed only 10 percent of their total investment to the agricultural and livestock sectors during her First Plan, and only 4.8 percent during the Second (although planned allocation for these sectors was over 14 percent). In the livestock sector as a result of small investment in a rinderpest eradication program financed and carried out by French and U.S. aid, the rate of growth of livestock production increased from 3 percent to 6-7 percent per annum. However, an international study team points out

that if the Mauritanian government does not assign much higher priority to the hitherto neglected livestock sector, future growth of production in the sector could fall to pre-rinderpest campaign level, or even below that level. Senegal, in which prospects for livestock development have been described by livestock experts as remarkably good, has failed to exploit its comparative advantage in this sector. Precise figures for the Plan allocations to the agriculture and livestock sectors are not available, but recurrent fiscal appropriations for these sectors have never exceeded 2 percent.

Development of these traditional sectors may be a significant source of raising the standard of living of the people, particularly for the landlocked countries of the region. Models of economic development that envision the modern industrial sector (whether dominated by private capitalistic enterprises or by public enterprises) as the 'engine of growth' that gradually pulls the traditional sector out of its abysmal poverty by investing all its profits and drawing labor from the latter sector, do not appear to be appropriate for the Sahel-Sudan countries. With the exception of Senegal, no other country of the region has a significant and well established modern industrial sector. And the obstacles in the way of esta-

blishing one are almost insurmountable. These countries have a great scarcity of trained managers and entrepreneurs, and of skilled workers in general. Growth of a modern industrial sector would therefore need much more action on the part of the governments than mere provision of appropriate incentives. However, even if governments of these countries were willing to take the initiative by establishing public enterprises with expatriate managers and skilled workers, if necessary, while simultaneously taking steps to increase the supply of trained local personnel through establishment of local institutions to train people in managerial skills, subsidization of labor training, etc., other problems would remain. For example, the small size and fragmentation of markets and the absence of an efficient transport network would make it impossible for these enterprises even to cover their costs. Fragmentation of markets and high transport costs make capturing of the entire domestic market unlikely. However, because of the small size of the market in each country, firms would not be able to take advantage of economies of scale even if they were able to capture the entire domestic market. In order to take advantage of external economies it would be necessary to concentrate industry in at most one or two industrial centers in each country. But then,

firms located in Ouagadougou in Upper Volta could not compete favorably with suppliers from Ivory Coast and Ghana even in the markets of Southern Upper Volta. Firms located in Niamey in Niger could not compete with firms located in Kano, Nigeria, in the markets of the South and Southeast Niger. The firms in Ivory Coast, Ghana and Nigeria have the advantage of being more experienced and are able to reap economies of scale because of their access to relatively larger, richer markets. Compared to their rivals in Ouagadougou and Niamey, they incur much lower transport costs. Even if the governments of Upper Volta and Niger were willing to grant complete protection to domestic firms by levying prohibitive tariffs on competitive imports, smuggling would be impossible to control.

In view of the problems mentioned above, it is quite unrealistic to think of the modern industrial sector as becoming the 'engine of growth' in the Sahel-Sudan countries over the next three decades. Rather than pulling the traditional sector out of poverty, it would be difficult for the modern industrial sector even to survive unless it became dependent (almost like a 'parasite') on the traditional sector. The past experience of Niger in this regard is instructive. After independence in 1960, the government of Niger followed a policy of encouraging

industrialization by providing numerous incentives to private enterprises and setting up a number of public enterprises. However, it soon found itself saddled with a group of enterprises that could compete neither in domestic markets nor abroad. Since smuggling from Nigeria imposed severe constraints on the level to which import duties on foreign products could be raised, the only way to keep these enterprises in operation was to grant them direct subsidies from the budget. The increased revenue requirements led the government to abolish subsidies on fertilizers and other agricultural inputs and to increase taxes on farmers very sharply. Between 1960 and 1970 direct taxes on farmers increased more than 100 percent. Between 1965 and 1970, a period during which farmers' incomes declined due to adverse weather conditions, taxes on farmers' incomes were increased by 30 percent. At the same time, subsidies on fertilizers, pesticides and other farm implements were abolished so that prices of agricultural inputs rose sharply. The impact of this double squeeze on the agricultural sector deterred them from using more modern agricultural inputs and had a negative psychological effect for the growth prospects of Niger's agricultural sector. Moreover, this has ruled out the possibility of further growth of the modern sector because

an impoverished agricultural sector can no longer provide a sufficiently large market for the absorption of their output. Clearly one is led to believe that the overriding criteria for allocation point to the development of the traditional sectors and encouragement of those industries where economies of scale were not very important (or could be realized at levels of output sufficient to meet domestic demand) and in which transport costs formed only a small proportion of total cost. And the growth of such industries would be a function of time as the size of the domestic market grows. Such a market expansion could be stimulated by population growth as well as by increased income of the rural population. In addition, as the country's transport network improves, transport costs could be reduced and the competitive position of domestic producers vis-a-vis foreign producers could be improved.

It follows that for the landlocked countries of the Sahel-Sudan development options may be limited to the agricultural and livestock sectors. However, even for Senegal, which is not landlocked and which already has a relatively well developed transportation system and a fairly significant number of industries (some of which can compete even in international markets), there are important reasons that point to an agricultural and livestock option

in contrast to the attention it has received in the past.

Perhaps another reason for greater emphasis on the development of agriculture and livestock sectors in Senegal is equity. The country's per capita income figure of about \$200 is seriously misleading. It conceals the fact that 75 percent of the country's population (those engaged in agriculture and livestock production) subsists at an average income of \$80, whereas the remaining 25 percent enjoys an average income of \$550. If we assume that it is desirable for the traditional sectors to increase their income and reduce income disparities as economic development proceeds, then there are two ways to accomplish this: (1) turning the terms of trade (or redistributing income) in favor of the traditional sectors, and (2) raising productivity in these sectors. Obviously, if method (1) is adopted, the traditional sector benefits initially at the expense of the modern sector. However, over time better markets in the traditional sector, etc., may stimulate the productive capacity of the modern sector.

Mauritania, another Sahelian country which is not landlocked, had been able to register a 'healthy' rate of growth before the onset of the drought, mainly because of developments in its mining sector. Output in this sector, measured in constant 1969 prices, increased

from CFAF 0.6 billion in 1961 to CFAF 14.2 billion in 1969. Over the same period GDP increased from CFAF 27.5 billion to CFAF 47.1 billion. In other words, increased output in the mining sector accounted for more than 70 percent of the increment in output over this eight-year period. These developments in the mining sector may have enabled Mauritania's economy to 'grow' in terms of conventional indicators of economic growth, but the results of neglecting the agriculture and livestock sectors, manifested themselves in the form of extreme income disparities. It has been estimated that per capita income in the traditional sectors, which support 92-95 percent of the country's population, is only \$52. The corresponding figure for the modern sector is \$510--or approximately ten times higher than that in the traditional sectors. Whatever the GNP figures may indicate, it is obvious that from the viewpoint of 95 percent of Mauritania's population, such a process can hardly be called economic development.

Also it is important to bear in mind that Mauritania's mineral wealth is limited. Verified reserves of iron ore, the country's chief mineral export, with a proven metal content of about 60 percent, amount to only 150 million tons. MIFERMA, the mining company which is exploiting the iron ore deposits, expected to achieve a

rate of production of 12 million tons annually by 1972. Given this rate of production, the country's iron ore deposits which are commercially feasible to exploit (given present technology) will be exhausted in the next twelve years. Subsequently, unless new mineral deposits are discovered, Mauritania will face problems similar to the rest of the Sahelian countries, if it continues to neglect the agriculture and livestock sectors.

7.4 Heavy Reliance on Foreign Aid for Development

As discussed previously, the volume of investment by itself does not insure economic development. Nevertheless, investment (private and public) is one of the necessary conditions for growth. It is not certain that aid-sustained growth can be transformed into self-sustained growth in the Sahel unless the dynamic processes of development take hold.

It is very difficult to estimate gross private domestic capital formation in the Sahel-Sudan area since a great deal of it is in the form of additional livestock and associated agricultural products. Data for private domestic savings and investment are presented in Part II but they should be treated with caution and reservations since their reliability is questionable.

Foreign investment has been primarily in the

form of public aid since multinational corporations have largely ignored this area. Foreign private enterprises have dominated the meager industrial market, the trade sector, and the financial aspects of cash crops. Thus, development efforts have depended heavily on outside aid from governmental and international agencies. Such a heavy reliance upon foreign public aid invariably influences development strategies, and more often than not, reflect the objectives of the donors rather than the development needs and interests of the recipients.

From the data presented in Table 7.2 at least two conclusions can be safely drawn:

(1) The Sahel-Sudan countries rely on foreign resources to finance the bulk of their planned investments.

(2) Over the last decade, this reliance on foreign resources has increased.

The high dependence on foreign resources is at least partially responsible for the low realization rates of plan targets. As the IMF surveys of African Economies explained in the case of Niger's Second plan:

The relatively lower realization rate was due partly to the limited absorptive capacity of the economy and the shift in reliance on foreign financing (from 36 percent

TABLE 7.2

Percentage of Total Plan Expenditures Financed by
Foreign Resources

Country	Plan I	Plan II	Plan III
Chad	(1966-70) 63	(1971-80) n.a	
Mali	(1970-72) 90	(1974-78) 90	
Mauritania	(1960-62) 96	(1963-67) 92	(1970-72) 94
Niger	(1961-64) 36	(1965-68) 83	(1969-72) 89
Senegal	(1961/62- 1964/65) n.a	(1965/66- 1967/68) 28	(1969/70- 1972/73) 61
Upper Volta	(1963-67) 100	(1967-70) 71	(1972-76) n.a.

Source: International Agencies.

during the first plan to 83 percent in the second plan) which entailed procedural and project preparation difficulties.⁴

During 1965-71, per capita net flow of loans and grants to the region as a whole was higher than per capita flows for the developing countries. In view of the needs of the region and the publicity accompanying the drought, it is quite likely that more aid will be attracted by the area in terms of both per capita and total aid. It follows that the region will have a higher than average dependence upon foreign aid for LDC's, increasing the impact of this exogenous factor.

An extremely high proportion of gross investment is financed by net flow of loans and grants (except for Mauritania). Net flow of aid contributes on the average three times as much to the GNP of these countries as compared to the average for all developing countries, as shown in Table 7.3.

Although Senegal received substantially greater net flow of loans and grants (\$58 million) than the rest of the countries, the relative share of foreign net flows

4. Surveys of African Economies, p. 443.

TABLE 7.3

Country	Net Flow as Percent of Gross Investment (1971)	Net Flow as Percent of GNP (1971)
Chad	86	11
Mali	97	7
Mauritania	8	3
Niger	76	16
Senegal	48	8
Upper Volta	53	10
All Six	56	9
All LDC's	19	3

of loans and grants as a percentage of the gross investment was substantially less (48 percent) than the rest of the countries (Mauritania excepted). This means that Senegal's magnitude of gross investment, net investment, and per capita investment was substantially greater, and it financed a larger proportion of investment from domestic sources as compared to the rest of the countries.

8. THE THREE VICIOUS CIRCLES: SUMMARY DIAGNOSIS

The preceding descriptions and analysis of the economic data of the region have led us to the identification of a number of bottlenecks, distortions, and constraints. In this section we illustrate these relationships explicating the major interactions among the variables, and the consequences which these interrelations have created. In many ways, the economic ills of the region are not much different from those of the developing countries of Africa, Asia, and Latin America. And a number of these problems are present in the advanced countries as well, such as maldistribution of income, rural plight, high rates of urban unemployment, and a host of ineffective monetary, market, and fiscal policies.

However, the distinguishing characteristics of the Sahel-Sudan region are the fragility of the system due to frequent recurrences of drought and the lack of institutional means to deal with these problems.

The recent drought (1968-1973), while dramatizing the fragile conditions in the region and inflicting substantial losses of property and human life, pointed to a fundamental problem of the area--a long-term trend of successively deteriorating ecological conditions. A convenience vehicle to illustrate this process is the familiar "vicious circle"--

a concept well-known in the field of economic development. Three interrelated vicious circles have been identified. The first one represents the ecological-agricultural relationship and trends-- partly an exogenous factor. The second and third illustrate the institutional bottlenecks and policy parameters.

8.1 The Ecological-Agricultural Circle

Climate in the Sahel-Sudan region is the predominant factor in production. Yet development economists, by and large, have neglected to treat this variable rigorously and adequately. Progressive deterioration of the region's ecology is due to recurrent droughts at varying degrees of frequency and intensity (22 recorded over the last 400 years) and to human, social, cultural, political and economic institutions. The actual operation of these elements has resulted in a "tragedy of the commons.

The northern cattle-raising and southern sedentary farming areas are both caught in this vicious circle. The region's climate has been and will remain subject to extreme variations in annual precipitation, which in turn cause variations in agricultural output. The herders have adopted a mode of cattle-raising which includes large seasonal weight fluctuations in the animals. A relatively long period of cattle-grazing (8-10 years as compared to

3-4 years under normal conditions) is practiced before animals reach the market. Significant increases in cattle population (50 percent increase in 1970 over 1960) in combination with the excessively long grazing periods have caused range depletion, and this, in turn, has lowered the carrying capacity of the grazing land. Repetition of the process has reduced the grazing capacity of the land even further. According to our calculations, the region's 1970 cattle population exceeded its optimum productive capacity by a factor of two. As explained in Volume II, cattle population could be reduced without reducing meat. In fact, the rate of output could be increased substantially.

In the sedentary farming area, a similar phenomenon prevails. Frequent periods of adverse climatic conditions and pressures of increasing population have, over time, reduced soil fertility. In the absence of suitable agricultural technologies and fertilizers, the traditional farming system relies on fallow periods to restore soil fertility. Since little new arable land is available, the rate of decline in soil fertility has been higher than the rate of soil recovery. From 1961 to 1970, the fallow time in Niger declined by 50 percent, while farming technology and application of fertilizers did not change substantially. This vicious circle is illustrated in Figure 1 below.

The actual length of time that a field can be

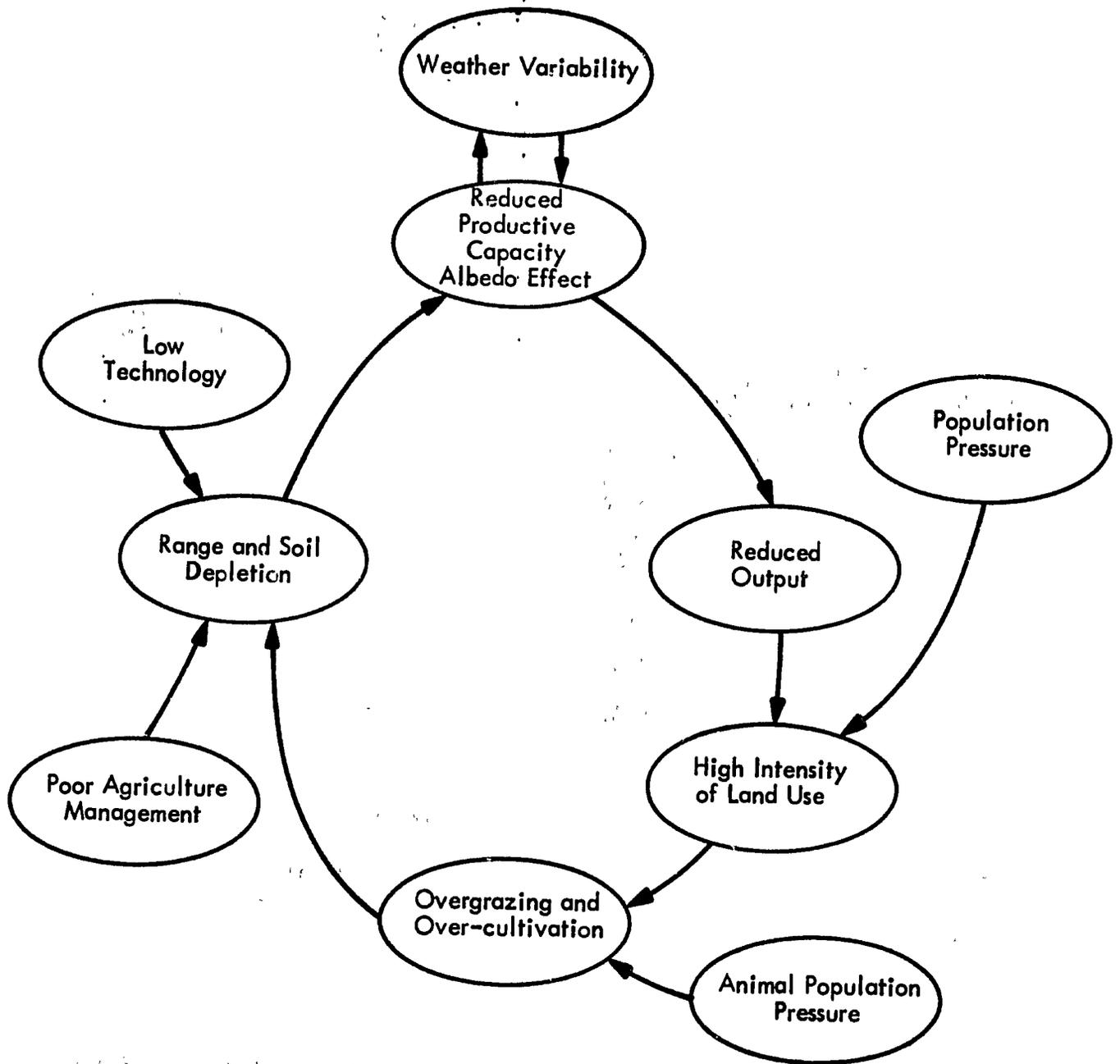


Figure 1. The Ecological/Agricultural Vicious Circle.

cultivated before its yield is reduced to the point at which it must be abandoned to lie fallow varies with soil type, precipitation, the kind of crop grown, and the agricultural practices of the area. The number of years that the land must lie fallow to restore full fertility also varies.

The intensity of land use in a fallow-farming system can be represented by an R factor which is the ratio of the number of years a field is cultivated to the total number of years in a cultivated-fallow cycle, expressed as a percent. Under low population pressure, the R factor may be about 10 percent--that is, only about 10 percent of the land is under cultivation at any one time. Under increased pressure, an improvement to semi-permanent farming ($R=50\%$) and even to permanent farming ($R=100\%$) may be achieved.

For the sake of illustration, let us assume that, at the end of 3 years, yields decrease to the point at which land is allowed to become fallow. Let us assume further that 9 years are required to restore fertility. If cultivation is resumed after the 9 years, an R of 25 percent results. This intensity of use does not reduce the fertility of the land. However, an R of 50 percent results in a gradually declining fertility.

With $R=50\%$, even though the yield per hectare is

falling, the total production may increase for a short period because of the greater area under cultivation. Over a longer period, however, this process of degradation will result in a decrease in total production. (This is illustrated in Figure 2 below).

Obviously, if more intensive agriculture is to be practiced, technology must be applied to maintain, or to increase, the soil fertility for field crops, as well as to maintain or increase the natural carrying capacity of rangelands.

Modification of the weather on a large scale is neither technically nor economically feasible at the present. The experience of other developing countries, however, shows that the basic problem of achieving any significant increase in the food available per capita under the traditional agricultural system lies in the pressure which the increasing population is imposing on the land. Since there is little prospect that the population growth rate will be reduced significantly within the next two decades, the only solution is the introduction of simple technologies which will increase agricultural yields and bring about a balance between the carrying capacity of the land and the consumption requirement. In this way the strong influence of the weather might also be diminished.

In summary the vicious circle representing the

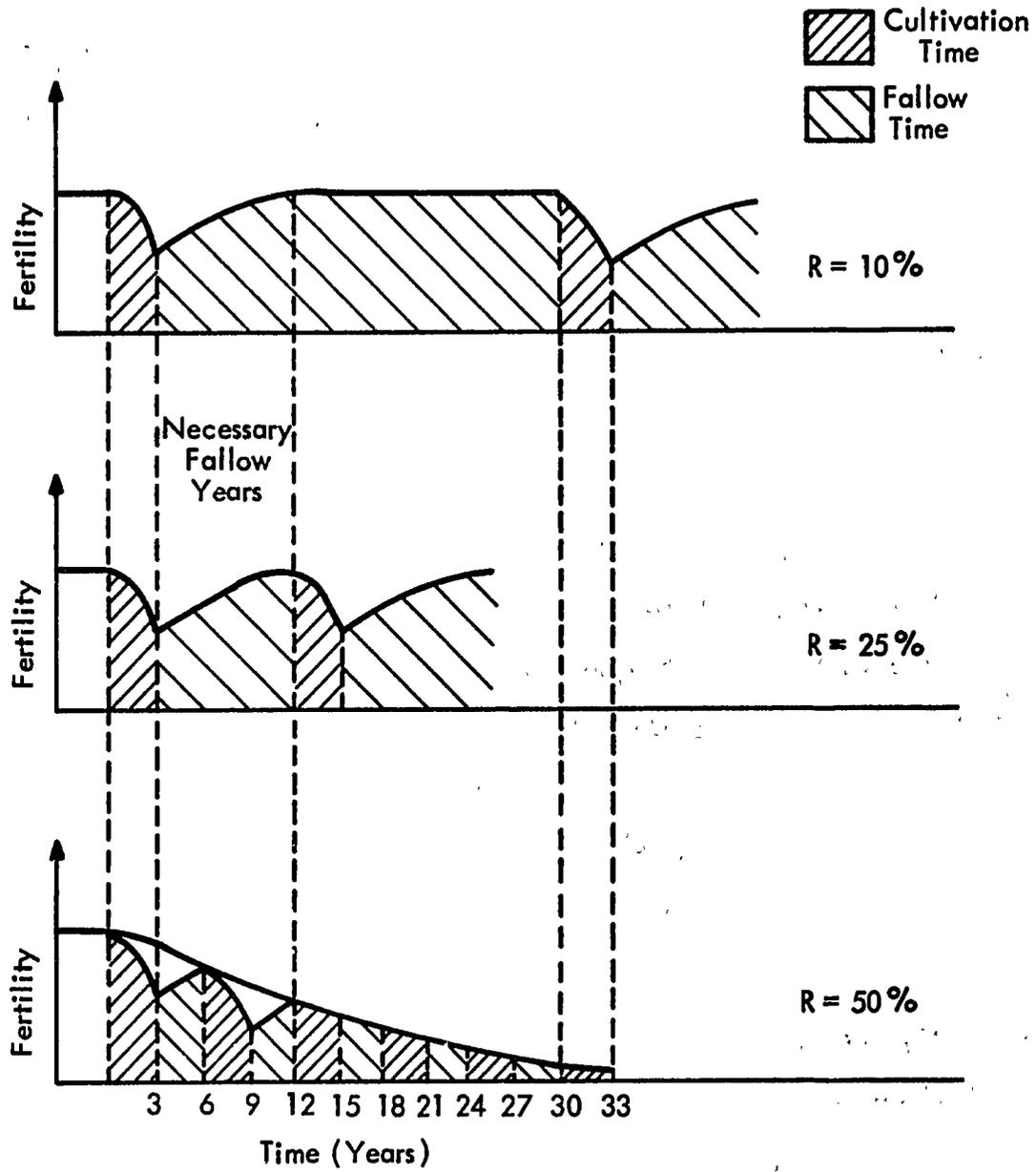


Figure 2. Relationship of Fertility to Cultivation and Fallow Time.

traditional sector's interaction between man and his environment represents the most critical problem of the area and, unless it is broken, the necessary conditions for creating fundamental changes in the area will not be met. Low productive capacity attended by low output and subsistence living conditions give rise to malnutrition, emigration of younger people from the traditional sector, low investment, and a low level of technology. Efforts to remedy the symptoms and effects rather than the cause itself have proven ineffective. One thing that is predictable with a high level of confidence is the recurrence of the drought. Unless measures are taken to minimize their risk, future droughts will probably prove more devastating since there is an almost irreversible trend to restore the damages of the drought by expanding the traditional mode of production during the good years.

The impoverishment of the farms is exacerbated by the patterns of energy consumption, in which nearly 90 percent of the energy is drawn from wood resources. According to our estimates, the rate of wood consumption in Upper Volta has reached equilibrium with the rate of net production of trees. If this trend continues and alternative sources of energy (such as the production of methane from cellulose) are not developed, the problems of deforestation and desertification will be intensified.

Overgrazing of the fragile range has led to an increase in "albedo," and this in turn may have an adverse effect on cloud formation and on the frequency and quantity of precipitation. At the Goddard Institute, a preliminary stimulation model is being built to measure the effect of albedo on cloud formation and vice versa. Since this effort is still in its preliminary stages, no conclusion can be drawn at present. It is, however, clear that the climate and the lack of social, political, and economic incentives and controls regarding land use are the basic factors in the ecological-agricultural vicious circle.

8.2 The Human Opportunity Circle

Since the agricultural-ecological circle has caused low production capacity, it has resulted in low output, and subsistence living conditions in the traditional sector. In the rural areas, a number of factors contribute to an economic gap between the elite and the masses that are institutional as well. Producer prices, generally low, bear little relation to world market prices. For instance, in Chad, producer prices for cotton were kept fixed for 14 years. Opportunities for saving, credit, investment, and employment are lacking and this has led to secular and seasonal emigration to the cities, into the coastal states, and even out of the African continent.

Essentially this means that the human and economic resources of the traditional sector which provides most of the foreign exchange reserves have been taxed without compensation by either social goods and services or by budgetary allocation. The rural areas suffer from inadequacies in health care facilities and infrastructure, in transportation and communication networks, from an educational system not responsive to social needs, and from a lack of other social amenities. As a result of these restricted opportunities, the well-being of the region's inhabitants has deteriorated. See Figure 3 for illustration.

In summary, low income has resulted in a low level of savings, investment, and technology, and therefore low output and income. The inadequacy of financial institutions has led the rural sector to traditional forms of savings (i.e., more cattle), which are essentially counter-productive.

8.3 The Traditional-Modern Sector Circle

The rate of immigration into the modern sector has been much higher than the rate of increase in employment opportunities, and has precipitated a very high unemployment rate in the cities. Moreover, minimum wage laws, overvalued currencies, and low levels of worker skills have created adverse conditions for international competition.

The rapid immigration to the cities has also led to inadequate housing, sanitation, water systems, health care, and nutrition, and thus a generally poor quality of life among the masses. (See Figure 4 for illustration).

These policies and conditions have fostered certain internal inconsistencies. Since the prices of both imports and the products of the modern sector have been held quite high, growth of a market for industrial goods has been inhibited in the traditional sector. The elasticity of income demand of that sector has been disregarded in pricing, income, and tax policies. Industrial policies have been geared to foreign markets, neglecting rural demands and the need for a mutually adjusted system between industry and agriculture. (See Figure 5 depicting a vicious circle of underdevelopment).

In summary the following constraints dominate the region's destiny.

(1) Ecological factors--Generally sparse and highly variable rainfall limits agricultural productivity and causes large variations in yield.

(2) Certain economic policies--A system of monetary arrangement over which the countries themselves have little control, has created restrictive monetary and tight fiscal policies.

(3) International trade--Exports are sub-

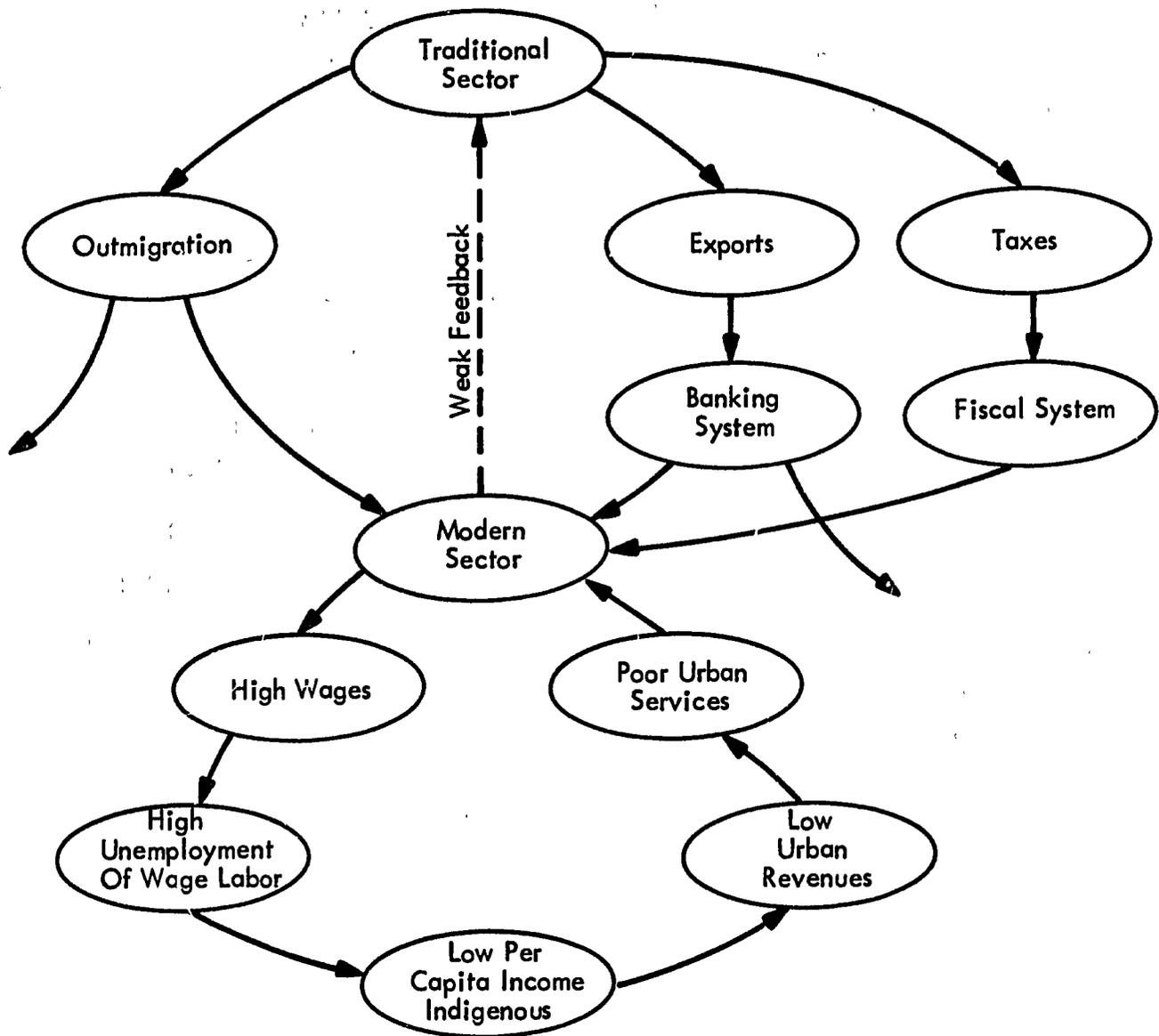


Figure 4. The Traditional Modern Sector's Interactions Vicious Circle

ject to short-term fluctuation on both the demand side (world market) and the supply side (because of climatic conditions), while prices of imports have been steadily rising.

(4) Economic development--Economic growth development financing is heavily dependent on foreign aid which has not been responsive to the breaking of the vicious circles.

(5) Population growth--The population growth has been and will probably remain for some time independent of the region's economic growth rate.

(6) Human resources--Lack of qualified personnel will continue to impose a major constraint upon the absorptive capacity and will keep the region dependent upon foreign technical assistance.

(7) Resource gap--The savings-investment and foreign exchange gaps will necessitate continued high dependency upon foreign aid.

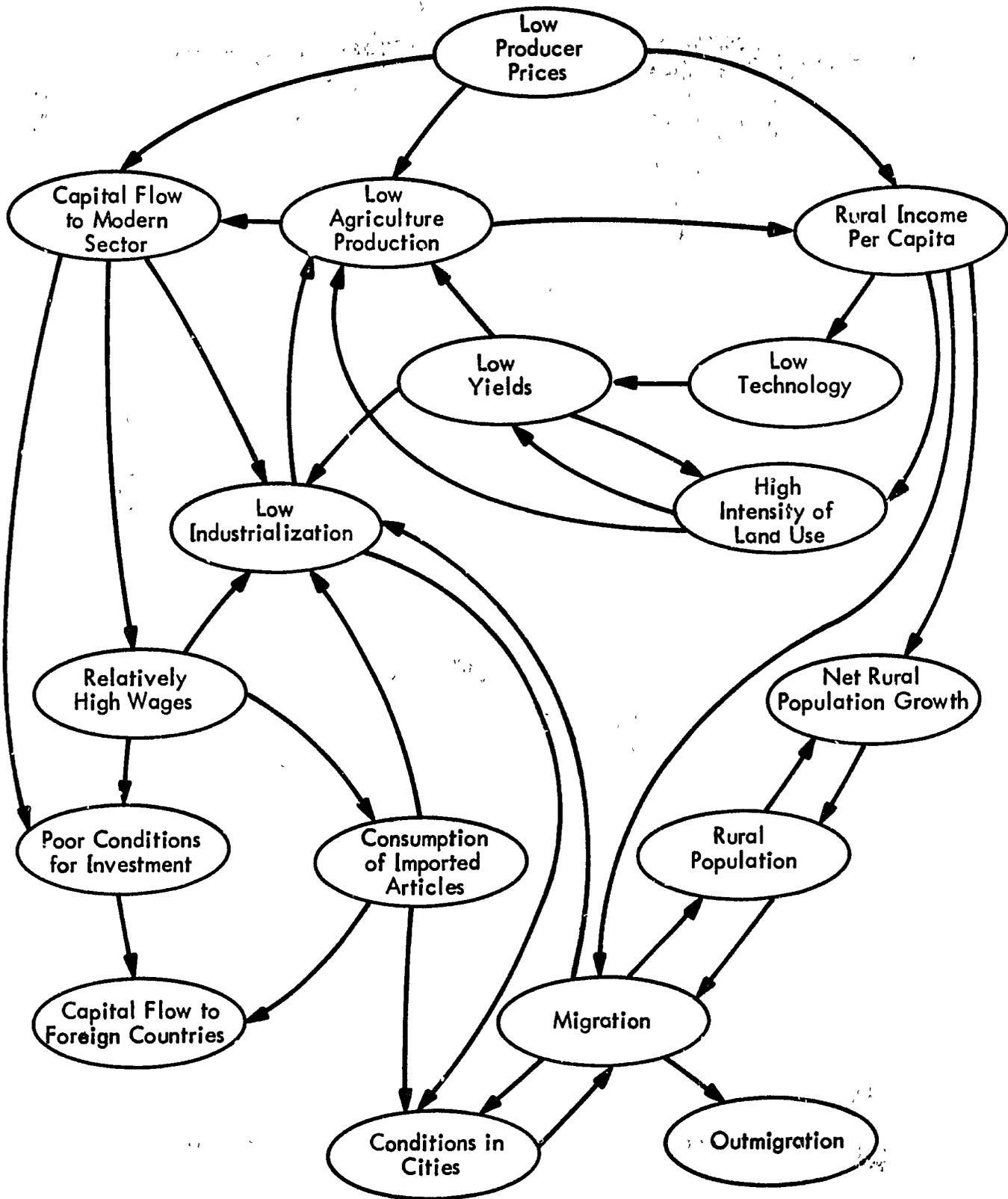


Figure 5. Underdevelopment Vicious Circles.

9. MACROECONOMIC PROJECTIONS AND ESTIMATES OF FOREIGN AID REQUIREMENTS

In spite of the fact that macroeconomic projections and estimates of foreign aid requirements have become a widespread practice by economists, planners, and business practitioners, they have not received high marks for their accuracy or validity. Nevertheless, these projections and estimates are useful for gaining insight and some idea of the order of magnitude. This task is accomplished with the help of some aggregate mathematical model of the economy ranging from the works of Harrod-Domar to those of Chenery and Bruno, Chenery and MacEwan, Chenery and Strout and others. The technical aspects of these models are discussed in Appendix A to this section. The aim of these projections are to derive estimates of feasible or plausible growth rates of the GNP, investment, savings, imports, exports, foreign capital requirements, and other economic variables and parameters.

In our opinion an ideal exercise for the macroeconomic projections of the Sahel-Sudan region would have been to derive cost estimates for the agricultural strategy which is developed in Volume II as an illustration of the application of the framework developed for the region. These cost estimates could have been supplemented with cost estimates from the transportation model, the water model,

the integrated industry framework, the energy and the technology requirements, and the requirements from the social sectors such as health, nutrition, education, and associated fields. Also, the estimates of the impact of socio-political and economic institutions such as the monetary system, pricing policies, mass elite relations, communication, interactions at local, national, and regional levels and other social interaction could have been incorporated in estimating possible trends upon the economic parameters such as savings rate, marginal capital output ratio, and others. For instance, if the monetary system is modified and extended into the rural sector what impact would it have upon the savings rate? If the mass-elite gap is closed, how would that influence incentives and in turn the marginal capital output ratios. If the risk of climate upon production is minimized, to what extent would the rate of production, exports and import substitution be altered?

Such an exercise would require an in-depth knowledge and elaborate information base that are not available to us, nor did we have the resources, the time, or the necessary African inputs to consider this approach in any detail.

Instead, we adopted a somewhat modified version of the Chenery and his associates approach to make some projections, although in our estimates of the various para-

meters and these trends we did examine the historical data of the region as well as cross comparisons that we felt were applicable.

Our choice of the projection model of the Sahel-Sudan countries was influenced by the presence of three most important constraints, namely: (1) the savings constraint, (2) the balance of payments constraints, and (3) the absorptive capacity constraint. Also, it should be noted that in this projection, foreign aid requirements do not include emergency food requirements as a result of any major future droughts. We believe that for this region a clear distinction would have to be drawn between emergency aid requirements to ward off famine or compensate for drought devastation and aid requirements for economic growth. Since emergency assistance will be a function of climatic condition and no reasonable means are available to predict the behavior of the climate of the region, emergency aid would have to be considered on an ad hoc basis until a world wide or a regional system of aid for such purpose is instituted. In this exercise we identified seven macroeconomic variables, seven parameters, and seven equations with an assumption of a target growth rate of 5 percent per year (a target set by the U.N. development decade of the 70's), under alternative sets of assumptions which we considered plausible.

The projections for the GNP and foreign aid requirements of each of the countries and for the region as a whole (from 1995 through 1999) are summarized on a five year basis in tables 9.1 through 9.4. For a technical discussion of various growth models, their limitations, choice of our model and the rationale for our estimates and their trends, we refer you to Appendix A of this section.

Our model includes the following:

Variables:

V_t	Gross National Product
I_t	Gross Investment
S_t	Gross Domestic Savings
C_t	Consumption
M_t	Imports of Goods and Services
E_t	Exports of Goods and Services
F_t	Net inflow of Foreign Capital

Parameters:

\bar{r}	Target Growth Rate of GNP
α	Marginal Propensity to Save
β	Maximum Rate of Growth of Investment
k	Incremental Gross Capital-Output Ratio
μ	Marginal Import Rate
ϵ	Rate of Growth of Exports

Relations:

$$V_t = V_0 + \frac{1}{k} \sum_{T=1}^{t-1} I_T$$

$$S_t = S_0 + \alpha(V_t - V_0)$$

$$I_t \leq (1 + \beta) I_{t-1}$$

$$V_t \leq (1 + \bar{r}) V_{t-1}$$

$$M_t = M_0 + \mu(V_t - V_0)$$

$$E_t = E_0 (1 + \varepsilon)^t$$

$$V_t = S_t + C_t$$

$$F_t = \max \{I_t - S_t, M_t - E_t\}$$

Our base year is 1975 for which 1971 data is used with the assumption that due to the severe drought from 1971-1974, the 1975 level of the economic variables are about the same as those of 1971. This assumption could be wrong either upward or downward since no detailed surveys of the impact of the drought or its delayed effects have been undertaken. We also believe that our projections are optimistic because of the values of the parameters which we have assumed. For instance, our calculations have shown that the marginal capital-output ratio for Senegal was 6; we have trended

this value to reach 4 which means a substantial improvement over the projected period. For the remaining five countries a figure of 4 is assumed which may be quite less although it falls within reasonable range of the performance of the developing countries. Such improvement in the value of capital output ratio assumes substantial improvement in administration, economic management, and the incentive structures. Likewise, in our alternative sets of projections, the rate of growth of investment has been trended from 8 percent to 10 percent, and the marginal propensity to save has been trended from 10 percent to 25 percent--such trends will require substantial improvement in rural credit and in the banking system. Also, improved trends have been indicated in the rate of growth of exports which assumes a more realistic producer prices and countermeasures to minimize the cyclical effects of the climate. Likewise, the values of the marginal input rate for our second set of assumptions have been raised substantially--a factor which depends upon the performance of experts as well as donors' aid. We have further assumed that foreign aid would effectively contribute to development.

The principal advantages of the Chenery-Strout model are: (1) it is not very stringent for data requirements, and (2) it explicitly incorporates the three most important development constraints that seem to be relevant for the

Sahel-Sudan countries--the domestic savings constraint, the balance of payments constraint, and the absorptive capacity constraint. By varying the values of various parameters within plausible limits, the model can be used to generate alternative feasible growth paths for the economy.

Instead of using constant values of the various parameters we assumed that some of them, e.g. the marginal propensity to save, the rate of growth of exports, the maximum feasible growth rate of investment, etc., will change in a favorable direction over time. Thus, instead of using a single value for each of the parameters derived from historical data, we have used time paths. Historical data influence these time paths through the choice of initial values and growth rates. This is a reasonable thing to do because the values of parameters based on historical data are very low. Deriving estimates of foreign aid requirements on the assumption that the low historical parameter values will continue to operate for the entire projection period, can therefore, be seriously misleading. We do not claim, however, that our particular choices of time paths are in any sense optimal. They are feasible in the sense that several underdeveloped countries have been able to achieve through determined efforts. The important conclusions were:

- (1) The absorptive capacity constraint will prove

to be a very significant bottleneck, particularly in Chad and Upper Volta. In both of these countries annual gross capital formation has actually declined over the period 1964-71, the only period for which data is available. Taken literally, this would imply a negative value of the rate of growth of investment. The value of investment as a proportion of GDP in each of these countries is quite low initially, and if we assume the historical trend, it will take more than 15 years merely to achieve the target growth rate. Clearly, a larger amount of technical assistance and a comprehensive manpower training program are key elements if better growth performance is to be achieved.

(2) For Mauritania, the values of parameters based on historical data are such that the model indicates that enough savings and foreign exchange will be available to sustain a 5 percent growth rate of GDP. In fact, even for an 8 percent growth target, the model predicted no bottlenecks. These results must be treated with caution, however, since most of the investment in the past decade was carried out by foreign investors who brought with them not only the financial resources but also the required skilled personnel. Even though the earnings from existing mines will be sufficient to finance investment and import requirements implied by an 8 percent growth rate, the absorptive capacity constraint may prevent the economy from

achieving such a growth rate, if foreign investment and the concomitant inflow of skilled personnel slows down or stops altogether. Thus, even though Mauritania may have ample financial resources, continuation of technical assistance, and assistance in manpower development programs seems necessary for the target growth rates.

(3) The estimates of foreign aid requirements are quite sensitive to the assumed values of the parameters, particularly the marginal savings rate, the capital output ratio and the rate of growth of exports. Detailed sensitivity tests were performed only for Senegal. It is hoped that the results of these sensitivity tests will also shed some light on the impact of these parametric variations on the total foreign aid requirements for the six countries.

(4) Two estimates of total foreign aid requirements were derived, one on the assumption of a sustained growth of exports at an annual rate of 6 percent, the other on the assumption that they will grow at 3 percent during 1975-79, at 4 percent during 1980-84, and at 5 percent thereafter. Other assumptions remained the same for the two sets of projections. In the former case, about \$5 billions worth of foreign aid will be required during 1975-2000, and in the latter case about \$9 billion. Clearly, these estimates also depend upon whether or not our expectations regarding saving effort, etc., as implied by our

assumed parameter values, are fulfilled.

(5) The Sahel-Sudan region has experienced two kinds of droughts--(a) minor droughts, when there is below normal rainfall only for one or two years, and (b) major droughts such as the one recently experienced, when rainfall stays at subnormal levels for three years or more. Our procedure for estimating the capital-output ratio does try to take account of minor droughts. But we cannot "average out" the influence of major droughts, which can cause severe dislocation throughout the economy besides a decline in output. Thus, if a major drought occurs within our projection period, the variance between the actual and projected figures will be much greater than normal.

Table 9.1: FOREIGN AID REQUIREMENTS OF THE SAHEL-SUDAN COUNTRIES, 1975-2000

PERIOD	AID REQUIREMENTS UNDER HIGH EXPORT PERFORMANCE		AID REQUIREMENTS UNDER RELATIVELY MODEST EXPORT PERFORMANCE	
	BILLIONS 1971 CFAF	MILLIONS 1971 DOLLARS	BILLIONS 1971 CFAF	MILLIONS 1971 DOLLARS
1975-79	230.69	902	273.82	1,070
1980-84	261.62	1,023	382.89	1,497
1985-89	271.85	1,063	424.91	1,661
1990-94	265.15	1,037	530.99	2,076
1995-99	251.69	984	675.02	2,639
TOTAL	1,281.00	5,009	2,287.63	8,943

Table 9.2: FOREIGN AID REQUIREMENTS TO ENABLE THE SAHEL-SUDAN COUNTRIES ATTAIN 5 PERCENT GROWTH OF GDP, IF RELATIVELY MODEST EXPORT PERFORMANCE IS ASSUMED. (ALL FIGURES IN BILLIONS 1971 CFAF EXCEPT THOSE FOR MALI WHICH ARE IN BILLIONS 1971 MF)

<u>Period</u>	<u>Country</u>	CHAD	MALI (in MF)	MAURITANIA	NIGER	SENEGAL	UPPER VOLTA
1975-79		49.46	30.69	-	41.97	124.31	42.73
1980-84		57.06	56.51	-	76.12	166.62	54.83
1985-89		69.77	96.92	-	120.70	112.33	73.65
1990-94		92.28	145.74	-	176.23	84.89	104.72
1995-99		104.78	208.07	-	247.10	69.81	149.29
TOTAL		395.34	537.93	-	662.12	557.96	425.22

**Table 9.3: PROJECTIONS OF THE GROSS DOMESTIC PRODUCT OF
THE SAHEL-SUDAN REGION (BILLIONS OF CFAF, 1971
PRICES)**

Year	CHAD	MALI (in billions MF)	NIGER	SENEGAL	UPPER VOLTA	MAURITANIA
1975	80	167	95	208	85	-
1980	87	204	118	205	96	-
1985	102	259	151	339	112	-
1990	124	330	193	432	137	-
1995	157	422	246	552	175	-
2000	200	538	314	704	224	-

One dollar = 250 CFAF

Table 9.4: FOREIGN AID REQUIREMENTS TO ENABLE THE SAHEL- SUDAN COUNTRIES ATTAIN 5 PERCENT GROWTH OF GDP, IF HIGH EXPORT PERFORMANCE IS ASSUMED. (ALL FIGURES IN BILLIONS, 1971 CFAF, EXCEPT THOSE FOR MALI WHICH ARE IN BILLIONS 1971 MF).

<u>Period</u>	<u>Country</u>	<u>CHAD</u>	<u>MALI (in MF)</u>	<u>MAURITANIA</u>	<u>NIGER</u>	<u>SENEGAL</u>	<u>UPPER VOLA</u>
1975-79		45.28	27.25	-	35.60	93.45	42.73
1980-84		49.07	39.33	-	50.68	87.64	54.56
1985-89		63.19	29.06	-	70.25	52.61	71.27
1990-94		70.78	9.30	-	95.39	20.26	74.07
1995-99		61.84	-	-	125.51	0.36	63.98
TOTAL		290.16	104.94	-	377.93	254.32	306.61

APPENDIX A

MACROECONOMIC PROJECTIONS

APPENDIX A: A FRAMEWORK FOR MACROECONOMIC PROJECTIONS

1. INTRODUCTION: THE NEED FOR MACROECONOMIC PROJECTIONS

A group of distinguished economists have, in a report on the problems of long-term economic projections, prepared for the United Nations Economic Commission for Asia and the Far East, observed that:

"For most of the countries in the ECAFE region an image as concrete as possible of the path which their economy may follow in the next ten to twenty years and of the structure of their economy at the end of that period is a necessity if the governments are to follow consistent and rational policies of economic development and planning; if the private sectors are to make their own decisions intelligently; and if economic cooperation and co-ordination among the countries of the region is to be pursued successfully."¹

These observations, we believe, also apply to the countries of the Sahel-Sudan region.

In almost all underdeveloped countries policy makers pursue a number of economic and non-economic objectives simultaneously. A high growth rate of income, a high rate of consumption in the present, a high level of employment

1. United Nations, "Problems of Long-Term Economic Projections," with special reference to Asia and the Far East, (New York: 1963), p. 86.

for the country's work force, a high degree of self-reliance², are but a few examples. If targets pertaining to each objective are arrived at independently, it is very likely that they may be mutually inconsistent. Thus, for example, the high growth objective, as reflected in the high target growth rate of GDP, may conflict with the high present consumption and self-reliance objectives, as reflected in the planned rates of saving and of the levels of foreign capital inflow. The most important function of macroeconomic projections is to point out such inconsistencies in the initial phases of the planning process, so that they can be rectified at the outset and a mutually consistent set of targets arrived at. Planners can then study the best mix policy instruments necessary to foster such a development of the economy. Clearly, consistency of plan targets is not something to be desired in itself. But the

2. There is considerable evidence that this is an important objective of economic policy in many underdeveloped countries. Self-reliance is usually interpreted as independence from foreign aid. Some policy makers may even treat foreign aid as a cost. See for example, Chenery and MacEwan, "Optimal Patterns of Growth and Aid: The Case of Pakistan," in Adelman and Thorbecke (ed.), The Theory and Design of Economic Development (Baltimore: John Hopkins Press, 1966). In a linear programming version of the two-gap model which Chenery and MacEwan use to determine the optimal pattern of foreign capital inflows over time for Pakistan, even pure grants and the grant-equivalent of foreign loans appear with a negative coefficient in the social welfare function.

implications of inconsistencies, which are not rectified early in the planning process, are that serious bottlenecks will emerge during the plan period which will frustrate the development of the economy according to the desired pattern. Thus, if, as in the example cited earlier, the target rate of growth of GDP, the rate of domestic saving, and the planned level of foreign capital inflow are not mutually consistent, the economy may not be able to attain the target growth rate because of non-availability of sufficient investible resources. Or to take another example, if the rate of growth of exports envisaged in the plan, is not consistent with other targets, serious balance of payments problems may occur during the plan period. These problems may frustrate the realization of plans of various groups in the economy, and indeed of the target growth rate itself, even though available savings may be quite adequate to meet investment requirements.³ The importance of advance warnings regarding these bottlenecks that macro-

3. This phenomenon, often referred to in the development literature, as a case of frustrated savings, is familiar to many underdeveloped countries. In such a situation, a number of entrepreneurs, who have adequate domestic capital, are willing to invest, but because of foreign exchange shortage, are unable to obtain licenses from the government to import the machinery and raw materials necessary to carry out their projects. Also, the government may regard increasing public savings as not only feasible but also desirable, but may be constrained to postpone a number of public sector projects because of the shortage of foreign exchange.

economic projections can provide, from the viewpoint of planners in underdeveloped countries, can be fully appreciated only when it is realized that in such countries the intersectoral mobility of resources is low and can be ameliorated only in the long run through policy instruments, and that the transformation of both human and natural resources into productive factors of production requires a substantially long period of time. Thus the advance warning that a certain proposed growth rate of exports is inconsistent with the other targets and will lead to serious balance of payments problems in the future, may prompt planners to take steps to bring about a higher growth rate of exports, and/or a higher rate of import-substitution, which may even avert the balance of payments difficulties. Without such advance warning and therefore, without the appropriate export-promotion and/or import-substitution measures, the steps which policy makers would be forced to take when the economy was already in the midst of a balance of payments crisis, would necessarily have to be of an ad-hoc nature and could lead to more problems than they resolve.⁴ It would also, almost inevitably, entail some

4. For an illuminating discussion about the types of problems that can arise, see Jagdish N. Bhajwati and Padma Desai, "India: Planning for Industrialization," (London: Oxford University Press, 1970), Part VII.

sacrifice in terms of the growth rate and the high present consumption targets.

2. The simple Harrod- Domar Model -- Why It is Not Appropriate for the Sahel-Sudan Countries.

Macroeconomic projections are usually made with the help of some aggregate mathematical model of the economy. The well-known Harrod-Domar model⁵, or some variant of it, is most often used. In essence, the Harrod-Domar model states that the increase in GDP, V , from year t to year $t + 1$, i.e. $V_{t+1} - V_t$, is determined by the amount of net investment in year t , I_t , and its 'productivity' as measured by the inverse of the capital-output ratio, k . I_t is assumed to be limited only by the availability of savings in year t , S_t , which in turn depends upon V_t through the relation: $S_t = sV_t$. Then, given estimates of s and k derived from recent national income data, the model predicts a growth rate of GDP of s/k percent. Also, the model can be used to derive an estimate of the level of domestic savings necessary to sustain a particular target growth rate of GDP. Or otherwise, if such a high domestic savings rate is deemed infeasible or undesirable, the model can provide estimates of net foreign capital inflows necessary for the

5. A lucid discussion of the use of the Harrod-Domar model for macroeconomic projections can be found in Michael P. Todaro, Development Planning: Models and Methods (Nairobi: Oxford University Press, 1971), Chapter 4.

realization of the GDP growth target.⁶

Mostly because it is so simple conceptually, and because its requirements in terms of data and of computational facilities are minimal, the Harrod-Domar model has been widely used in underdeveloped countries. Despite that, it is a rather crude analytical device and suffers from some serious weaknesses which make it unsuitable for making macroeconomic projections in the Sahel-Sudan countries. Two of its major weaknesses are:

(1) As is evident from our brief description of the Harrod-Domar model, it assumes that, given the 'productivity' of capital as reflected in the inverse of k , shortage of savings is the only constraint on the growth of GDP. Experience in many underdeveloped countries has shown that there are two other important constraints:

(a) The constraint imposed by the coun-

6. This is a relatively simple exercise. The basic equation of the model is $r = s/k$, where r is the growth rate of GDP, and s and k are as defined above in the text. If the target growth rate is r^* , we must have $s = kr^*$. In other words, kr^* percent of GDP must be saved and invested. However, if the maximum rate of saving considered feasible by policy makers is \bar{s} percent of GDP, where $\bar{s} < kr^*$, foreign capital inflows in the amount of $(kr^* - \bar{s})$ percent of GDP are needed to meet the investment requirements.

try's limited absorptive capacity.⁷ In other words, if the country's endowment of skilled personnel, capable of planning and implementing various projects is very limited, it may not be able to carry out investment in an amount sufficient to meet the target growth of GDP. In such a situation availability of adequate investible resources from domestic savings does not help to accelerate the growth rate of the economy, nor does the inflow of foreign capital, unless of course, it is also accompanied by the inflow of foreign skilled personnel. Thus if the absorptive capacity of an economy is limited, macroeconomic projections of GDP, savings, investment levels, foreign aid requirements, etc. derived from the simple Harrod-Domar model can be seriously misleading because they will be based on the assumption that the economy will attain the target growth rate immediately, and will continue to grow at this rate for the entire projection period. In fact, however, depending upon the severity of the absorptive capacity constraint, it may take a number of years for the economy to attain the target growth rate.

(b) The constraint imposed by the econo-

7. For a concise and excellent discussion of the concept of absorptive capacity and of the problems associated with its measurement, see Everett E. Hagen, The Economics of Development (Homewood, Illinois: Richard D. Irwin, Inc., 1968), pp. 375-379.

my's limited capacity to import and to produce import-substitutes. No underdeveloped country can produce all the investment goods and raw materials that it needs. Each country must import a certain amount of these commodities. For small countries, like those of the Sahel-Sudan region, the proportion of imports can be fairly large. Clearly, the higher the target growth rate, the larger the need to import non-competitive consumer goods like cars, refrigerators, radios, watches, etc. Now if the foreign demand for a country's exports is limited, as is its capacity to produce the machines, raw materials, etc. that it must have to meet the investment target, a situation can arise when its export earnings will be insufficient to meet its import bill. On the other hand, it may have sufficient domestic savings to meet its investment target. The problem is that these savings are presumably in the form of some agricultural commodities, or of some manufactured goods, like textiles, which the underdeveloped country is capable of producing. Because of the limited demand for these commodities in the developed countries which produce the type of investment goods, etc. that the underdeveloped country needs, it is unable to transform its savings into the desired type of investment goods through international trade. Also, given its level of technological sophistication, it is unable to transform these savings into the desired goods

by shifting its productive resources from one to the other. This is a classic case of frustrated savings that we discussed earlier. Clearly, in such a situation, the Harrod-Domar model which looks only at available domestic savings versus investment requirements, will project zero foreign aid requirements and growth of GDP at the desired rate. In fact, however, the economy will be unable to sustain its growth target unless sufficient foreign aid is made available to enable it to finance the necessary imports.

(2) The second major weakness of the Harrod-Domar model lies in the simplistic nature of its savings function, namely, savings are a constant proportion, s , of GDP. In practice, however, if the government of an underdeveloped country is committed to a policy of economic development, it uses its policy instruments to ensure that the proportion of GDP that is saved increases over time.⁸ Therefore, if the growth target is constant, foreign aid requirements as a proportion of GDP will decline over time. The Harrod-Domar model, on the other hand, projects foreign

8. Professor W. A. Lewis describes the process of economic development as the transformation of an economy from one that saves and invests 4 or 5 percent of its national income to one that saves and invests 12 to 15 percent or more. See "Economic Development with Unlimited Supplies of Labor," in Agarwala and Singh (ed.), The Economics of Underdevelopment (London: Oxford University Press, 1958), p. 416.

aid requirements as a constant proportion of GDP.

It may be of interest to mention here that for short term projections, in countries where evidence indicates that limited absorptive capacity and balance of payments problems do not exist, the Harrod-Domar model may give quite reasonable results, particularly, if the marginal and average saving propensities are not very different. But for the Sahel-Sudan countries its usefulness even for short-term projections is doubtful. This is so for a number of reasons. First, there is considerable evidence that limited absorptive capacity is a bottleneck in each of the six countries. Apart from the fact that investment has increased at a slow pace in each of these countries,⁹ the limited absorptive capacity is reflected in the fact that, in each of the countries, on the one hand, the realization rates fell far short of plan targets for investments in various sectors, on the other hand, only a fraction of the foreign aid that had been pledged for the plans by various donors, was actually utilized.¹⁰ Secondly, the proportion

9. Mauritania seems like an exception judging from the growth rate of investment. However, as will be pointed out in greater detail later, this was made possible only because of the large foreign investments in the mining sector.

10. See section 7 of this report for data on the realization rates of various plan targets, and percentage of foreign aid actually disbursed.

of GDP saved (i.e. the average propensity to save) is very low at present. In some cases it is even negative. Clearly, if the governments of these countries were going to formulate development plans they would aim at much higher marginal savings rates. As we pointed out a little earlier, the Harrod-Domar model is not appropriate in such a situation either.

3. THE CHENERY-STROUT MODEL¹¹

From our discussion in the preceding section we concluded that in order to obtain reasonable macroeconomic projections for the Sahel-Sudan countries, our aggregate mathematical model must explicitly recognize the three most important constraints that appear to be relevant for the countries of the region -- the absorptive capacity constraint, the savings constraint and the balance of payments constraint. Also, it must incorporate a saving function with marginal propensity to save higher than average propensity. Professor Hollis B. Chenery and his associates

11. The present discussion has been included primarily for the benefit of the reader who is not familiar with the Chenery-Strout model. Those already familiar with it will find nothing new in it, and are advised to skip subsection 3.1.

have developed such a model¹² by extending the simple Harrod-Domar model that was described in the preceding section. We shall use the particular form of this model that was used by Chenery and Strout to project long term foreign aid requirements of a number of underdeveloped countries.

First, we shall briefly describe the Chenery-Strout model. Then we shall use it to derive macroeconomic projections for the six Sahel-Sudan countries. The policy implications of these projections will be discussed in the following section. The limitations of the Chenery-Strout model and suggestions for possible extensions that would enhance its utility are discussed in section 5. The reader wondering about how the values of the various parameters were obtained is advised to see Section 6 where the problems encountered in obtaining and analyzing the data are briefly discussed.

12. See H.B. Chenery and M. Bruno, "Development Alternatives in an Open Economy: The Case of Israel," Economic Journal, 1962, pp. 79-103. Chenery and MacEwan, "Optimal Patterns of Growth and Aid," op. cit., and Chenery and A.M. Strout, "Foreign Assistance and Economic Development," American Economic Review, September 1966. The discussion here follows Chenery and Strout quite closely.

3.1 DESCRIPTION OF THE MODEL

Variables (subscript t indicates year; o, initial year)

V_t	Gross domestic product
I_t	Gross investment
S_t	Gross domestic savings (ex-ante)
C_t	Consumption
M_t	Imports of goods and services (ex-ante)
E_t	Exports of goods and services
F_t	Net inflow of foreign capital

Parameters

\bar{r}	Target growth rate of GDP
α	Marginal propensity to save
β	Maximum feasible growth rate of investment
k	Incremental gross capital-output ratio hereinafter referred to as capital-output ratio
μ	Marginal import rate
ϵ	Rate of growth of exports

Relations

$$V_t = V_o + \frac{1}{k} \sum_{T=1}^{t-1} I_T \quad (1)$$

$$S_t = S_o + \alpha(V_t - V_o) \quad (2)$$

$$I_t \leq (1 + \beta) I_{t-1} \quad (3)$$

$$V_t \leq (1 + \bar{r}) V_{t-1} \quad (4)$$

$$M_t = M_0 + \mu(V_t - V_0) \quad (5)$$

$$E_t = E_0 (1 + \epsilon)^t \quad (6)$$

$$V_t = S_t + C_t \quad (7)$$

$$F_t = \max \{ I_t - S_t, M_t - E_t \} \quad (8)$$

Equation (1) describes the production function for the economy. It is based on the Harrod-Domar assumption that $(V_{t+1} - V_t)$ is determined by investment in year t , I_t , and its 'productivity' as measured by the inverse of the capital output ratio.

Equation (2) gives ex-ante savings in year t . 'Ex-ante savings' may be interpreted as potential savings, given the level of GDP. It is assumed that if adequate foreign exchange is available to finance the imports of capital goods, raw materials, etc., ex-post savings and ex-ante savings will be equal. In other words, the economy's full savings potential can be realized if adequate amounts of foreign exchange are available. Otherwise, at least part of the potential savings will be unrealized (i.e. frustrated).

Inequality (3) represents the absorptive capacity constraint. This particular specification represents an ingenious attempt by Chenery and Strout to resolve the difficult problems associated with the measurement of absorptive

capacity. They assumed that a country can increase its volume of investment from year to year by the maximum percentage by which it has done so during any five-year period in the recent past. β represents this maximum growth rate.

Inequality (4) represents the target growth rate of GDP. The reason for imposing this upper bound on the growth rate of GDP is that a higher growth rate implies larger investment requirements. There is definitely an upper limit to the amount of foreign capital inflow that policy makers can expect to receive. Also, there must be an upper limit beyond which they cannot and/or would not want to increase domestic savings. Thus, there is an upper limit to the amount of investible resources that can be made available to the policy makers. To be consistent, therefore, the model introduces this constraint.

Equation (5) determines the level of ex-ante imports in year t . These can be interpreted as the minimum imports of capital goods, raw materials, etc. that are absolutely necessary for the economy to achieve the target growth rate.¹³ If the foreign exchange constraint is binding,

13. Chenery and Strout have used different notation for the ex-ante and ex-post levels of savings and imports to emphasize the difference between these magnitudes.

ex-post imports will be equal to this ex-ante level. In other words, the country will then be importing only those items that are essential for its growth, and which cannot be produced domestically. If the foreign exchange constraint is not binding, ex-post imports will exceed the ex-ante level. In such a situation at least part of the imports will consist of commodities that could be produced domestically if enough capital was available.

Equation (6) represents exports which are assumed to increase at the exogenously given rate, ϵ . This rate of growth can be influenced by various government policies aimed at export promotion. Also, provided appropriate adjustments are made for differences in capital-output ratios and import requirements between industries producing import-substitutes and other industries, E may be interpreted as exports plus import-substituting output. ϵ must then be interpreted as the combined growth rate of the two.

Equation (7) is a definitional equation which says that GDP is the sum of savings and consumption.

The difference between required investment and ex-ante savings determines the "ex-ante savings gap" for each year. The difference between ex-ante import requirements and exports determines the "ex-ante trade gap" for each year. According to Equation (8), the larger of the two gaps determines the required amount of net foreign capital inflow

for each year. The ex-post equality between the savings gap and the trade gap must hold identically, just as in the Keynesian macromodels ex-post savings and investment are identically equal though their ex-ante magnitudes may differ.

The above eight relations fully determine the time paths of all our variables, given their initial values and the values of the various parameters. Initially, in most underdeveloped countries, investment as a proportion of GDP is not sufficiently high to make the target rate of growth immediately attainable. Then constraint (4) is not binding (i.e. it holds with strict inequality) and can be ignored. Constraint (3) is binding and continues to remain so as long as investment is not sufficient to allow the target growth rate of GDP to be achieved. This gives us the seven equations necessary to determine the values of our seven variables. Also, the fact that constraint (3) is binding implies that the economy is increasing investment at the maximum feasible rate so as to attain the target growth rate in the shortest possible time, and, in the meantime, to attain the highest feasible growth of GDP. Chenery and Strout call this phase of the economy's development, Phase I, or the phase of investment constrained growth.

If $\beta > \bar{r}$, then since I is increasing at the rate β and V at a rate less than \bar{r} , I/V increases over time. Ul-

timately, it reaches the value $k\bar{r}$, which is the value of I/V required to attain the growth rate \bar{r} , given the capital output ratio k . GDP will in the future grow at the rate \bar{r} . Constraint (3) will no longer be binding and can be ignored. Constraint (4) will now hold with equality, and will provide the seventh equation that, in conjunction with the six others, will determine the time paths of our seven variables. The economy will now be in Phase II of its development.

In both Phases I and II, the required foreign capital inflows are determined by the larger of the savings-gap and the trade-gap. Since $k\bar{r}$ percent of GDP must be invested each year to sustain the \bar{r} percent growth rate, provided the marginal propensity to save, α , exceeds $k\bar{r}$, the economy will ultimately reach a stage when domestic savings are sufficient to finance required investment. In other words, provided $\alpha > k\bar{r}$, the savings gap will ultimately close. Also, since required imports are a linear function of GDP, import requirements will increase at the same rate as GDP.¹⁴ Therefore, if $\epsilon > \bar{r}$, i.e. the growth rate of exports is higher than the target growth rate of GDP, the trade gap will also

14. Strictly speaking, this holds only if μ is constant throughout and is equal to M_0/V_0 . If $\mu > M_0/V_0$, or is increasing over time, the growth rate of imports will exceed the growth rate of GDP. The converse holds if $\mu < M_0/V_0$, or it is decreasing over time.

ultimately close. When both gaps have become non-positive, the economy no longer needs foreign aid to sustain the target growth rate \bar{r} . It then enters Phase III of its development, the Phase of self-sustained growth.

The number of years the economy spends in each of the three phases, as well as the time profile and total amounts of foreign assistance required to attain self-sustained growth, are functions of the parameter values. With the help of some algebra, it is possible to derive relations that will enable us to answer such questions. The reader interested in the details is referred to the Chenery-Strout article. The importance of these relations, from the viewpoint of planners, can hardly be overemphasized. They provide a quick and ready method of testing the implications of alternative sets of targets without the need to make computer runs. Given the planners' realistic assessment of foreign aid availability, these relations can provide important insights regarding the magnitudes of the savings effort and of the export promotion and/or import-substitution efforts, that must be made if the proposed targets are to be met. These efforts may be regarded as feasible and desirable, and, therefore, detailed plans may be drawn up accordingly. Or, they may be regarded as infeasible and/or undesirable by policy makers. In this case a modified set of targets may be proposed and tested similarly.

3.2 Using the framework for Macroeconomic Projections

The framework described in the preceding subsection was used to make long-term projections for the six Sahel-Sudan countries. Besides illustrating how such a model can be used for purposes of long-term planning, the assumptions regarding parameter values were so chosen that the result should provide foreign aid donors some rough estimates of the amount of aid needed to enable these countries to attain a 5 percent growth rate of GDP over the next twenty-five years.

The most difficult problem in making the projection was, of course, obtaining the data. The initial year of the projection period is 1975. However, the most recent GDP estimates for the Sahel-Sudan countries that are available are for 1971 for Chad, Mali and Senegal; 1970 for Upper Volta; and 1969 for Mauritania and Niger. In the absence of information regarding the precise impact of the recent drought on GDP and its various components, the rather arbitrary assumption was made that GDP and its various components would remain the same in 1975 as they were in the most recent year for which information is available. For Niger, the figures for savings and investment in 1969 were not available. They were derived by assuming that saving is 13 percent and investment 17 percent of GDP.

TABLE 1: INITIAL VALUES OF VARIABLES USED IN THE PROJECTIONS

(All figures in Billions CFAF except figures for Mali which are in Billions MF)

Country	Initial Values V ₀	C ₀	I ₀	S ₀	M ₀	E ₀	F ₀
Chad	79.8	80.9	6.0	-1.1	17.2	7.8	9.4
Mali	166.9	145.3	25.4	21.6	34.1	32.1	3.8
Mauritania	45.6	32.5	12.5	13.1	15.8	21.0	-0.6
Niger	95.2	82.6	15.9	12.6	12.5	6.3	6.2
Senegal	208.0	183.9	42.0	24.1	59.9	48.8	17.9
Upper Volta	85.5	86.1	7.1	-0.6	14.3	6.6	7.7

Sources: (i) U.N. Documents
(ii) Africa South of the Sahara (London: Europe Publications, 1973).

These were the approximate values of the saving rate and the investment rate during the previous years for which data are available. Table 1 shows the initial value of the different variables for all the six countries.

Details of the methods used and the problems encountered in estimating the various parameter values can be found in Section 6. Here we shall only list the assumptions that were made regarding the behavior over time of the different parameters, and the rationale for these assumptions.

First of all the values of parameters α , the marginal propensity to save, β , the maximum feasible growth rate of investment, and ϵ , the rate of growth of exports were assumed to increase over time rather than remain fixed at the values derived from historical data. In some runs for Senegal the value of the capital-output ratio was also assumed to change over time in a favorable direction, i.e. downwards. In doing so we have followed the advice of the group of experts whose report on the problems of long-term economic projections in the ECAFE countries has cited earlier. The rationale for this procedure is very well explained in the same report:

"The first and most important point to be borne in mind in working out long-term projections in the ECAFE region is that they have to serve as aids to systematic long-term planning or programming. For this reason,

'projection' has to connote something more than a simple extrapolation of historical trends. Since the main objective of economic policy in the ECAFE is to change the direction of these historical trends, extrapolation based on coefficients or structural relationships derived from time-series will not be adequate. These might, in some cases, be useful as indicators of the position the economy may reach if it is assumed that there will be no changes in policy or that the exogenous influences will remain unaltered. In this sense, such extrapolations also involve implicit judgments regarding future policy or consistency in relationships. But these judgments would not be such as to give an idea of the range of desirable and feasible rate of growth in respect of the magnitudes concerned, and it is such a preview of the future that planners need."¹⁵

Thus for the parameters α , β and ϵ instead of using fixed values derived from historical data we have used time paths. Historical data influence these time paths through the choice of initial values. Thus for Chad and Upper Volta, both of which have had zero or even slightly negative saving rates (i.e. the ratio of gross domestic savings to GDP) during the past decade, the initial value of the marginal propensity to save, α , was assumed to be only 10 percent. For the other countries which already have saving rates of about 12-13 percent, the initial value of α was assumed to be 15 percent. Similarly higher initial values of β and ϵ were assumed for Senegal which

15. United Nations, Problems of Long-Term Economic Projections, op. cit., p. 3.

Table 2: ASSUMED PARAMETER VALUES

Target growth rate, $\bar{r} = .05$ for all six countries and for all sets of projections.

		<u>Capital-output ratio, k</u>			
		<u>High Performance</u>		<u>Modest Performance</u>	
All six countries		4.0		5.0	

<u>Maximum feasible growth rate of investment, β</u>						
	<u>Chad</u>	<u>Mali</u>	<u>Mauritania</u>	<u>Niger</u>	<u>Senegal</u>	<u>Upper Volta</u>
t=0-5	.08	.08	.10	.08	.10	.08
t> 6	.10	.10	.12	.10	.12	.10

<u>Foreign Trade Parameters, ϵ and μ</u>					
		<u>High Performance</u>		<u>Modest Performance</u>	
		<u>ϵ</u>	<u>μ</u>	<u>ϵ</u>	<u>μ</u>
Chad, Mali, Niger, Upper Volta		.06	.20	.03 t=0-4	.30
				.04 t=5-10	
				.05 t>11	
Mauritania*	.10	.35	-	-	
Senegal **		.05 t=0-4 .06 t> 5	.25	.045 t=0-4	.25
				.05 t> 5	

* Only one set of assumptions was made regarding trade prospects for Mauritania. The country already has a substantial trade surplus and given the demand forecasts for iron ore, the country's major export, in international markets, foreign exchange is not expected to be a bottleneck.

** It seems paradoxical that the high performance assumption for Senegal should be relatively pessimistic as compared to the other countries. However, even with this assumption, the trade-gap does not exceed the savings-gap. Foreign aid requirements would therefore not be affected if a more optimistic assumption were made.

is relatively well endowed with skilled personnel than the rest of the countries, and has been much more successful in diversifying and expanding its exports than all the other countries except Mauritania.

Table 2 summarizes our assumptions regarding parameter values. In view of the past performance of the Sahel-Sudan countries, these assumptions may seem overly optimistic. Comparison with what other underdeveloped countries have been able to accomplish may help the reader form his judgment regarding the plausibility of our assumptions. Table 3 presents the upper quartiles, medians, and lower quartiles for the various parameter values observed by Chenery and Strout.

Three sets of projections were made for each country. In case A, high performance assumptions were made regarding both the capital output ratio, k , and the foreign trade parameters--the rate of growth of exports, ϵ , and the marginal import rate, μ . In case B, a high performance assumption regarding k was combined with modest performance assumptions regarding ϵ and μ . Finally, in case C, modest performance assumptions were made for k as well as ϵ and μ . Comparison of the results in cases A and B can serve to illustrate the impact on foreign aid requirements of trade performance. Similarly, comparison of B and C can provide us with some information about the salu-

TABLE 3
DISTRIBUTION OF PARAMETER VALUES, 1957-62.
31-COUNTRY SAMPLE

PARAMETER	UPPER QUANTILE	MEDIAN	LOWER QUANTILE
β	.19	.14	.10
κ	2.78	3.52	4.72
α	.26	.19	.02
μ	.01	.20	.46
ϵ	.080	.051	.021
I_o/V_o	.20	.17	.14

SOURCE: Chenery, H.B., and Strout, A.M., "Foreign Assistance and Economic Development."

tary effects of improved methods of production and other measures that would result in a lower capital-output ratio.

The result of our projections are summarized in tables 4-22. It is hoped that our projections encompass the lower and likely upper limits of the development options open to the economies of the Sahel-Sudan, hence enabling them to serve as a useful frame of reference for policy analysis.

More detailed sensitivity tests were performed for Senegal. These findings are reported in the next section.

TABLE 4. MACROECONOMIC PROJECTIONS FOR CHAD (CASE A)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	79.80	80.90	6.00	-1.10	7.10	17.20	7.80	<u>9.40</u>	9.40
1980	88.60	88.38	8.82	0.22	<u>8.60</u>	18.96	10.44	8.52	8.60
1985	102.06	99.82	14.20	2.24	<u>11.96</u>	21.65	13.97	7.55	11.96
1990	123.73	116.04	22.87	7.69	<u>15.18</u>	25.99	18.69	7.29	15.18
1995	157.12	138.89	31.43	18.23	<u>13.19</u>	32.66	25.02	7.65	13.19
2000	200.53	171.45	40.11	29.08	<u>11.02</u>	41.35	33.48	7.87	11.02

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ASSUMED PARAMETER VALUES:

$\bar{r} = .05$

$k = 4.0$

$\mu = .20$

$\beta = \begin{cases} .08 & t = 0-5 \\ .10 & t \geq 6 \end{cases}$

$\varepsilon = .06$

$\alpha = \begin{cases} .10 & t = 0 - 4 \\ .15 & t = 5 - 10 \\ .20 & t = 11 - 15 \\ .25 & t \geq 16 \end{cases}$

Note: In Tables 4-22, the larger gap is underlined.

TABLE 5. MACROECONOMIC PROJECTIONS FOR CHAD (CASE B)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	79.80	80.90	6.00	-1.10	7.10	17.20	7.80	9.40	9.40
1980	88.60	88.38	8.82	0.22	8.60	19.84	9.13	10.71	10.71
1985	102.06	99.82	14.20	2.24	11.96	23.88	11.11	12.23	12.23
1990	123.73	116.04	22.87	7.69	15.18	30.38	14.18	16.20	16.20
1995	157.12	138.89	31.43	18.23	13.19	40.40	18.09	22.30	22.30
2000	200.53	171.45	40.11	29.08	11.02	53.42	23.09	30.33	30.33

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ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 4.0$$

$$\mu = .30$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\epsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$$

$$\alpha = \begin{cases} .10 & t = 0 - 4 \\ .15 & t = 5 - 10 \\ .20 & t = 11 - 15 \\ .25 & t \geq 16 \end{cases}$$

TABLE 6 MACROECONOMIC PROJECTIONS FOR CHAD (CASE C)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	79.80	80.90	6.00	-1.10	7.10	17.20	7.80	<u>9.40</u>	9.40
1980	86.84	86.88	8.82	-0.04	8.86	19.31	9.13	<u>10.18</u>	10.18
1985	97.60	96.03	14.20	1.57	<u>12.63</u>	22.54	11.11	11.43	12.63
1990	114.94	109.01	22.87	5.93	<u>16.94</u>	27.74	14.18	13.57	16.94
1995	142.96	128.20	35.72	14.67	<u>21.05</u>	36.12	18.09	18.02	21.05
2000	182.33	157.80	45.58	24.53	21.05	47.96	23.09	<u>24.87</u>	24.87

ASSUMED PARAMETER VALUES:

$\bar{r} = .05$

$k = 5.0$

$\mu = .30$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\epsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$$

$$\alpha = \begin{cases} .10 & t = 0 - 4 \\ .15 & t = 5 - 10 \\ .20 & t = 11 - 15 \\ .25 & t \geq 16 \end{cases}$$

TABLE 7. MACROECONOMIC PROJECTIONS FOR MALI (CASE A)
(BILLIONS MF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	166.90	145.30	25.40	21.60	<u>3.80</u>	34.10	32.10	2.00	3.80
1980	204.15	173.24	37.32	30.91	<u>6.41</u>	41.55	42.96	-1.41	6.41
1985	259.01	214.39	51.80	44.63	<u>7.17</u>	52.52	57.49	-4.96	7.17
1990	330.57	268.05	66.11	62.52	<u>3.60</u>	66.83	76.93	-10.10	3.60
1995	421.90	336.55	84.38	85.35	-0.97	85.10	102.95	-17.85	-
2000	538.46	423.97	107.69	114.49	-6.80	108.41	137.77	-29.36	-

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ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 4.0$$

$$\mu = .20$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$e = .06$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 11 \end{cases}$$

TABLE 8. MACROECONOMIC PROJECTIONS FOR MALI (CASE B)
(BILLIONS MF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	166.90	145.30	25.40	21.60	<u>3.80</u>	34.10	32.10	2.00	3.80
1980	204.15	175.10	37.32	29.05	<u>8.27</u>	45.28	37.57	7.71	8.27
1985	259.01	218.99	51.80	40.02	11.78	61.73	45.71	<u>16.02</u>	16.02
1990	330.57	268.05	66.11	62.52	3.60	83.20	58.34	<u>24.86</u>	24.86
1995	421.90	336.55	84.38	85.35	-0.97	110.60	74.46	<u>36.14</u>	36.14
2000	538.46	423.97	107.69	114.49	-6.80	145.57	95.04	<u>50.53</u>	50.53

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ASSUMED PARAMETER VALUES:

$\bar{r} = .05$

$k = 4.0$

$\mu = .30$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\epsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 11 \end{cases}$$

TABLE 9. MACROECONOMIC PROJECTIONS FOR MALI (CASE C)
(BILLIONS MF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	166.90	145.30	25.40	21.60	<u>3.80</u>	34.10	32.10	2.00	3.80
1980	196.70	169.14	37.32	27.56	<u>9.76</u>	43.04	37.57	5.47	9.76
1985	242.27	205.60	60.11	36.67	<u>23.43</u>	56.71	45.71	11.00	23.43
1990	309.09	251.94	77.27	57.15	<u>20.13</u>	76.76	58.34	18.41	20.13
1995	394.49	315.99	98.62	78.50	20.13	102.38	74.46	<u>27.91</u>	27.91
2000	503.48	397.73	125.87	105.74	20.13	135.07	95.04	<u>40.04</u>	40.04

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ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 5.0$$

$$\mu = .30$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\varepsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 11 \end{cases}$$

TABLE 10. MACROECONOMIC PROJECTIONS FOR NIGER (CASE A)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	95.20	82.60	15.90	12.60	3.30	12.50	6.30	<u>6.20</u>	6.20
1980	118.52	101.26	23.36	17.26	6.10	17.16	8.43	<u>8.73</u>	8.73
1985	151.16	127.37	30.23	23.79	6.44	23.69	11.28	<u>12.41</u>	12.41
1990	192.92	155.89	38.58	37.03	1.55	32.04	15.10	<u>16.95</u>	16.95
1995	246.22	195.87	49.24	50.36	-1.12	42.70	20.20	<u>22.50</u>	22.50
2000	314.25	246.89	62.85	67.36	-4.51	56.31	27.04	<u>29.27</u>	29.27

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ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 4.0$$

$$\mu = .20$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\varepsilon = .06$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 10 \end{cases}$$

TABLE 11. MACROECONOMIC PROJECTIONS FOR NIGER (CASE B)
(BILLIONS CFAF ; 1971 PRICES)

A	B	C	D	E	F	G	H	I	
YEAR	GDP	CONSUMPTION	INVESTMENT	(A-B) DOMESTIC SAVINGS	(C-D) SAVINGS GAP	IMPORTS	EXPORTS	(F-G) TRADE GAP	(max. of E or H) REQUIRED FOREIGN AID
1975	95.20	82.60	15.90	12.60	3.30	12.50	6.30	<u>6.20</u>	6.20
1980	118.52	101.26	23.36	17.26	6.10	19.50	7.37	<u>12.12</u>	12.12
1985	151.16	127.37	30.23	23.79	6.44	29.29	8.97	<u>20.32</u>	20.32
1990	192.92	155.89	38.58	37.03	1.55	41.82	11.45	<u>30.37</u>	30.37
1995	246.22	195.87	49.24	50.36	-1.12	57.81	14.61	<u>43.19</u>	43.19
2000	314.25	246.89	62.85	67.36	-4.51	78.21	18.65	<u>59.56</u>	59.56

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ASSUMED PARAMETER VALUES:

$$\bar{F} = .05$$

$$k = 4.0$$

$$\mu = .30$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\epsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 11 \end{cases}$$

TABLE 12. MACROECONOMIC PROJECTIONS FOR NIGER (CASE C)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	95.26	82.60	15.90	12.60	3.30	12.50	6.30	<u>6.20</u>	6.20
1980	113.86	97.52	23.36	16.33	7.03	18.10	7.37	<u>10.72</u>	10.72
1985	142.32	120.29	35.58	22.02	13.56	26.64	8.97	<u>17.66</u>	17.66
1990	181.64	147.43	45.41	34.21	11.20	38.43	11.45	<u>26.98</u>	26.98
1995	231.82	185.06	57.96	46.75	11.20	53.49	14.61	<u>38.87</u>	38.87
2000	295.86	233.10	73.97	62.77	11.20	72.70	18.65	<u>54.05</u>	54.05

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ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 5.0$$

$$\mu = .30$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$$

$$\epsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 11 \end{cases}$$

TABLE 13. MACROECONOMIC PROJECTIONS FOR SENEGAL (CASE A)
(BILLIONS CFAF; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-C) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	208.0	183.90	42.00	24.10	<u>17.90</u>	59.90	48.80	11.10	17.90
1980	265.47	229.87	53.12	35.59	<u>17.53</u>	74.27	62.88	11.39	17.53
1985	338.81	288.54	67.79	50.26	<u>17.53</u>	92.60	84.14	8.46	17.53
1990	432.41	352.21	86.52	80.20	<u>6.32</u>	116.00	112.60	3.40	6.32
1995	551.87	441.81	110.43	110.07	<u>0.36</u>	145.87	150.69	-4.82	0.36
2000	704.34	556.16	140.87	148.18	-7.31	183.99	201.66	-17.67	-

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ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 4.0$$

$$\mu = .25$$

$$\beta = \begin{cases} .10 & t = 0 - 4 \\ .12 & t \geq 5 \end{cases}$$

$$\epsilon = \begin{cases} .05 & t = 0 - 4 \\ .06 & t \geq 5 \end{cases}$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 11 \end{cases}$$

TABLE 14. MACROECONOMIC PROJECTIONS FOR SENEGAL (CASE B)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	208.0	183.90	42.00	24.10	<u>17.90</u>	59.90	48.80	11.10	17.90
1980	265.47	229.87	53.12	35.59	<u>17.52</u>	74.27	61.10	13.16	17.52
1985	338.81	288.54	67.79	50.26	<u>17.53</u>	92.60	77.99	14.62	17.53
1990	432.41	352.21	86.52	80.20	6.32	116.00	99.53	<u>16.47</u>	16.47
1995	551.87	441.81	110.43	110.07	0.36	145.87	127.03	<u>18.84</u>	18.84
2000	704.37	556.16	140.94	148.19	-7.25	183.99	162.13	<u>21.86</u>	21.86

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ASSUMED PARAMETER VALUES:

$\bar{r} = .05$

$k = 4.0$

$\mu = .25$

$\beta = \begin{cases} .10 & t = 0 - 4 \\ .12 & t \geq 5 \end{cases}$

$\epsilon = \begin{cases} .045 & t = 0 - 4 \\ .05 & t \geq 5 \end{cases}$

$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t > 11 \end{cases}$

TABLE 15. MACROECONOMIC PROJECTIONS FOR SENEGAL (CASE C)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	208.00	183.90	42.90	24.10	<u>17.90</u>	59.90	48.80	11.10	17.90
1980	259.28	224.93	64.82	34.36	<u>30.46</u>	72.72	61.10	11.62	30.46
1985	330.92	282.23	82.73	48.68	<u>34.05</u>	90.63	77.99	12.64	34.05
1990	422.34	344.65	105.59	77.68	<u>27.90</u>	113.48	99.53	13.95	27.90
1995	539.02	432.17	134.76	106.86	<u>27.90</u>	142.66	127.03	15.62	27.90
2000	687.94	543.86	171.09	144.09	<u>27.90</u>	179.89	162.13	17.76	27.90

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ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 5.0$$

$$\mu = .25$$

$$\beta = \begin{cases} .10 & t = 0 - 4 \\ .12 & t \geq 5 \end{cases}$$

$$\epsilon = \begin{cases} .045 & t = 0 - 4 \\ .05 & t \geq 5 \end{cases}$$

$$\alpha = \begin{cases} .15 & t = 0 - 4 \\ .20 & t = 5 - 10 \\ .25 & t \geq 11 \end{cases}$$

TABLE 16. MACROECONOMIC PROJECTIONS FOR UPPER VOLTA (CASE A)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	85.50	86.10	-1.10	-0.60	<u>7.70</u>	14.30	6.60	7.70	7.70
1980	95.91	94.95	10.43	0.96	<u>9.47</u>	16.38	8.83	7.55	9.47
1985	111.84	108.49	16.80	3.35	<u>13.45</u>	19.57	11.82	7.75	13.45
1990	137.48	127.68	27.06	9.80	<u>17.26</u>	24.70	15.82	8.88	17.26
1995	175.33	153.47	35.07	21.86	<u>13.21</u>	32.27	21.17	11.10	13.21
2000	233.77	189.80	44.75	33.97	10.79	41.95	28.33	<u>13.63</u>	13.63

ASSUMED PARAMETER VALUES:

$$\bar{r} = .05$$

$$k = 4.0$$

$$u = .20$$

$$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t > 6 \end{cases}$$

$$\epsilon = .06$$

$$\alpha = \begin{cases} .10 & t = 0 - 4 \\ .15 & t = 5 - 10 \\ .20 & t = 11 - 15 \\ .25 & t > 16 \end{cases}$$

TABLE 17 MACROECONOMIC PROJECTIONS FOR UPPER VOLTA (CASE B)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-C) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	85.50	86.10	7.10	-0.60	<u>7.70</u>	14.30	6.60	7.70	7.70
1980	95.91	94.95	10.43	0.96	9.47	17.42	7.73	<u>9.69</u>	9.69
1985	111.84	108.49	16.90	3.35	<u>13.45</u>	22.20	9.40	12.80	13.45
1990	137.48	127.68	21.5	9.80	17.26	29.89	12.00	<u>17.89</u>	17.89
1995	175.33	153.47	35.07	21.86	13.21	41.25	15.31	<u>25.94</u>	25.94
2000	223.77	189.80	44.75	33.97	10.79	55.78	19.54	<u>36.24</u>	36.24

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ASSUMED PARAMETER VALUES:

$\bar{r} = .05$

$k = 4.0$

$\mu = .30$

$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$

$\epsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$

$\alpha = \begin{cases} .10 & t = 0 - 4 \\ .15 & t = 5 - 10 \\ .20 & t = 11 - 15 \\ .25 & t \geq 16 \end{cases}$

TABLE 18. MACROECONOMIC PROJECTIONS FOR UPPER VOLTA (CASE C)
(BILLIONS CFAF ; 1971 PRICES)

YEAR	A GDP	B CONSUMPTION	C INVESTMENT	D (A-B) DOMESTIC SAVINGS	E (C-D) SAVINGS GAP	F IMPORTS	G EXPORTS	H (F-G) TRADE GAP	I (max. of E or H) REQUIRED FOREIGN AID
1975	85.50	86.10	7.10	-0.60	<u>7.70</u>	14.30	6.60	7.70	7.70
1980	93.83	93.18	10.43	0.65	<u>9.78</u>	16.80	7.73	9.07	9.78
1985	106.57	104.01	16.80	2.56	<u>14.24</u>	20.62	9.40	11.22	14.24
1990	127.08	119.37	27.06	7.72	<u>19.34</u>	26.77	12.00	14.77	19.34
1995	159.81	141.83	39.95	17.98	<u>21.98</u>	36.59	15.31	21.28	21.98
2000	203.96	174.95	50.99	29.01	21.98	49.84	19.54	<u>30.30</u>	30.30

ASSUMED PARAMETER VALUES:

$\bar{r} = .05$

$k = 5.0$

$\mu = .30$

$\beta = \begin{cases} .08 & t = 0 - 5 \\ .10 & t \geq 6 \end{cases}$

$\epsilon = \begin{cases} .03 & t = 0 - 4 \\ .04 & t = 5 - 10 \\ .05 & t \geq 11 \end{cases}$

$\alpha = \begin{cases} .10 & t = 0 - 4 \\ .15 & t = 5 - 10 \\ .20 & t = 11 - 15 \\ 125 & t \geq 16 \end{cases}$

TABLE 19 : FOREIGN AID REQUIREMENTS TO ENABLE THE SAHEL-SUDAN COUNTRIES ATTAIN 5 PERCENT GROWTH RATE OF GDP. 1975-99.

CASE A *

(ALL FIGURES IN BILLIONS 1971 CFAF EXCEPT THOSE FOR MALI WHICH ARE IN BILLIONS 1971 MF)

Period	Country					
	Chad	Mali	Mauritania**	Niger	Senegal	Upper Volta
1975-71	45.28	27.25	zero	35.60	93.45	42.73
1980-84	49.07	39.33	zero	50.68	87.64	54.56
1985-89	63.19	29.06	zero	70.25	52.61	71.27
1990-94	70.78	9.30	zero	95.39	20.26	74.07
1995-99	61.84	zero	zero	125.51	0.36	63.98
TOTAL	290.16	104.94	zero	377.93	253.32	305.61

*See tables 4, 7, 10, 13 and 16 for details of the assumptions referred to as Case A.

**The model projected zero foreign aid requirements for Mauritania. However, see the discussion on pg.

TABLE 20 : FOREIGN AID REQUIREMENTS TO ENABLE THE SAHEL-SUDAN COUNTRIES ATTAIN 5 PERCENT GROWTH RATE OF GDP. 1975-99.

CASE B *

(ALL FIGURES IN BILLIONS 1971 CFAF EXCEPT THOSE FOR MALI WHICH ARE IN BILLIONS 1971 MF)

Period	Country						
	Chad	Mali	Mauritania**	Niger	Senegal	Upper Volta	
1975-71	49.46	30.69	zero	41.97	93.45	42.73	
1980-84	57.06	56.51	zero	76.12	87.64	54.83	
1985-89	69.77	96.92	zero	120.70	79.52	73.65	
1990-94	92.28	145.74	zero	176.23	86.85	104.72	
1995-99	104.73	208.07	zero	247.10	99.93	149.29	
TOTAL	395.35	537.93	zero	662.12	447.39	424.22	

*See tables 5, 8, 11, 14 and 17 for details of the assumptions referred to as Case B.

**The model projected zero foreign aid requirements for Mauritania. However, see the discussion on pg.

TABLE 21 : FOREIGN AID REQUIREMENTS TO ENABLE THE SAHEL-SUDAN COUNTRIES ATTAIN 5 PERCENT GROWTH RATE OF GDP. 1975-99.
CASE C *
(ALL FIGURES IN BILLIONS 1971 CFAF EXCEPT THOSE FOR MALI WHICH ARE IN BILLIONS 1971 MF)

Period	Country						
	Chad	Mali	Mauritania**	Niger	Senegal	Upper Volta	
1975-71	48.49	32.76	zero	39.39	121.99	43.11	
1980-84	43.70	73.55	zero	66.03	159.13	56.99	
1985-89	68.99	103.93	zero	106.04	145.65	78.13	
1990-94	90.30	111.85	zero	157.52	139.51	101.78	
1995-99	108.44	162.62	zero	223.23	139.51	124.25	
TOTAL	359.92	484.71	zero	592.21	705.79	404.26	

*See tables 6, 9, 12, 15 and 18 for details of the assumptions referred to as Case C.

**The model projected zero foreign aid requirements for Mauritania. However, see the discussion on pg. .

TABLE 22: TOTAL FOREIGN AID REQUIREMENTS FOR THE SIX SAHEL-SUDAN COUNTRIES TO ATTAIN 5 PERCENT GROWTH OF GDP. 1975-99.

	CASE A		CASE B		CASE C	
	BILLIONS 1971 CFAF	BILLIONS 1971 DOLLARS	BILLIONS 1971 CFAF	BILLIONS 1971 DOLLARS	BILLIONS 1971 CFAF	BILLIONS 1971 DOLLARS
1975-71	230.69	0.90	242.96	0.95	269.36	1.05
1980-84	261.62	1.02	303.91	1.19	362.63	1.42
1985-89	271.85	1.06	392.10	1.53	450.78	1.76
1990-94	265.15	1.04	532.95	2.08	545.04	2.13
1995-99	251.69	.98	705.14	2.76	676.74	2.65
TOTAL	1,281.00	5.00	2,177.06	8.51	2,304.55	9.01

SOURCE: Tables 19, 20 and 21.

NOTES : (i) The Malian franc (MF) has been converted into CFAF at the official exchange rate. 1 CFAF = 2 MF.

(ii) The CFAF has been converted into dollars at the official exchange rate. 1 dollar = 255.71 CFAF.

4. SUMMARY OBSERVATIONS ON THE PROJECTIONS

Tables 4 - 18 give a summary picture of the behavior over time of each of the variables for the five countries--Chad, Mali, Niger, Senegal and Upper Volta-- for cases A, B, and C. Mauritania is not included because, in view of the expected growth of output and exports from her mining sector, shortage of savings or of foreign exchange, are not expected to be important constraints during our projection period. The two-gap model is, therefore, not quite appropriate to her situation. The final section contains some suggestions regarding a more appropriate model.

Although the model does indicate the value of each variable for each year during the period 1975-2000, we decided to present these values at five year intervals only, beginning with 1975. The reason for doing so lies in our recognition of the fact that changes in weather conditions can be expected to cause significant fluctuations in output and other related variables, during our projection period. Unless we can accurately predict the changes in weather conditions, and also obtain a much better understanding of the relationship between weather and GDP, it is not possible to predict the exact behavior over time of GDP and its related variables. Displaying the values of these variables for each year would give the impression of a degree of precision that seems quite unwarranted under the circumstances.

However, our model does partially take into account the influence of weather conditions on output. Our procedure for estimating capital-output ratios,¹⁶ tries to "average-out" the influence on output of minor droughts.¹⁷ Therefore, if only minor droughts occur during our projection period, and the frequency of this occurrence is not very different from that in the period 1960-70, the trend of the variables indicated by our model should be much more reliable than the yearly values. The values at five-year intervals presented in tables 4 - 18 are meant to be indicative of these trends.

For the same reason, we have presented in tables 19-22, foreign aid requirements for five-year periods only. These have been obtained by adding the annual foreign aid requirements indicated by the model. Again, we hope that these five-year totals will be roughly indicative of the magnitude of foreign aid requirements provided the governments of these countries do take the necessary steps to bring about the changes in parameter values that we have assumed. Such a

16. See Section 6 for details of the procedure.

17. By "minor drought" we mean a period of below normal rainfall lasting only one or two years.

TABLE 23: PER CAPITA GDP PROJECTIONS FOR CHAD, MALI,
NIGER, SENEGAL AND UPPER VOLTA (CASE A)

Country	GDP ^a (millions 1971 \$)	1975		GDP ^a (millions 1971 \$)	2000	
		Population ^b (millions)	Per capita GDP (\$)		Population ^c (millions)	Per capita GDP (\$)
Chad	312	3.8	82	784	6.2	126
Mali	330	5.1	65	1,053	8.4	125
Niger	372	4.1	91	1,229	6.7	183
Senegal	813	3.9	208	2,754	6.4	430
Upper Volta	335	5.4	62	875	8.9	98

Notes: (a) Derived from Tables 4, 7, 10, 13 and 16. The CFAF and MF were converted into dollars at the present official exchange rates: 1 dollar = 255.79 CFAF and 1 CFAF = 2 MF.

(b) Having no information regarding the impact of the recent droughts on population, we made the arbitrary assumption that population in 1975 is the same as it was in 1971. This assumption is in line with our assumption regarding the value of GDP and the other variables in 1975.

(c) Derived from the 1975 population figure assuming a rate of growth of 2 percent per annum. In view of population growth rates in the past, both this assumption and that in (b) are conservative and should make our results appear favorable.

task will certainly not be an easy one. It will require much more in-depth analyses at a micro-level, of the various options available to the economy. Also, it may involve some very hard decisions on the part of policy-makers.

We pointed out in the introduction of this paper that the most important function of macroeconomic projections is to provide planners a broad picture of the development of the economy and to provide advance warning regarding potential bottlenecks in the development process. Let us see what kind of insights regarding the development of the Sahel-Sudan countries are provided by our projections.

4.1 The Level of Per Capita GDP by 2000 A.D.

The difficult task that planners in the Sahel-Sudan countries face is brought out clearly in Table 23, which presents projections of per capita GDP in the year 2000 A.D. Even under the optimistic set of assumptions underlying these projections--a low capital-output ratio, namely, 4.0, availability of foreign capital to meet the savings-gap and/or trade gap, and a rate of population growth of only 2 percent which is significantly lower than the historical growth rate of population in these countries--our projections indicate that only Senegal and Niger will be able to double their per capita GDP during this 25 year period. In Upper Volta, GDP per capita would still be below \$100 in the year 2000, and in Chad and Mali, \$126 and \$125, respectively.

4.2 The role of the absorptive capacity constraint. The reason for the slow rate of growth of per capita GDP in Chad and Upper Volta is to be found in the limited absorptive capacity of these economies. If we had strictly followed the Chenery-Strout method for estimating the parameter β , the maximum feasible growth rate of GDP, we would have obtained an estimate of β that would be close to zero in the case of Chad and Upper Volta. During the decade 1960-70, the level of investment declined in these countries even when measured in current prices. However, we assumed β to be 8 percent during 1975-80, and 10 percent thereafter. Despite this optimistic assumption (in view of past performance), the model indicates that these economies will require almost 15 years before they become capable of achieving a sustained growth rate of 5 percent, even if donors are willing to provide enough foreign assistance to close the "two gaps." If a higher capital output ratio, $k = 5$, is assumed, the corresponding period increases to about 20 years. In the case of Niger and Mali, though, the same assumptions regarding absorptive capacity were made, the relatively higher growth performance is due to the fact that these countries have a higher ratio of investment to GDP in the initial year compared to Chad and Upper Volta.

Our projections, therefore, do bring into focus the importance of the absorptive capacity constraint. Clearly,

policy makers in any developing country will not be satisfied with a development plan that will not even enable them to reach \$100 per capita GDP in the next twenty-five years. The alternative plans that they would then like to formulate for their economy, our model suggests, should lay greater emphasis on steps to improve its absorptive capacity, e.g. setting up schools and institutions for training managers, negotiating a higher level of foreign aid in the form of technical assistance, etc.

4.3. The role of foreign trade. Since cases A and B differ only in their assumptions regarding the marginal import rate and the rate of growth of exports, comparing the results in these two cases can provide useful insights into the important role of foreign trade for the development of the Sahel-Sudan region. An assumption, implicit in the projections, is that sufficient foreign aid will be available to fill the two-gaps, no matter what their size, thereby enabling the economy to sustain the desired growth rate, provided absorptive capacity is not a bottleneck. Since the assumptions regarding absorptive capacity and capital-output ratios are the same in cases A and B, the principal difference between these two is reflected not in the growth of GDP attained over a period of time, but in the amount of foreign aid required to attain that level of GDP.

From the viewpoint of donors, this is perhaps the most significant index since it measures directly the cost that they have to bear. From the viewpoint of policy makers, who may be more interested in the level of GDP attained, however, the difference between cases A and B may not be very significant since the development of GDP is identical in the two cases. A little reflection reveals that in this respect taking the model results literally can be very misleading. Though the model implicitly assumes that the two gaps will be filled by foreign aid, whatever their magnitude, in reality, the amount of foreign aid available to the country may be fixed. If so, the country would be able to attain a higher growth rate of GDP under case A assumptions than it would under case B assumptions.

To illustrate, let us consider the case of Mali. In case A the total foreign aid required to attain self-sustained growth at 5 percent is about CFAF 105 billions. In case B, our projections indicate that Mali would need about CFAF 538 billions during 1975-2000. Also, such an amount of aid would still not enable it to achieve self-sustained growth. The difference between the two cases, from the viewpoint of Malians, lies in the fact that if the amount of foreign assistance available to them was limited to CFAF 105 billion, then, if their foreign trade sector behaved accord-

ing to case A assumptions, they would be able to attain 5 percent growth of GDP. In the other case they would be unable to do so.

Some idea of the importance of foreign trade can be obtained by comparing Tables 19, 20, and 22. Not only does the relatively modest export performance imply a significant increase in total aid requirements (\$5 billion during 1975-2000 in case A vs. \$8.5 billion for the same period in case B), but the differences in aid requirements of individual countries are even more significant. Mali would need MF 105 billion (approximately \$205 million) during the period 1975-95, and would become independent of foreign aid thereafter, in case A. On the other hand, in case B, she would need MF 538 billion (about \$1.05 billion) during 1975-99, and her reliance on foreign aid would still be increasing. Similarly, if her foreign trade sector behaved as implied by the assumptions in case A, the model shows that Senegal could become independent of foreign aid by 1995, after having received CFAF 253 billion (approximately \$1 billion). Under case B assumptions, however, her aid requirements during 1975-99 amount to CFAF 447 billion (approximately \$1.75 billion), and the trade-gap will be increasing.

To the planners and policy makers in the Sahel-Sudan countries, the projections indicate the magnitude of the export-promotion and import-substitution efforts they must

make to achieve a 5 percent growth target. If the amount of foreign aid that they can expect to receive over the next twenty-five years is closer to the amount indicated in Table 19 rather than that indicated in Table 20, they will have to take steps to bring about a 6 percent growth rate of exports and a 20 percent marginal import rate. They also point out, indirectly, the importance of economic cooperation among the Sahel-Sudan countries. Given the small size of their individual markets, cooperation in establishing import-substituting industries may represent the most efficient method of setting up economically viable industries.

To the foreign aid donors, the projections point out that helping the Sahel-Sudan countries to diversify and expand their exports, may represent a much less burdensome way of helping them to attain self-sustained growth. Comparing cases B and C which differ only with regard to their assumptions regarding the capital-output ratio, ($k = 4$ in case B, and $k = 5$ in Case C), the projections indicate that even if development planners in the Sahel-Sudan countries, strive very hard to improve production techniques and to select the type of projects that will result in a low over-all capital-output ratio, their reliance on foreign aid will not be substantially reduced if their exports do not expand significantly. Moreover, since the trade-gap dominates in each country in case B for almost the entire projection period,

TABLE 24: NET FLOW OF LOANS AND GRANTS TO
CHAD, MALI, NIGER, SENEGAL AND UPPER VOLTA

(All figures in Billions CFAF except those
for Mali which are in Billions MF)

	Average 1965-1968	1969	1970	1971
Chad	6.00	5.62	5.45	7.49
Mali	10.45	10.65	10.29	18.84
Niger	5.72	9.21	11.53	12.66
Senegal	12.83	12.56	10.43	14.96
Upper Volta	4.90	6.15	5.60	7.49

Source: U.N. documents.

the foreign aid requirements would not be significantly lowered even if planners could reduce the capital-output ratio further.

4.4 The required inflow of foreign aid. The foreign aid requirements in cases A, B and C presented in Tables 19, 20 and 21 respectively, may be compared with the amounts of net flows of loans and grants to the five countries during 1965-71. For Chad, Niger and Upper Volta, if the level of foreign aid is maintained at the same level as the 1965-71 average, the 5 percent growth target will be very difficult to sustain. In fact, the total amount of foreign aid required by these three countries during 1975-99 in case A is almost twice as high as that implied by maintaining the 1965-71 average net capital inflow during 1975-99. For Mali and Senegal, the amount of foreign aid required during our projection period is substantially below that implied by maintaining the 1965-71 average inflow, if case A assumptions are satisfied. However, in Senegal, the average capital inflow required during the first ten years is considerably higher than the 1965-71 average.

In cases B and C, the average requirements of all countries are about twice as high as their 1965-71 average, as can be seen by comparing Tables 20 and 21 with Table 24.

4.5 The case of Mauritania. For Mauritania, initial values of the variables and the values of parameters

derived from historical data are such that the model indicates that enough savings and foreign exchange will be available to sustain a 5 percent growth rate of GDP. In fact, even for an 8 percent growth target, the model predicted no bottlenecks. These results must be treated with caution, however, since most of the investment in the past decade was carried out by foreign investors who brought with them not only the financial resources but also the required skilled personnel. In the future, even though earnings from existing mines may be sufficient to finance investment and import requirements implied by a high growth target, the economy's limited absorptive capacity may prove to be a bottleneck, particularly, if foreign investment and the concomitant inflow of skilled personnel slows down, or stops altogether. Thus even though Mauritania may have ample financial resources, continuation of technical assistance, and assistance in manpower development programs may be necessary.

4.6 Sensitivity of the projections to assumed parameter values. Comparison of cases A, B and C has already provided us information regarding the sensitivity of our projections to the assumed values of the capital-output ratio, the growth rate of exports, and the marginal import-rate. In this subsection we present the results of some further sensitivity tests that were performed for Senegal. We may

again remind the reader that, since the model projects GDP on the assumption that the two-gaps will be filled by foreign aid, whatever their size, even widely different assumptions regarding saving propensities, growth rate of exports, capital-output ratios, etc., may lead to identical projections of GDP. GDP is therefore, not an appropriate variable for performing sensitivity tests. On the other hand, different assumptions regarding these parameters will lead to different requirements of foreign aid. We shall therefore, perform our sensitivity tests by looking at how the amount of foreign aid needed to enable GDP to grow at the target rate, varies when a particular parameter is changed. Such a sensitivity test is meaningful not only from the viewpoint of donors, but also from the viewpoint of policy makers in the underdeveloped country. This is so because in reality, the amount of foreign aid that will be made available to the country is likely to be fixed. Therefore, the type of parameter changes that in our projections indicate higher foreign aid requirements, will in the real world, lead to a slower growth of GDP.

In presenting the results of our sensitivity analysis, we would like to stress their qualitative nature rather than the precise numerical values that our model gives. Also, we believe that the conclusions of this analysis will apply, in a qualitative sense, to our projections for the other coun-

tries of the region.

4.6.1 Implications of changes in capital-output ratios. As shown in the following section, the capital-output ratio, k , estimated from historical data for the economy of Senegal is about 6.0. Aside from the influence of weather, an important reason for this high estimate of k is that during the 1960's a very high proportion of investments in Senegal, were concentrated in building social infrastructure, and other projects with very long gestation periods. This also partly explains why the estimate of k for Senegal is substantially higher than the corresponding estimates for the other Sahel-Sudan countries. The value, $k = 4$, which was used in case A for Senegal, was based on the assumption that planners will immediately take steps to lower the overall capital-output ratio. Such steps would include, among others, a shift in the pattern of investments in favor of projects with shorter gestation periods, and efforts to improve techniques of production in the agriculture and livestock sectors. Another set of projections was made under the assumption of a more gradual decline in k . It was assumed that k will be 6.0 during 1975-79, 5.0 during 1980-84, and 4.0 thereafter. The assumptions regarding the other parameters were exactly the same as in case A. Comparing this set of projections with those obtained in case A, we

found that the foreign aid requirements during 1975-99 increased from CFAF 253 billions to CFAF 558 billions. Also, whereas in case A, the country would be able to attain self-sustained growth at the target rate of 5 percent by 1995, under the assumption of a more gradual decline in k , dependence on foreign aid would continue beyond the year 2000 A.D. If the capital-output ratio decreases at an even slower pace, or does not decrease at all, the dependence on foreign aid is likely to be much greater.

Clearly, the exact numbers are not important, but our results do serve to illustrate the importance of immediate steps to lower capital-output ratio for the economic development of the Sahel-Sudan countries.

4.6.2. Implications of changes in saving rates.

To test the implications of changes in the marginal savings rate, a set of projections was made under the same assumptions as case A except that a different time path was assumed for the marginal savings rate, α . It was assumed to be .12 between 1975-79, .15 between 1980-84, and .20 thereafter. The implication of this more modest savings effort was that the amount of foreign aid needed during 1975-99 increased to about CFAF 460 billions. Again, the savings gap would persist even beyond the year 2000. Obviously, the amount of foreign aid needed would be larger if the marginal savings rate increased over time at an even slower

rate.

Again, the qualitative nature of the result is important. It suggests that if the amount of foreign aid that the Sahel-Sudan countries have received in the past is any guide to what they can expect to receive in the future, they will have to make a tremendous effort to increase their savings if they wish to attain a 5 percent growth rate of GDP.

4.6.3 Implications of higher growth rates. Projections were also made for Senegal assuming a target growth rate of 6 percent. When this high target growth rate assumption was made in conjunction with the same assumptions regarding the other parameters as in case A, the model projected total foreign aid requirements of about CFAF 400 billions and a GDP in the year 2000 amounting to CFAF 875 billions in constant 1971 prices. Also, under these assumptions, the model indicated that the economy will be able to sustain its growth target beyond our projection period without further reliance on foreign aid. In case A, though the total foreign aid requirements are lower (about CFAF 253 billion), the level of GDP attained is only CFAF 705 billion.

By comparing the above mentioned results with cases B and C for Senegal, we can see that the amount of foreign assistance necessary to support a high growth rate under

high performance assumptions, may be substantially less than that needed to sustain a lower growth rate under more modest performance assumptions. If the amount of foreign aid donors were willing to provide Senegal over the next twenty-five years is limited to CFAF 400 billions, high performance of the type envisaged in case A may enable it to attain self-sustained growth at 6 percent. With more modest performance, the same amount of foreign aid may prove to be inadequate to sustain a 5 percent growth rate.

Another set of projections was made with a target growth rate of 6 percent. This time it was assumed that the capital output ratio is 6.0 during 1975-79, 5.0 during 1980-84, and 4.0 thereafter--the same assumption as in subsection 4.6.1. All other parameters were assumed to be the same as in case A for Senegal. The model indicated foreign aid requirements during 1975-99 exceeding CFAF 1000 billion. Clearly, given reasonable expectations of foreign aid availability, a 6 percent growth rate will not be feasible unless efforts are made to lower the overall capital-output ratio.

5. LIMITATIONS OF THE PROJECTIONS

It seems appropriate to point out the following limitations of our projections.

(1) As mentioned earlier the capital-output ratios used in the model have been estimated so as to "average-out" the influence on output of minor droughts. Provided only minor droughts occur during the projection period, these projections may provide policy makers in the Sahel-Sudan countries with a useful preview of the future development of their economies. However, if a major drought,¹⁹ such as the one recently experienced by the region, occurs during our projection period, these projections are likely to be rendered meaningless. A major drought causes not only a temporary decline in output, but also severe dislocation throughout the economy, and it is not possible to "average-out" its influence by adjusting our capital-output ratios. We may derive some consolation from the fact that historical data on rainfall in the region for the last 400 years, indicate that a major drought occurs once in 25-30 years. Thus, if the historical pattern of rainfall in the region continues into the future, we may have some confidence in the projections. By the end of our projection period, we hope that

19. We may define a major drought as a period of below normal rainfall lasting three years or more.

the development that takes place during the twenty-five years, will have made these economies much less vulnerable to future droughts.

(2) The Chenery-Strout model is too aggregative. In fact, it treats the economy as if it produces just one commodity. Such a model can be profitably used to test the consistency between a given set of targets and the constraints assumed to operate in an underdeveloped economy, and to identify broad areas towards which policy measures can be directed so as to remove potential inconsistencies. But this is only the first step in economic planning. The next step usually is to plan the development of the major sectors of the economy because, in reality, no economy produces only one commodity, and due to a number of reasons, different sectors of the economy should experience different rates of growth. To perform this important task a model that distinguishes between the different sectors of the economy is required.

Given the quality of the economic data for the Sahel-Sudan countries, the size and degree of inter-dependence of their industries, etc., an elaborate multi-sectoral model of the Leontief type, is not needed. In fact such a model may do more harm than good by deflecting the attention of planners from much more important tasks of evolving useful poli-

cies and institutions.²⁰ What is needed, is a model that divides the economy into a few important sectors, such that planners can use it to determine the main conditions for "balanced" growth,²¹ which they must take into account in designing policies. One of the main-sector models, developed by Shinichi Ichimura²² in a report on programming techniques for economic development prepared for the UN ECAFE, may serve as a convenient starting point.

(3) Finally, though the model can give planners quite useful information regarding the nature and magnitude of structural changes that are needed to bring about a desired

20. In the words of W. Arthur Lewis: "The recent trend towards putting more figures into Development Plans has unfortunately tended to obscure the fact that what matters in planning is not mainly figures but mainly policy. It is possible to write a good Development Plan without using any figures, by concentrating on policies which will stimulate an upward movement of the economy. It is also possible to write a Development Plan which is mathematically completely consistent, but which will nevertheless achieve nothing, because policies are lacking." W.A. Lewis, "Development Planning", (London: George Allen and Unwin Ltd., 1966), p. 22.

21. "Balanced" growth of the sectors does not mean that they must all grow at the same rate, but that their growth rates must be in proper relationship to each other. These proper relationships depend, of course, on such factors as growth rates of consumers' demand for each sector's output, each sector's input requirements, etc.

22. United Nations, ECAFE, Programming Techniques for Economic Development, Report of the first group of experts on programming techniques. (Bangkok, 1960). See Chapter III and Appendix to Chapter III.

pattern of economic development, it is not an appropriate framework within which the optimal mix of policy instruments necessary to implement these changes, could be meaningfully discussed. For example, it may indicate that given planners' realistic assessment of foreign aid availability, the marginal savings rate must be increased from 15 percent to 20 percent, in order to achieve the desired rate of growth of GDP. But a number of policy instruments could be used for this purpose. Various taxes could be changed in order to increase public savings. Incentives could be given to different groups in the private sector so as to increase private savings. The optimal mix of these policy instruments can be arrived at only after conducting a detailed inquiry, at the micro level, regarding the effectiveness of these instruments.

6. A NOTE ON DATA PROBLEMS

The problems encountered in obtaining and analyzing the data for our projections are briefly discussed in this section. For the sake of concreteness, we present in Table 25, the GDP data for Upper Volta that we were able to compile from different sources. As the reader can see, we have data for only three years--1964, 1968, and 1970. The Surveys of African Economies published by the IMF²³ does provide data for the years 1965 and 1966. According to the IMF data, GDP in current prices in 1965, 1966 was CFAF 56.5 billions and CFAF 58.2 billions, respectively. Total consumption in the same years was CFAF 46.8 billions and CFAF 48.9 billions. Obviously, these data are inconsistent with those in Table 25. Similar problems of inconsistency of data from different sources were encountered in compiling the GDP data for all the Sahel-Sudan countries.

6.1 Procedure used for Estimating Capital-Output Ratios

In our projections we have used the incremental gross capital-output ratio.²⁴ This is calculated by dividing

23. International Monetary Fund, Surveys of African Economies, vol. 3 (Washington, D.C., 1970).

24. For an exhaustive list of the various capital-output concepts (average, marginal, incremental, ceteris-paribus, historical, projected, net, gross, etc.) and a discussion of the differences among them, see Gunnar Myrdal, Asian Drama (New York: Pantheon, 1968), vol. III, Appendix 3 by Paul Streeten.

dividing the gross investment during a period of time by the increment in GDP over that same period of time. Sometimes the period of time may be one year. For the Sahel-Sudan countries however, such a short period of time is not appropriate due to wide fluctuations in output caused by the weather. We therefore estimated the capital-output ratio by treating our unit of time as five years. In symbols, our estimate of k is obtained as

$$k = \frac{\sum_{T=t}^{t+4} I_T}{V_{t+5} - V_t}$$

As is obvious from the above formula, we have assumed a one year lag between investment and the resulting increase in output. Provided we choose our time period so that the two extreme years are 'normal' in terms of weather, this procedure gives fairly stable estimates of capital-output ratios.

Using this procedure we obtained an estimate of k for Senegal of about 6.0. For the other countries, the estimates ranged from 3.0 for Mauritania to 4.5 for Mali. The extremely high value for Senegal is due to the composition of investments during the 1960's which were concentrated in infrastructure and other projects with long gestation periods.

6.2 Estimating the values of other parameters

The problems encountered in making estimates of

other parameters can be illustrated by the example of Upper Volta. Table 25 shows that the average growth rate of exports for the period 1964-70 is almost 12 percent. However, the exports begin from such a low base, and the time period for which we have data, is so short that extrapolation is very dangerous. The export data for the other countries also showed average growth rates of exports ranging between 7 and 11 percent. The qualifications that we made in the case of Upper Volta are also applicable for the rest of the countries.

TABLE 25: UPPER VOLTA, GDP (USES), 1964, 1968
1970 (ALL FIGURES IN BILLIONS CFAF:
CURRENT PRICES)

	<u>1964</u>	<u>1968</u>	<u>1970</u>
Consumption	69.1	76.9	86.1
Gross domestic Investment	7.7	7.5	7.1
Exports	3.5	6.5	6.6
GDP (1 + 2 + 3 - 4)	69.2	77.9	85.5

SOURCE: U.N. Documents

The data on gross investment in Upper Volta shows a decrease in investment between 1964 and 1970, the only

period for which we have data. So the Chenery-Strout procedure²⁵ for estimating the maximum feasible growth rate of investment, β , could not be used. The investment data for Chad showed a similar trend. By using the Chenery-Strout procedure the estimates of β obtained for Mali, Mauritania and Senegal were 8 percent, 20 percent and 10 percent respectively. The high estimate for Mauritania is due to the fact that most of the investments were made by foreigners who also brought with them the required skilled personnel.

We have estimated the marginal import rate, μ , by dividing the increment in imports by the increment in GDP over a period of time. Using this procedure we obtain an estimate of μ equal to 20 percent for Upper Volta during the period 1964-70. The estimates of μ for the other countries were also in the neighborhood of 20 percent. In cases B and C of our projections, the assumption that the marginal import rate will be 30 percent has been made in view of the possibility that the need to import machinery, raw materials and consumer durables might increase once the process of development was underway.

The marginal savings rate, α , was estimated by dividing the increment in savings by the increment in output over a

25. The Chenery-Strout procedure for estimating β is discussed on p. 142.

period of time. Using this procedure for Upper Volta we obtain an estimate of α equal to minus 4 percent for the period 1968-71. For Chad, the estimate of α for the period 1968-71, is also minus 4 percent. Positive values of α were assumed, however, for our projections since they are not intended to be mere extrapolations of historical trends. Judging from what other underdeveloped countries have been able to achieve, the type of savings performance we have assumed in our projections for these countries, does not seem to be infeasible.

APPENDIX B

ASPECTS OF FISCAL
POLICY IN SENEGAL

and

TAX STRUCTURE IN
SENEGAL - A DESCRIPTION

APPENDIX B-1

1. ASPECTS OF FISCAL POLICY IN SENEGAL

This paper is divided into three parts. In the first section we will review the tax structure and expenditure policies and ask whether they are suited to fostering economic growth. In the second section we shall briefly examine an area of budget-policy which we feel is a possible source of significant efficiency losses. In the third section we take a look at the distributional content of present policies. While the paper is intended to be primarily diagnostic we shall discuss policy alternatives where they seem appropriate.

1.1 Economic Growth

In discussing fiscal policy and growth we will first present a simple model of economic growth. We shall rely on the Harrod-Domar model. We then examine how fiscal policy can be employed to raise economic growth, and how far it is being used in Senegal. Growth models have generally been of the pure supply constraint variety and this provides a reasonable fair description of growth in developing economies. The availability of factors has been considered the essential constraining feature in the longer run. The modeling of the investment decision in developing countries has been built around supply considerations, and not demand considerations such as the motiva-

ions of entrepreneurs, that predominate in developed economies. In these models it is implicitly assumed that no matter what demand conditions might result, there is always a sufficiently large set of investment projects which will yield a satisfactory rate of return to absorb savings. The constraint on the rate of economic growth becomes the supply of savings. Investment confidence and incentives are redundant concepts in such a model and Keynesian economics becomes irrelevant. An act of foregone consumption is automatically an act of increased savings and therefore investment. Government policy of raising the savings rate can proceed without fear of so depressing consumption that income falls--investment automatically results from the savings.

Formally we can write the model as follows:

First an equation expressing the investment-savings equality.

$$I = \Delta K = s \cdot y. \quad (1)$$

The second equation relates income to capital stock in a linear fashion.

$$Y = \frac{K}{k} \quad (2)$$

Hence from (1) (2)

$$g = \frac{\Delta K}{K} = \frac{s}{k} \quad (3)$$

Where I = investment

ΔK = change in capital stock

y = income

k = capital-output ratio

K = capital stock

s = savings rate

g = growth rate

We assume that population is not a constraining factor. From equation (3) we deduce the rate of economic growth in this model is a function of the capital output ratio and the savings rate. The growth rate increases linearly with the savings rate.

This is not an altogether unfair description of the way developing economies grow. The emphasis is removed from the problem of insufficient aggregate demand to one of insufficient aggregate capital supply. Government policy is now constrained by the amount consumption can be reasonably reduced before a subsistence income is reached. If that amount is small the government cannot generate a great deal of extra savings. In the Sahel, Senegal is the only country in the Sahel-Sudan region with an income per capita somewhat above a subsistence level. Fiscal policy as a growth instrument therefore has potentially more leverage than in the remainder of the Sahel-Sudan countries, although the principals espoused here could be applicable to the re-

maintaining countries; especially as they experience economic growth in the future.

Now suppose we consider a foreign sector. So long as the foreign company's investment is sensitive to the rate of return to capital, policies which raise the rate of return to capital (say by reducing corporate profits tax) will attract foreign capital into the country. The interest elasticity of supply determines the proportionate increase in investment for a one percent increase in the rate of return to capital. If this elasticity is high then increasing the rate of return on foreign investment will result in a large increase in investment. If the elasticity is small then using government revenues to stimulate the rate of return will result in only a small increase in overseas investment. A government which is seeking to maximize the present discounted value of the future flows of utility from consumption will only choose to subsidize investment if the present discounted value of consumption that would have resulted from alternative government expenditure is less than the present discounted values of the consumption induced by investment subsidies. If the flow of consumption induced by investment subsidies is to be sufficiently large, then the subsidies must induce an overseas company to initially make a sufficiently large

investment to stimulate those consumption flows. It follows that there is a lower bound on the interest elasticity of investment, ceteris paribus, which makes the subsidy optimal for government. An estimate of that elasticity is required before judgment on investment incentives can be made.

Let us now move on to put the following question to the model: How might the level of economic growth be raised?

The government could use fiscal devices to raise the savings rate to the optimal level. The fiscal contribution of the government to economic growth may then be gauged by its impact on the savings rate. How might we assess this? Insofar as the government can reduce consumption using fiscal measures and raise either private or public saving, then the savings rate is increased. Generally the view has been taken that a higher tax effort (ratio of taxes to GNP) will induce an increase in the savings rate. Economists have often pointed to the statistical fact that countries with higher GNP generally have higher tax efforts.¹

1. G.S. Sahota, Indian Tax Structure CH I PI.

Senegal's tax system is geared to a considerable tax effort (18.2%); however, we must ask how the tax income is spent before any judgment can be reached about the impact of the fiscal system on the growth rate. For example, suppose the government chooses a tax system which raises taxes (T) and, since it changes disposable income, changes private savings (S) in the following linear manner:

$$S = aT \quad (4)$$

Where we would normally expect a to be negative.

Suppose for every dollar spent by the government (G) a proportion is invested in productive projects (I), then:

$$I = bG \quad b > 0 \quad (5)$$

Suppose also the government has a balanced budget

$$G = T \quad (6)$$

so that increase in net investment is given by

$$I + S = (b+a)T \quad (7)$$

Then for a higher tax effort to raise the rate of growth, a necessary and sufficient condition is that a is greater than -b. From the point of view of economic growth we would attempt to maximize a.

Consideration of equation (7) leads to the conclusion that if fiscal instruments are to be effective in raising the rate of economic growth there are three distant options that could be employed. These fiscal options are not mutually exclusive.

Option 1. Holding the level of taxes, and both the level and structure of expenditures constant, alter the structure of taxes to increase algebraically a.

Option 2. Holding the structure of taxes constant, and the structure of expenditures constant, raise (or, exceptionally, lower) the levels of expenditure and taxation.

Option 3. Holding the structure and level of taxation and the level of expenditures constant, alter the composition of expenditures to raise b.

The conclusions we shall reach and the arguments that will be made in the ensuing sections can be anticipated at this juncture. It appears that it is not possible to significantly reduce 'a' by reorganizing the tax structure while holding tax revenues constant, without incurring distributional problems. Secondly, we find that despite the revenue raising suggestions that are considered which lead from the conclusion that it is possible to raise somewhat the level of taxation and still remain in the mainstream of international tax systems, revenue raising on a more significant level will probably incur the problems of political constraint and economic distortion. Finally, we find that option 3 if carefully and imaginatively pursued could free the most significant quantities of resources for use by development planners.

1.1.1 Option 1

In order to propose a restructuring of the tax system, which, for every unit of taxation will increase the share of foregone consumption and reduce the share of foregone savings, we must take a view as to the impact of the major taxes on the consumer savings decision.

In order that the argument be structured clearly, this issue is discussed under two more specific, yet somewhat arbitrary questions.

(1) Is the differential rate of taxation on unearned to earned income significant?

(2) Is the source of the bulk of tax revenue markedly more depressing on savings than feasible alternative sources of that revenue?

The choice of a tax rate on the earnings from capital is dictated by equity as well as growth considerations. The question posed is aimed to reveal the government weighting of these criteria and to assess the implications of the policy.

In Senegal unearned income from bank deposits and equity holding bears a tax of 16 percent (the tax on movable capital) in addition to the global "2nd stage" income tax (I.G.R.). Earned income faces a 2 percent tax at the "first stage" and whatever proportion of

the 3 percent "payroll" tax the employer is able to pass forward to the employee. At the second stage earned income also pays the I.G.R.

If we assume after "passing forward" the wages and salaries tax is 4 percent, then net income from a given sum which is totally earned is 14.3 percent greater than net income which is totally unearned.² Depending on the magnitude of the elasticity of savings with respect to the rate of return the combination of the tax on capital and the income tax will reduce savings. A reduction of the capital tax to 4% would remove the differential and reduce the overall tax rate on savings. This would reduce revenue by approximately 525 m CFA which would have to be found elsewhere if tax revenues are to be maintained. The corporate tax rate is currently 33.3 percent which is not high by international comparison, and this weakens the case for reducing the tax on income from capital.

If we assumed the capital tax were reduced

2. The actual rate reduction required to increase the return to capital by 5 percent is not independent of the I.G.R. tax rate. It is therefore more straight forward to argue in terms of the net post-tax rate change and to then work back and determine the reduction of the "movable tax" rate that would provide a reduction of 5% on average across the income tax categories.

so that the return to capital increased by 5 percent³ then if also we postulate a range of savings elasticities we can project the increased private saving that would be induced.

TABLE I

<u>Savings elasticity</u>	<u>0.5</u>	<u>0.2</u>	<u>0.05</u>	<u>0.01</u>
Increased saving (in billions of CFA)	1.7	.7	.17	.04

From the tax income from "movable capital tax" and from the distribution of taxpayers across the marginal tax brackets, we calculate that an increase in the average rate of return to capital of 5 percent would cost the Treasury between 250 m CFA and 400 m CFA.

Now we assume the government allocates 48 percent⁴ of its budget to "productive investment". The term "productive investment" is interpreted here to include health and education expenditures as well as direct development investment, but does not include defense and administrative services. We may now calculate the savings foregone by the government.

3. This figure is derived from the National Income Accounts after taking the definition of productive investment to include the following expenditures: Rural Development, Public Works Plan, Industry and Trade, Education, and Health.

4. Since the IGR global income tax rate is independent of income source, this holds for all income brackets.

TABLE II

<u>Cost to the Treasury</u>	<u>250m</u>	<u>450m</u>
Foregone public Investment	120m	216m

To stimulate private savings greater than 216 m CFA, we can see from Table 1 a savings elasticity greater than 0.06 would be required. We have not had the resources in preparing this report to estimate the elasticity of saving with respect to the interest rate. It would seem, however, that to expect an elasticity of supply greater than 0.06 is not unreasonable.

Let us now calculate the differential incidence on saving of a tax on consumption goods and the capital tax. If we take the view that tax on consumption goods will on the average depress saving only by a factor 's' multiplied by the magnitude of tax receipts, we can estimate the foregone private savings that an investment tax on consumption (an increase in the sales tax rates) would induce. Suppose we assume that an increment in consumption taxes of 100,000 CFA results in a fall in savings of S.100,000 CFA. We may then tabulate the foregone savings if a consumption tax is imposed to raise the revenue, which the tax on capital formerly raised.

TABLE III

<u>Revenue</u>	<u>450</u>	<u>250</u>
Foregone savings		
rate S = 10%	45.0	25.0
rate S = 15%	67.5	37.5
rate S = 20%	90.0	50.0

In millions of CFA.

In the balanced budget case, where a reduction in the tax on capital is matched by an increase in consumption taxes, we only require private savings to increase by the amount savings was reduced when the sales tax was supplied. This amount is given in the table directly above for a range of savings rates. For the most pessimistic case where the Treasury raises 450m CFA and the proportion of reduced savings out of tax revenue equals 20 percent, the foregone savings is only 90m CFA which the reduced tax on capital will induce so long as the savings elasticity is greater than 0.025.

In view of these arguments it would appear that a reduction of the tax on movable capital based on growth criteria and an increase in indirect tax rates to offset revenue loss will, for reasonable parameters, increase the savings rate. However, we should carefully note the magnitude of the anticipated savings increase. If the government has to raise 450m CFA to finance the change, and if savings elasticity is as high as 0.1 the increment in

savings is only 250,000 CFA which is just under one percent of current savings. As a final note we should recognize that equity criteria might indicate a higher tax rate on unearned income which provides a separate argument for not reducing the tax on capital income.

In this section we will ask whether the major source of tax revenue has a dampening effect on private savings greater than alternative sources of the bulk of tax revenue.

The bulk of government income is raised from import taxation (an average of 38% 1969/71). To raise a significant proportion of that revenue with another tax would seem limited to either major increase in sales and production taxes or a substantial increase in direct income tax rates. There is no reason to believe that the differential incidence on the rate of saving would be to increase savings for any of the candidate replacements. It would seem therefore that the current basic structure of the tax system is not inimical to economic saving and growth and that little impetus to the system could be given by restructuring tax revenues.

In summary we have found little evidence that Option 1 would significantly raise the rate of total saving and thereby the rate of economic growth. However,

there is the added caveat that we found a reduction in the tax on "movable capital" and a corresponding reduction in government expenditures, under conservative estimates of necessary parameters, would require an elasticity of savings of only 0.06 to raise savings. Also, we found that if a consumption tax increase offset the reduction in tax on capital, a savings elasticity of 0.02 would be sufficient to increase savings for reasonable parameter estimates. However, we pointed out that increased savings induced by a 5 percent increase in the return to capital and an offsetting consumption tax would be only in the order of 1 percent of total savings.

1.1.2 Option 2.

The question we shall tackle in this section is whether there is scope for increasing the level of taxation within the Senegalese economy, which will produce resources for government expenditures on investment. Questions of tax changes are often subject to political constraint, and because of this, we shall attempt to do no more than raise alternatives, point out their implications, and where possible point to international comparisons to justify or refute policy alternatives. Our general conclusion is that while there is room for increasing revenues in certain areas by placing the tax structure in the mainstream

of international tax systems, revenues so generated will not increase tax income by more than 5 percent of current tax revenue.

Senegal already raises a high proportion of taxes to the level of GNP. In the following table IV several developing countries and their ratios of taxes to GNP in 1966/68 are presented.⁵

TABLE IV

<u>Country</u>	<u>Tax as % of GNP</u>
Zambia	28.6
Brazil	20.6
Ivory Coast	19.7
Senegal	18.2
Mali	15.0
Chad	13.7
Ghana	13.3
India	11.6
Mexico	9.9
Pakistan	8.3

The indication from this table is that the Senegal economy is already reasonably highly taxed and it anticipates our conclusion at the end of this section. The removal of resources from the private, to the public sector, would not seem a major source of stimulus to economic growth, if the Senegal economy is to maintain a tax structure similar to other nations.

5. This table is drawn from the calculations of R. Chellich, "Trends in Taxation in Developing Countries, " IMF Staff Paper, July 1971.

--Income Taxes:⁶ In 1970/71 direct taxes, excluding poll taxes, accounted for 21 percent of tax income. In the following table we compare this with some other economies.⁷

TABLE V

<u>Country</u>	<u>Year</u>	<u>Percent Direct Taxes to Total Tax Revenue</u>
Ghana	1965	18
Canada	1966	32
U.S.	1966	29
Peru	1964	24
Ceylon	1965	21
Burma	1966	59
India	1966	22
Pakistan	1966	12
Israel	1966	43
Senegal	1970	21
Brazil	1964	34
Zambia	1964	53
Mexico	1965	43

While the proportion of direct taxes raised in Senegal corresponds to the proportion raised in India it would seem that income is relatively lightly taxed. The remainder of this section provides an examination of the income tax schedules in Senegal.

In order to compare the direct tax structure with some other systems we shall look at some

6. We shall not deal with the important questions of administrative reform which have been dealt with elsewhere.

7. United National Statistical Yearbook.

"Western" economies during the 1950's when income was virtually half the level today, and also with some less developed economies during the same period.

First we shall compare between countries the minimum income required for a man with a wife and two children to pay taxes. In order to do this we compute the ratio of this minimum required income level, \hat{Y} , to the average income level, \bar{Y} , and thereby compare the relative point within the income distribution at which income taxation begins. The figures are presented in the following table.⁸

TABLE VI

<u>Country</u>	<u>Year</u>	$\frac{\hat{Y}}{\bar{Y}}$
Senegal	1970-71	6.9
Australia	1954-55	0.9
Israel	1952-53	6.6
Japan	1953-54	2.3
India	1954-55	14.5
Mexico	1950	1.5
Pakistan	1954-55	18.0
Pakistan	1967-68	1.2
Egypt	1951	3.6
UK	1954-55	1.8

In comparison with India and Pakistan, 1954-55 Senegal begins an income taxation at a lower level relative to average income. The ratio is not so low as for Egypt, Mexico, Ja-

8. The data in this and the following table is taken from "Indian Tax Structure" by G.S. Sahota (Delhi Institute 1961).

pan or Western economies. In addition, it would seem possible to make a case for lowering the minimum taxable income, however, we shall do no more than raise that particular question for official consideration. The floor of the first tax bracket is set sufficiently high, however, for the following question to be raised: Is 2 percent too low a figure for the first tax bracket? This tax bracket is twice the average national income in width so that the rate of 2 percent applies to a relatively large income band. Rather than tackle this question separate from the question of the rates for incomes above the first tax bracket, we postpone answering the question we have posed.

An alternative way of looking at the system is to ask what is the percentage of taxes to earned income for a man with two children at different income levels. The comparisons are presented in the following table. We assume for simplicity that all income is labor income.

TABLE VII

<u>Country</u>	<u>Income (multiple of national average)</u>	
	<u>10</u>	<u>20</u>
Senegal	2.7%	6.8%
Pakistan	20.0%	40.0%
Australia	25.4%	42.0%
Japan	26.7%	38.5%
Mexico	1.5%	2.3%
India	0.0%	2.3%
Ceylon	0.0%	0.3%
Egypt	3.0%	3.9%
UK	27.5%	44.1%

Data for each country is 1950 except Pakistan, Senegal, and India which are 1968-69 and 1970-71 and 1957 respectively. In terms of this comparison Senegal scores close to the bottom of the list. The average tax rate in Senegal rises only slowly with respect to income increases due to the gently increasing marginal tax rate and the quotient system of family allowances. If Senegal is to move closer to the mainstream of international tax policy an increase in average tax rate would seem appropriate. We might ask: suppose the quotient system were abolished but 50,000 CFA tax deduction was permitted for a wife and 25,000 CFA tax deduction was permitted per child, how does this affect the average tax rates? The average tax rate for an income earner 10X greater than the average becomes 6.9 percent and for an income earner 20X greater than average the average tax rate is now 14%. While such a reform is hardly sufficient alone to raise average tax rates to anything approaching Western economies it would lead to a structure closer to the developing countries. An increase in the marginal tax rate for each range would further increase the average tax rate. Such marginal increases would not be unreasonable by international comparison, however, the political constraints may make both abolition of the quotient system and an increase in rates unacceptable.

An exact calculation of the increased

revenue such a tax reform would yield is beyond the data sources at our disposal, however, with a suitable choice of ranges for the crucial variables we can reach an approximate indication.

In order to carry out this calculation we first need to estimate the typical family composition in each income bracket from given data and use that family composition estimate to predict tax receipts under the new allowance system. Using data provided by the Ministry of Finance of Senegal, the revenues in each income bracket appear to fall approximately between the revenues that would be generated by the following 2 groups:

Group 1: The taxpayers are half single men and half married men with 4 children.

Group 2: The taxpayers are half single men and half married men with 2 children.

We can therefore estimate the revenue for these 2 groups under the allowance system described above, where a wife receives an allowance of 50,000 and children 25,000 CFA each.

	<u>Group One</u>	<u>Group Two</u>
total tax revenue (millions of CFA)	2,700	2,900

The estimates for income tax revenue

under the revised allowance system are presented above. The actual revenue we estimate would lie between the 2 figures but perhaps a more conservative range would be 2,500-3,000 million CFA. Revenue under the old allowance system was 1,355 million CFA.

We recognize the significant increase in revenues that would result from this single reform. However, should the allowances be doubled or even tripled, tax revenues would remain above 2,200 million CFA so that there is considerable room to keep earners with large families at the bottom end of the income scale, at their old net income level.

While we can justify an increase in average tax rates by international comparison we should briefly note one drawback. It would seem correct to assume that we are raising the taxation from those with the highest marginal propensity to save hence we might expect private savings to be markedly reduced.

--Import Taxes: As was pointed out in the description of the tax system, import taxes are the largest single revenue-raising instrument. Furthermore, it has been the change in the structure of imports from consumer goods to investment goods that has been largely responsible for the sluggish growth of tax revenues. Import

revenues were only 16 percent higher in 1971-72 than in 1964-65. To maintain the growth of revenues with the level of imports either the tax on consumption imports or machinery imports must be raised.

(1) Administration: The import tax system is a possible target for reform. The major tax is the FTRTT. This is the tax which before domestic sales tax was extended to import goods, provided the import tax raising instrument. Domestic sales tax has since been extended to import goods hence the FTRTT is a surcharge purchase tax on imported goods alone. There are a set of other taxes analytically similar to the FTRTT. Of these it seems the surcharge on the FTRTT, the statistical tax, and the customs duties could be merged into a single tax. The fiscal duty could be left separate to be adjusted for revenue purposes as the need arose. Such a reform would clarify the rates actually being charged by placing a single percentage rate on each good and not a multiplicity of taxes. Hopefully a freeing of administrative resources might result.

(2) Tax Rates: We shall now turn to the question of whether the rates themselves should be adjusted. The raising of import taxes is something to be done after careful consideration. What we shall do here is to question whether in a country with surplus labor,

substantial investment incentives and a moderate "corporation tax," the same country wishes to subsidize the importation of capital which will usually incorporate a low ratio of labor employed to capital. Every major import tax is either low or zero for investment goods. At present the FTRTT tax rate on industrial equipment is 2.1% against a standard rate on many goods of 22 percent. Fiscal duty is either zero or 5 percent and the statistical tax exempts all investment goods. Financial deductions are also allowed for companies against the domestic sales tax that was paid on production equipment. It is clear that imported machinery bears considerably less tax than other imported goods.

In an economy wishing to avoid the bottlenecks caused by a shortage of equipment, and wishing to stimulate capital accumulation, a low capital goods tax is clearly desirable. The question we must face up to is how large a tax on investment goods is optimal. A tax increase will choke off a certain amount of investment imports, but increase resources available for public investment. In so far as an elasticity of demand for imported investment goods is small a tax increase will only choke off a small quantity of investment goods purchases, and the tax revenue earned will facilitate an increase in public plus private investment. If the elasticity is large so much private investment may be discouraged that tax re-

venues do not permit sufficient public investment to offset the fall in private investment. When elasticities are difficult to obtain with certainty a large increase in the FTRTT rate on investment goods is a major and unnecessary risk. It would seem far more sensible to contemplate a small but noticeable increase, if any increase at all. Below is presented a table of possible increase in the FTRTT rate which at present is 2.1% on capital equipment.

New Rate	5.3	8.6	10.3
Revenue increase estimate*	160	350	430

*In million CFA

A small rate increase, to say 8.6%, would raise revenues by 350 million. Since increases in investment imports are closely correlated with income increases this change would also serve to increase the income elasticity of the tax system, which in Senegal is very low. A final argument for the tax is provided by the probable overvaluation of the currency which cheapens imports and makes more expensive exports in domestic currency.

1.1.3 Option 3

The sectoral allocation of expenditures is, as we showed above, crucial to the method of raising the savings rate by increasing the level of government intervention. The performance of the Senegal fiscal system,

on this count, is poor. The criticism to be made is simple: the proportion of government expenditure in directly productive investment goods is a low proportion of its total expenditures. As a consequence fiscal policy has not been as forceful an instrument of economic development as it might have been had the high ratio of taxes to income been properly exploited. The chief source of the problem is the oversized Senegalese civil service. The independence of the new state in 1960 left Senegal with a civil service inherited from French rule, which, as a colonial centre, was more appropriate to administer a larger area than Senegal. However, the share of expenditures on government personnel did not fall over the past decade, and if anything, it rose. The absolute expenditure on government personnel has risen quite steadily over the same period. In 1971-72, 58.6% of total government expenditures was on wages and salaries. This amounted to 22.1 billion CFA out of a total revenue of 42.6 billion CFA.⁹

It is well here to place the magnitude of

9. The administration of Senegal absorbs a fraction over 5 percent of total GNP. In comparison with other countries at a similar stage of development, this seems high. While aggregated categories in National Income Accounts can be deceptive by including certain classes of items in one country but not in another. The average expenditure on "general Services" by the Governments of the Ivory Coast, Ghana, Sierra Leone, and Upper Volta was 2.7 percent of GNP. Senegal employed 5.2 percent of GNP on General Services.

foreign aid in context with total government expenditures so that we may gauge the assistance that Senegal is receiving with the scope for investment expenditure expansion that could accompany a thorough civil service reform. In 1970 the total value of foreign grants to Senegal was 5 billion CFAF. Loans amounted to another 4 billion CFAF. If Senegal could cut back its expenditures on general administrative services from 5.2 percent to 3.2 percent of GNP--which is still comfortably above the average for countries in equivalent economic situations,⁹ this would permit an increase in investment expenditures of 5.2 billion CFA; 0.25 billion CFA greater than the current contribution to domestic investment from foreign aid grants.

While any reform of the Civil Service that resulted in a paring down of the numbers employed can be expected to be politically difficult, it is reasonable to assume that a number of important posts can be set up associated with the investment projects made possible by the budget savings, then the transfer of labor out of government and into the supervision of productive work would be possible.

If a government is to successfully perform its role as a forceful instrument in the process of economic growth it must be able not simply to provide investment for a single year but continually over the years. This requires

a revenue from taxation which is growing with G.D.P., then the government is constrained either to play a less important role, or to engage in borrowing. As the Senegal tax structure is at present constructed it has a low, and possibly increasingly low, income elasticity. We take the view, however, that the elasticity of the system will not get much lower, and may even improve a little as a result of the natural turn of structure of trade. We take this position for the following reasons. First, the lowering of the income elasticity of tax returns has been largely due to the increased proportion of investment goods in total imports--and these bear a low duty. This proportionate increase for manufacture cannot continue indefinitely and will probably tend towards a new higher ratio of investment to consumer goods. This will be a lower elasticity system but it will have ceased to have a falling elasticity. Also export duties have fallen steadily over the past six years. Over the same period, income has been steadily growing. Hence this element of tax revenue has been negatively correlated with income. We expect this to be a purely temporary phenomenon.

The low income elasticity is because the tax base of the economy is not sufficiently well related to the elements of the economy which are growing most quickly. Unless the tax base is so attached it will not

permit the government an active investment role. Increased elasticity makes an additional argument for abolishing the family quotient system which was responsible for lowering the marginal income tax rate.

Increased revenue and increased elasticity make two useful arguments for income tax consideration in Senegal. Unless the taxation base is sensitively related to the growth sectors of the economy then Senegal will have continued difficulty in meeting the expenditures it wishes to engage in.

--Investment Incentives: We begin this section by asserting the role of investment incentives in a supply constrained model of economic growth. Investment incentives may alter the pattern of investment, or increase the rate of savings if savings are interest elastic, but in the absence of imperfect capital markets they serve little additional purpose other than increasing the return to capital. If we add a foreign sector, then extra overseas investment may be induced. With imperfect capital markets they result in investments at the margin which would otherwise not be made. Now with an optimal investment subsidy and imperfect capital markets, the subsidy will be related to the nature of the imperfection. If the imperfection strikes only at certain parts of the economy, then the incentive will assist by subsidizing capital in those indus-

tries alone.

Senegal employs a battery of investment incentives, including B.I.C. (corporation) tax holidays following a new industrial venture, and a system of priority investors which guides government-benefit decisions. We first will ask where the imperfections in the capital markets are likely to exist, or where social benefits of the investment will most likely exceed social costs. Then we shall ask how well the Senegalese incentive system meets the demands placed on it.

Three distinct areas for investment subsidy would appear identifiable.

(1) The Agricultural or Traditional Sectors: The monetary system in the countryside is highly underdeveloped, and investors, if they are able to obtain loans, are likely to have paid higher interest rates than if the banking system were fully developed and competitive. Unfortunately, the system of farming is such that for many farmers tax relief of the traditional sort is unlikely to reach small investors, since the traditional investor does not pay any of those taxes against which relief is offered. For the non-agricultural investor in the rural area, we may be more optimistic that he will be liable for BIC or BCN and hence be eligible for tax relief. We consequently reach the conclusion that investment incentives, possibly

in the form of subsidized direct input prices, should be applied to the farming sector.

(2) Small Business: We may generally expect that small entrepreneurs will have less attractive access to capital markets than the large company. This would indicate a good reason for applying tax incentives more generously to the small investor, or at least equal treatment to small investors.

In Senegal the system of priority investors discriminates in favor of investments of 50 million CFA minimum or those which create jobs for at least 40 Senegalese. The "priority investor" enjoys substantial tax benefits although these were modified by the 1972 Investment Code. Companies engaged in large investments therefore have a stronger economic incentive than small investors. This would appear a practice worth reconsidering. It seems to us that an extension of the concessions earned by larger firms to smaller companies would be worth careful official consideration.

(3) Export Industries: There seems a good case to be made for special treatment of investment goods in export industries. The probable overvaluation of the currency, the need for product diversification in the export sector, and the historical success of countries which have chosen export led growth to import substitution

led growth make such special treatment a reasonable consideration.

Our general feelings concerning investment incentives in Senegal are that the conditions of award are too widespread to influence the pattern of investment. We would lean towards a system much more selective in its incentives. In particular we feel that during the current economic depression in rural areas that investment subsidies could be applied directly to reduce the price of capital inputs for farmers.

1.2 Economic Efficiency

Traditionally taxes are used to correct for market distortions, redistribute income, and to raise revenue with minimum dead weight burden loss to the community. It would seem that in practice tax-revenue-searching developing economies may employ taxes to raise revenue with less concern for the distortions and distribution that would seem optimal. Earlier in the companion paper, we began to analyze efficiency aspects of the implications of the "export taxes" imposed on the agricultural sector. We feel it is here that the potentially most damaging distortion in the tax system exist. The rest of this section will be spent discussing this problem.

Planning experts in many developing countries have been increasingly aware of the crucially strategic

role of agricultural output in the early phase of economic growth. In order to meet population growth, foreign exchange requirements, and, in climates similar to Senegal, insulation against weather variation, an increase in agricultural productivity seems virtually axiomatic for sustained economic development. Clearly in view of this, fiscal policy in the agricultural sector must be exercised with detailed attention. Too severe a policy will undermine the provision of a growing food supply for the industrial sector and hamper the flow of foreign exchange to finance the increasing demand for capital good imports. Too easy a policy may be more than an agriculture based economy can afford. We take the view that in Senegal the profits available to the agricultural sector as set by government-fixed product and input prices has been squeezed to a level that might well have proved highly dangerous to the continued growth of marketed food production, and supply of foreign exchange, even in the absence of the recent drought. The distortive content of policy changes stems from changes in quantities produced that price changes induce. If in response to price changes the quantities change only a small amount, then there is little distortion. We need to form a view as to the elasticity of price response by farmers.

In the case of Senegal, we have observed how producer prices for groundnuts have not risen with world

prices until the major increase in 1972. Following the drop in farm gate producer prices for groundnuts in 1966, the quantities of purchased farm inputs including goods as varied as fertilizer to cultivators fell and the marketed tonnage of groundnuts, which peaked in 1967-68 at 834,000 tons, fell steadily to 447,000 tons in 1971. Following the increase in prices of 17% in 1972, sales again rose to 747,000 tons. It would seem that marketed output is quite responsive to price changes, and that artificially holding prices below the world price, is depressing output and foreign exchange earnings. A more precise statement of the supply elasticity is clearly required and would make a useful contribution.

As a further indication of the impact of the 1967 change in farmgate prices for groundnuts, we find that consideration of outstanding short-term credit shows how severely investment plans were curtailed by the lower prices. The average outstanding debt to agriculture over the 2 year period 1965-66 was 140m CFA per annum. The average over the period 1968-71 was 37m CFA, which was only 8% of the outstanding debt to the canning industry, or 18% of the debt to the fishing industries.

If, as it would appear, output of groundnuts is sensitive to prices, the government, by taxing the agricultural sector, will cause a fall in marketed output and a

direct proportional fall in export-earnings. Insofar as the currency is overvalued, a further marketing board "tax" would appear undesirable.

While it is reasonable argument to smooth out year to year changes in the world price that would cause economic hardship, we take the view that the average government surplus from such a smoothing operation would be only sufficiently large to cover administrative expenses, and not to provide a major source of revenue and negative incentives for the farmers.

1.3 Distribution

In this section we shall examine the impact of taxation and expenditure policies on income distribution both between rich and poor and also between the urban and rural areas. Economists traditionally have not always interested themselves in the spacial impact of taxation policies. However, it would appear especially wrong to ignore the spacial (i.e., in this context, rural/urban) aspects of tax/expenditure policies when (1) distinct socio-political cultures exist in the two regions, or (2) the analyst has every reason to believe that significant migrations or income redistributions, could result.

We must be sensitive to both of these conditions existing in Senegal. The distinct cultures and history of

urban-rural migration are well documented elsewhere in the report and need not detain us here. Our method will be to consider first taxation and then expenditures--reviewing who is making the major contributions to the treasury and who is receiving the benefits from the expenditures.

1.3.1 Taxation

--Direct taxation: as we have tried to do in the rest of this report, we shall start by attempting to get the relative magnitudes of the various tax policies mixed firmly in our minds. A look at Table VII¹⁰ indicates that the proportion of tax revenue from direct taxes is 27% for 1970-71. Of the income from direct tax sources, 13 percent (1.3 billion CFA) comes from the two poll taxes (regional tax, and fiscal minimum tax) on labor. Progressive income taxation therefore has more carefully than is usual with developed economies at the impact of indirect taxation to gauge the distributional content of the system.

In Section 1.1 of this report we documented the details of the average tax rate and indicated that the family allowance quotient system powerfully reduces the progressivity of the income tax system. In that section

10. Table VII in "Tax Structure: A description."

we did not find it beneficial to abolish the quotient system for revenue raising reasons. Our analysis result in a similar situation from an equity viewpoint. The international companion of the relative tax rates of different income groups presented earlier indicates that if Senegal wishes to maintain a progressivity in the tax system, a more progressive rate structure would be required. The arguments presented in the earlier section apply identically here. We must reach the conclusion that current income tax rates in Senegal reflect a view more favorable to higher income groups.

--Indirect taxation: Indirect taxes include both taxes on foreign trade and taxes on domestic production and sales. First consider taxes on foreign trade. Export taxes can be broken into two parts: taxes on groundnuts and their products and taxes on other goods. The proportion of exports from groundnut products was 55 percent in 1969. They provided, however, 92 percent of export revenue. The other export goods including canned meat and fish and fresh fish, paid duty at much lower rates. The export tax could be a rational optimal tax adjustment to a low elasticity of supply for groundnuts and a higher elasticity for other goods but the distributional impact is to tax heavily the groundnut producers relative to

those products which have more value added in urban areas.

The rapid rise in the world price of groundnuts after 1968 led to a much increased tax on groundnut production for the farmer. The proportion of total export value of groundnuts, earned by the farmer, net of marketing costs fell from 90 percent in 1968 to 65 percent in 1969-71. A tax rate of between 50 percent and 55 percent on sales price is high, relative to production taxes elsewhere in the economy. The distributional implication of the export tax would appear to place the burden on rural areas.

Import taxes provide the bulk of tax revenue (roughly 38 percent). It is natural to assume that the bulk of the heavily taxed items--beverages, processed foods, durable consumer goods, shoes, soaps and alcohol are purchased by the wealthier sections of the community since the goods in an African context may be classed as "luxuries." Hence, the taxation is progressive. However, in so far as taxes on the rural sector force farmers into the cash system they must find a way to dispose of the income earned. If it is not saved, it may be spent on highly taxed imported goods. It would be interesting to know what proportions of total tax revenues from the heavily taxed items like processed foods, soaps, and coffee or tea, are from rural areas. Further, it would appear rather more

probable that the urban poor who are unable to grow their own food are occasionally forced into consumption of highly taxed convenience foods. We should remain aware that 25 percent of total import revenues were foodstuffs. Of that group, 45 percent were cereals which are taxed at a low rate, but other foods (excepting vegetables) receive a high tax rate. It seems reasonable to assume that a fair number of such foodstuff items are largely purchased by either rural or urban poor. However, without a detailed budget study we can do no more than point to the danger of assuming imported high duty goods are luxuries when 25 percent of the total value of imported goods are foodstuffs, and thereby the danger of assuming that import taxation is strictly progressive. While import taxation is largely a tax on urban dwellers, and almost certainly fairly progressive a detailed study of consumption patterns would be necessary to secure this viewpoint, and to establish the extent of progressivity.

1.3.2 Government Expenditure

First we shall review expenditures in the rural sector against calculated tax payments by that sector. The absence of data makes a precise calculation impossible. We shall provide exact figures where possible and then indicate the determinants of the magnitude of the remaining

factors. The series of Government expenditures on rural development out-of-budget are provided in Table VIII.

TABLE VIII
EXPENDITURES ON RURAL DEVELOPMENT (1967-1972)

<u>Year</u>	<u>Amount</u>
1967	1.78 billion CFA
1968	2.05 billion CFA
1969	2.26 billion CFA
1970	2.25 billion CFA
1971	2.31 billion CFA
1972	2.48 billion CFA

Secondly, we must allow for a proportion of Health and Education expenditures in the rural areas. We must make one further major addition. Government expenditures on the third development plan are expected to average 8 billion CFA in the rural areas between 1969 and 1972.

Now let us turn to taxation. Taxes raised include the rural (regional) tax, the livestock tax, and the export taxes. The rural and livestock taxes contributed exactly one billion CFA in 1971-72.¹¹

Finally, the major source of income from the rural sector, which is the surplus earned by the government from groundnut production, is given in Table IX.

11. See Table Tax Structure; a description, Table III.

TABLE IX

GOVERNMENT SURPLUS FROM GROUNDNUT PRODUCTION (1967-71)

<u>Year</u>	<u>Value Paid to Farmer</u>	<u>Value "taxed" by government</u>
1967	15,651	3,216
1968	12,470	2,650
1969	12,531	8,579
1970	8,329	8,220
1971	18,170	7,176

Figures in Millions CFA

Source: Senegal National Accounts

The value accruing to the government not including the export duty on groundnut products averaged over 8 billion CFA between 1969 and 1971. Hence, the total tax revenue from rural areas during this period was at least 9 billion CFA, and when purchases of other taxed items are included 10 billion CFA would seem a conservative minimum.

We are now in a position to compare total expenditures and taxes in the rural sector. It would seem that taxes are at least 10 billion CFA per annum. The exact figure is determined by the quantity of taxed consumer goods purchased by the rural sector and the tax income from other rural sector products including export duties. On the expenditure side the rural sector is planned to receive 10.48 billion CFA per year in direct investment. In addition it will receive expenditures on Health and Edu-

cation. It is necessary also to make an allowance for administration expenditures.

We therefore find that direct "tax" payments by the rural sector approximates the direct expenditures on rural development. Without more detailed information on consumer demand patterns we are unable to assess the indirect tax contribution of the rural sector. However, in view of the relative low incomes of the rural sector it would seem unlikely that such tax contributions will significantly outweigh the rural expenditures on Health and Education plus an allowance for administration. We therefore reach the tentative conclusion that the impact of fiscal policies on rural-urban income distribution is not significantly discriminatory against either sector.

1.3.3 Administrative Expenditures

It was pointed out earlier in this report that 56 percent of total government expenditures was on wages and salaries. The distributional implications of this are briefly analyzed.

The maintenance of an oversized Civil Service, to absorb the excess supply of educated manpower at the going wage rates, lowers both the level of unemployment and the pressure to adjust downward wage rates for such classes. A fall in the wage rate would lower income

for those groups. It follows that, insofar as the absence of government intervention would lead to lower incomes for certain income groups, those groups are receiving distributional support from the government.

The direct employment of excess labor supply at the going wage rates is commonplace in Western economies during depressions and as a deflationary device. However, to pursue such a policy over a long period of time and for income groups in the upper half of the income distribution¹² would appear a different kind of policy. There are possibly good economic grounds for believing that distributional support for the well-educated is optimal for the society, however, we should recognize that government intervention on such a large scale vis-a-vis the size of the market is a distributional policy on a major scale. In all likelihood, a complete change of policy would be politically unacceptable but a transfer of labor into a central management pool and then into project control might provide a way of reducing the difficulty of diminishing the cost to the government of achieving a given income distribution.

12. The minimum wage for an unskilled worker in the public sector is 140,000 CFA per annum.

APPENDIX B-2

Tax Structure in Senegal: A Description

The tax system in Senegal is a combination of old and modern taxes overlapping in an unwieldy and complex fashion. Rather than integrate new revenue raising measures with the existing tax system, the administration has added on new taxes in a piece meal way. The upshot is a revenue system with many taxes which raise very little income. This paper will be presented in four parts. First direct taxes, then taxes on Foreign trade, third indirect taxes and finally a section on the remaining group of taxes. The intention is not to present an exhaustive detailing of all aspects of the system, but rather to present the main structure so that the analysis and proposals presented in the companion paper will be more readily understandable.

1. DIRECT TAXES

The present system includes both poll and livestock taxes which were inherited from the French nineteenth century regime, and modern progressive components. Since most revenue is raised by the modern taxes we shall look at them first.

1.1 Modern Direct Taxes

The "model" system on which the structure is based

consists of the following components. First, income is taxed proportionally according to source and regardless of the personal situation of the recipient. Second, income net of tax paid, is then taxed progressively and the normal tax allowances are included. The actual system is a variety of uneven taxes on the various sources of income. The general income tax is then applied to the remainder left after those taxes have been deducted. The various taxable components of income and the accompanying tax can be quickly listed:

1.1.1 B.N.C. A tax on the net income of the self-employed. 1971-72 Revenue: 40 million francs.

1.1.2 B.I.C. A tax on net profits whether earned in industrial, commercial, or agricultural enterprise. The concern need not be incorporated to be eligible for this tax. In effect the tax is not raised in the agricultural sector. Before we can describe the rates applicable, a distinction, new to economists trained in the U.S.A. must be made. The distinction is between "societes de capitaux" (capital companies) and "societes de personnes" (personal companies). The first group, which includes joint stock companies, is taxed regardless of who owns it. The latter, which includes partnerships, makes allowance for the personal situation of the owner-managers. In making such an allowance there is a failure to observe the proportionality associated with the ideal model, and personal allowances appear at both strata of

the direct tax system. While there is nothing inherently wrong with this, it does make it more difficult to establish the extent of progressivity in the system, and to reveal the efficiency distortions that result. For details of the allowances and other details on ensuing issues a good reference is the World Bank Report of 1973--Report No. 212 SE Volume III.

Since income from real estate and "movable capital" (bank deposits) are subject to another tax, they are deductible from income earned to derive taxable income.

Depreciation allowances permit the writing off of buildings in twenty years, equipment over five years, and trucks over three years. 1971/72 Revenue: 2,060 million francs.

1.1.3 Wage-Salaries Taxes. These three taxes are sometimes called payroll taxes. However, the tax formula is not independent of the wage paid. There are two taxes to be paid by the employer--their dual effect is to tax by 3 percent of net income. There is also a single tax due by the employee of 2 percent of his income. This tax is equivalent to a proportional income tax of 2 percent. The employer faces an additional tax of 5 percent on wages below 45,000 francs per month to finance National Assurance contributions. 1971/72 Revenue: CFAF 300 million.

1.1.4 Development Tax. This is an income tax for

professional and business persons. There are no personal allowances and the rate is 3 percent for gross salaries between 240,000 and 360,000 francs and 8 percent for those above 360,000. 1971/72 Tax Revenue: CFA 1,700 m.

1.1.5 Tax on Movable Capital. This is a tax on remuneration from equity and bank deposits. The basic rate is 16 percent. 1971/72 Tax Revenue: CFA 700 m.

1.1.6 Tax on Real Estate.

--The tax includes both land and buildings, yet the tax on land is restricted to urban areas. The rental value of a building is assessed, a deduction made to derive the tax base, and then a flat rate of 20 percent is applied. The deduction is 40 percent of value for housing and 50 percent for industrial buildings. There are also two smaller similar taxes. 1971/72 Tax Revenue: Land CFA 33 m.; Buildings CFA 700 m.

--Main morte. An additional wealth tax is placed on company property to make equitable the absence of transfers unlike when property is owned by individuals. Revenue: CFA 147 million.

That completes the summary of taxes on source of income. We now apply the second strata of the tax system which taxes net income after the first set of taxes have been paid. This global income tax is progressive, unlike many of those already described. We will now discuss this "umbrella" in-

come tax.

1.1.7 I.G.R. - Impot General sur le Revenue. The taxable income is calculated by netting out from gross income two classes of allowances and then to adjust for family burdens. The first class of allowance is the bulk of taxes already paid on income in the previous strata of taxes. Included are:

- The wage and salaries tax of employees.
- The Development tax.
- Employees pension contribution.

These taxes are deducted directly from gross income.

The second class of allowance includes those items often considered in western economies as deductible items. It includes:

- interest on debts incurred buying a home
- insurance premium.

Finally, family responsibilities are allowed for in the form of the "Quotient System" which works as follows. The taxable income deduced from the above procedure is divided by a number. This number is derived by counting two for parents and a half for every child. Thus a married taxpayer with 4 children has a quotient of 4. The maximum quotient is 5. Needless to say this implies a substantial tax allowance on the first few offspring.

Having divided deduced income by the derived number we

have taxable income.

The rates applicable to taxable income are given below.

	<u>Taxable Income Bracket</u>	<u>Rate Applicable to Bracket</u>
CFAF	0- 100,000	-
	101,000- 200,000	2%
	201,000- 350,000	10%
	351,000- 600,000	15%
	601,000- 900,000	20%
	901,000-1,500,000	25%
	1,501,000-2,500,000	35%
	2,501,000-5,000,000	50%
	5,001,000-more than	60%

1.1.8 A Surtax. A tax of 20 percent of the General Income Tax was levied in 1969. The rate is only 15 percent for families with five children or more. 1971/72 Revenue IGR 1,700 m. Surtax: CFA 300 m.

1.2 The Old Direct Taxes

1.2.1 Poll Taxes.

-- The Regional Tax. A poll tax on all urban dwellers. The rate is between CFA 450 and CFA 600 per taxable head. 1971/2 Revenue: 780 m.

-- Fiscal Minimum Tax. This is a poll tax on wage and salary earners, or those having large homes from real estate. Tax liability is graduated by income level. 1971/72 Revenue: CFA 600 m.

1.2.2 Other adhoc taxes.

-- Livestock tax. The tax is graduated

by animal-type, and assessed by village head. 1971/72 Revenue: CFA 220 m.

-- Patente. This tax is an annual charge for licensing a business. The rate is varied by business type. 1971/72 Revenue CFA 665 m.

This completes our survey of direct taxes. We shall now turn to taxes of foreign trade.

2. TAXES ON FOREIGN TRADE

2.1 Import Duties

Import duties have provided on average 38 percent of total revenue in the past 6 years. It consequently dominates every other revenue raising instrument by a considerable margin.

The boom of the late 1960's in Senegal was accompanied by a growth and change in structure of imports. The growth of imports, at fixed tax rates, would normally lead to a corresponding growth in revenues. However, the change in composition of imports led to a switch into low tax items and total import revenue remained more or less constant over the growth period. This change in structure was a switch from consumption goods which are highly taxed to investment goods which have a low duty.

Import duties are levied on an origin principle. A reciprocal trade agreement causes the Common Market countries to face lower duties, and roughly 70 percent of Senegal's trade originates in those countries. In addition to differentiation by origin there is not simply a single import duty rate which is varied by exporting country but rather many taxes. This constellation of taxes all possess individual characteristics. A table is included with a detailing of the various taxes and the rates individual exporting

countries face. I shall not discuss the table in detail, but review its leading components. A glance at the revenue table, which indicates revenues from individual taxes, shows three taxes provide over 80 percent of total import earnings. They are:

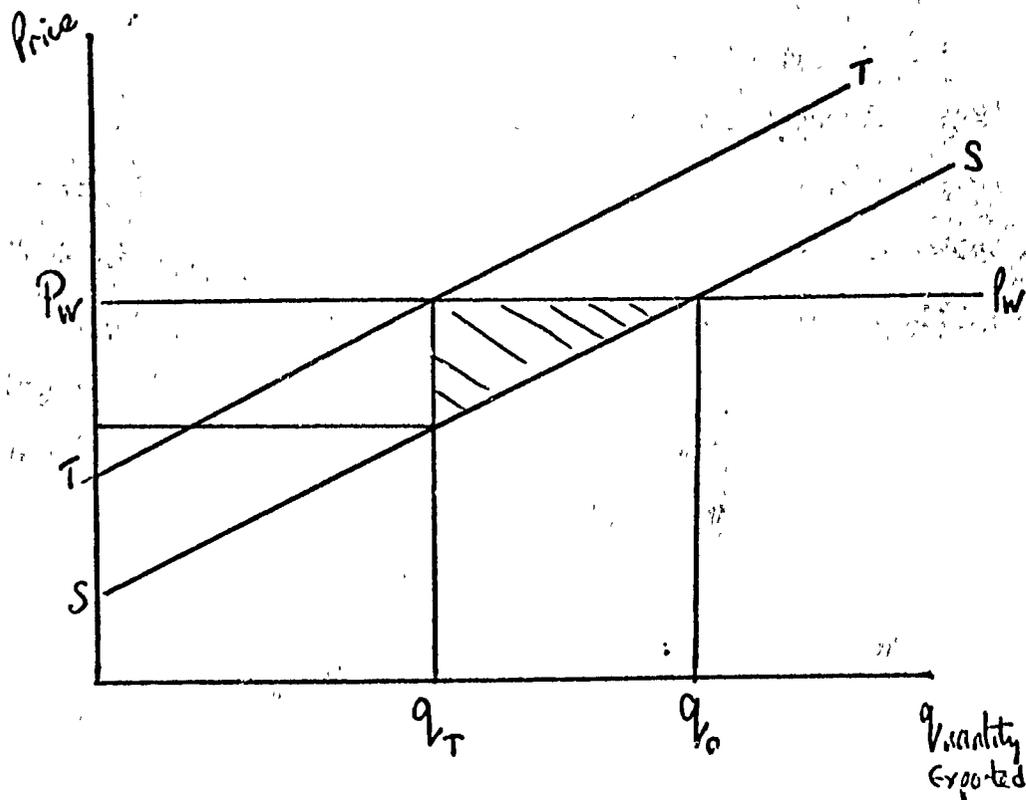
2.1.1 F.T.R.T.T. "Import extension of the Turn-over tax." The normal rate for this duty on imports is 22 percent and only Mauritania is exempt. Ivory Coast, Dahomey and Mali are granted special concessions. A higher rate of 30 percent is applied to some processed goods already produced in Senegal. A surtax was applied in 1965 to raise revenue from this tax.

2.1.2 Fiscal Duty. This is an ad-hoc proportionate tax on imports. The rate is varied considerably depending on revenue needs. The tax exempts or taxes very lightly investment goods. Depending on the revenue sought its rates vary--but does not discriminate by origin of the product.

This completes the discussion of the main features of import taxation. It is clear from the tables provided that the system is not a simple one. There does seem a need for intergrating the smaller taxes into the T.F.R.T.T., possibly leaving simply the Fiscal duty as a short term control variable. However, this will be discussed in the policy section of the paper.

2.2 Export Duties

The value of exports is largely dominated by the world price of groundnuts and domestic production. The ability of the governments to tax groundnuts and their products is limited by its position as a price taker in the world groundnuts market. In so far as it is a price taker the government cannot shift forward to other countries any part of its fiscal burden by levying an export tax. It can only exact, for the treasury, a portion of the surplus previously earned by the domestic producer. Consider Figure 1. The world price of groundnuts is P_w , the domestic supply curve is SS , and output is q_o . A per unit tax is then levied shifting the supply curve to TT . Output sold on the world market falls to q_t , the government earns and there is a deadweight loss of approximately, $1/2 \cdot t \cdot (q_o - q_t)$.



The more inelastic is the supply of groundnuts products the smaller is the deadweight burden.

In Senegal the government employs two methods of taxing exports. If we assume, however, the country is a price taker for its products, we might more accurately describe the government as taxing the producers and factors employed in the production of groundnut products. In the case of the first method of raising revenue, an explicit tax on producers is exactly what the government has in mind. This first method is the use of a government marketing agency to purchase groundnuts from the farmers, many of whom would otherwise be virtually out of the cash system, at prices below the world price. This tax is almost equivalent to a direct tax on income in the agricultural sector, and became most significant following the rise in groundnut prices after 1968. Since this is one of the few methods of taxing the agricultural sector it is a tax the government on equity, as well as revenue grounds, would presumably find attractive. However, there are problems with such a tax. It is well known that the distortionary effects of a tax stem from the changes in quantity choices that it induces. If the price of one element in the producers portfolio of crops is kept artificially low we would expect a substitution into more profitable crops. Such crops might be entirely for farm consumption and thereby escape the national treasury. We

would a priori expect a greater degree of substitution out of a good if there are more alternative choices available. With a general income tax the choice is simply between labor and leisure, but with a tax on a single crop the producer can choose either leisure or other crops, both of which have become more attractive. The conclusion is that in so far as the "marketing agency" tax reduces domestic production export revenues fall proportionally. If the substitution out of groundnuts is at all considerable, (the supply of groundnuts elastic) then the government is paying a considerable price in foreign exchange to exact a tax on the agricultural sector. Finally, we have no reason a priori to believe that the elasticity of supply of groundnuts is highly inelastic with respect to price. Rather it is suggested that this question is subject to careful scrutiny.

The second method for taxing exports is, in effect, per unit taxes on groundnut product production. The two major taxes, T.F.R.T.T. and Fiscal Duties work exactly as described in the import duty section. Exports for the majority of goods do not, therefore, receive a special tax, rather their production just does not receive any concession.

Finally insofar as Senegalese currency is overvalued there is a price of groundnuts facing the domestic economy which is less than it would be in equilibrium. This differential may be a substantial amount and may add considera-

ably to the deflated producer price. Total Export Revenues in 1971 were CFA 1,607 m. This represents a dramatic fall from CFA 3,200 m in 1966. The loss of preferential treatment from the French left the Senegal government unable to enjoy the benefits of a price for groundnuts higher than the world price. With the loss of this special treatment, the government was unable to exact such a high revenue.

This brings to an end our survey of taxes on Foreign trade. We now move to indirect taxes on domestic trade.

2.3 Domestic Sales Taxes

There are two categories of domestic taxation:

(1) a general sales tax and (2) a set of ad-hoc taxes on specific commodities. Over 70 percent of the total revenue from this source in 1971/72 came from the set of ad-hoc taxes. Taxes on oil products alone yielded more than the general sales tax on domestic production. With these magnitudes in the back of our minds we may now briefly review the two tax categories.

2.3.1 T.C.A. General Sales Tax. This tax is collected on the following base. The producer sells \$X worth of goods and T.C.A. is due at the appropriate rate on those sales. However, he is entitled to deduct taxes (T.C.A.) paid by producers of the component parts and raw materials, used in producing his good. In addition to "physical deduc-

tions" there are "financial deductions" whereby the producer deducts a proportion of his investment in machinery. Agricultural production is exempt, but a restricted class of "services" are subject to the tax. Services included are transport and hotels, excluded are accountants and professional services in general. The basic rate is 9.89 percent but this is varied by commodity. "Luxury" consumer goods which are imported face a 33 percent rate.

2.3.2 Ad hoc sales taxes. These taxes fall naturally into four groups of greatly differing importance. In order of their contribution to the exchequer:

- (a) taxes on fuels and vehicle licenses^s
- (b) taxes on alcohol and tobacco
- (c) taxes on production or sale of specified agricultural edible products.
- (d) other taxes

The accompanying table underlines the relative importance of these taxes. It also makes clear that unlike some other taxes, revenues have grown with national income. These taxes are all more or less straightforward, however, the following points are significant.

-- The tax on gasoline is approximately 45 cents a gallon. Since the tax can be levied on a small number of wholesalers it is easily administrated.

-- The refinery tax is an "ad valorem" tax

applied to the market price of refined product produced at the Dakar refinery. The rate is 23 percent but T.C.A. is not applied to refined products produced at Dakar.

This completes the discussion of indirect taxes. We pass on now to the remaining taxes in the system.

2.4 Other taxes

There are 2 main components of the tax system left to discuss; registration and stamp taxes and inheritance taxes.

2.4.1 Registration taxes. There exists a substantial list of documents which must be registered and a fee paid. I shall not list these deeds that must be registered but simply point out that we should advise scrutiny of that list for contents which involve costly administration for regressive, small returns to the exchequer and possibly negative net returns to the economy as a whole.

2.4.2 Inheritance Taxes. The peculiarity of this tax is that it is applied not to the estate as a whole, but to the individual receipts of beneficiaries. This provides an incentive to produce children since the average tax rate falls with beneficiaries, but also to spread the inheritance over the family since the rate is progressive on wealth received. The rate structure is given in Table 8.

Table 1: Yield from Modern Income Taxes

(In millions of CFA francs)

	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72 ^{1/}
Schedular Taxes								
Tax on Business profits (BIC)	1,648	1,508	1,525	1,969	2,068	1,922	1,686	2,060
Tax on Income from Self-Employed workers (ENC)	49	45	59	44	40	46	51	40
Housing Tax on Gross salaries, due both by Employees and Employers	1,251	1,019	1,261	1,259	1,330	1,366	1,337	1,500
Lump-Sum Tax on Gross Salaries due by Employers	-	-	136	224	245	251	232	300
Development Tax	348	1,008	990	998	1,203	1,435	1,487	1,700
Tax on Income from Movable Capital	626	672	488	556	511	663	550	700
Taxes on Income from Real Estate	582	675	742	522	435	845	771	580
Buildings	(443)	(556)	(538)	(415)	(341)	(664)	(603)	(700)
Land	(28)	(22)	(28)	(18)	(17)	(28)	(29)	(33)
"Mainmorte"	(110)	(96)	(177)	(29)	(76)	(149)	(136)	(147)
Taxes on Total Income								
General Income Tax (IGR)	1,032	1,098	1,172	1,016	1,102	1,612	1,452	1,700
Complementary Tax to the General Income Tax	-	-	-	-	3	170	210	300
Extraordinary Tax on Company Reserves	430	119	54	5	518	-	20	13
TOTAL	5,966	6,144	6,427	6,593	7,485	8,310	8,796	9,192

^{1/} Projected.

^{2/} Including the Surtax on Insufficiently Built Premises.

SOURCE: Ministry of Finance.

Table 2 GENERAL INCOME TAX (IGR)

Size Distribution of Number of Taxpayers, Taxable Income, Yield

TAXABLE INCOME BRACKET	NUMBER OF TAXPAYERS			TAXABLE BASE (CFAF millions)			YIELD (CFAF millions)		
	Total	(of which salaried)	% of all taxpayers	Aggre- gate	(of which salaried)	% of aggregate	Total	(of which salaried)	% of Total
CFAF 0 - 300,000	5,870	(5,606)	22.4	185	(124)	1.0	21	(19)	1.5
300,000 - 500,000	6,626	(6,100)	25.2	2,593	(2,376)	14.4	95	(117)	7.0
500,000 - 800,000	6,470	(5,859)	24.7	4,074	(3,639)	22.7	89	(77)	6.6
800,000 - 1,000,000	2,015	(1,838)	7.8	1,799	(1,639)	10.0	67	(60)	4.9
1,000,000 - 1,500,000	2,713	(2,440)	10.3	3,303	(2,969)	18.4	214	(194)	15.8
1,500,000 - 2,000,000	1,247	(1,130)	4.7	2,137	(1,934)	11.9	203	(182)	15.0
2,000,000 - 3,000,000	892	(793)	3.4	2,132	(1,892)	11.9	264	(227)	19.5
3,000,000 - 5,000,000	306	(237)	1.2	1,134	(872)	6.3	202	(149)	14.9
Greater than 5,000,000	88	(65)	0.3	680	(512)	3.4	200	(152)	14.8
TOTAL	26,247	(24,068)	100.0	17,967	(17,622)	100.0	1,355	(1,118)	100.0

SOURCE: Ministry of Finance.

TABLE 3: YIELD FROM OLD DIRECT TAXES

(In millions of CFA francs)

	1960 ... 1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72
TOTAL	<u>1,676</u>	<u>1,900</u>	<u>1,929</u>	<u>1,791</u>	<u>1,582</u>	<u>2,112</u>	<u>2,091</u>	<u>2,310</u>
Fiscal Minimum Tax	209	258	255	223	199	492	620	600
Regional Tax	702	745	733	759	639	724	760	780
Livestock Tax	176	198	183	224	196	215	169	220
"Patente"	449	517	541	422	412	575	522	665
License Fees	8	8	7	4	7	5	6	5
"Taxe Moillière" ^{1/}	132	174	210	159	129	101	14	40

^{1/} Abolished in 1969.

SOURCE: Ministry of Finance.

Table 4: TAXES ON IMPORTS

Origin of Imports	Customs Duty	Fiscal Duty	Other Import Levies		Other Indirect Taxes on Imports	
			Statistical Tax	Forfeit Tax	Sales Tax on Imports	Excise Duties
I. Member countries of the European Communities and French overseas countries	Exempted	Normal	Normal	Normal	Normal	Normal
II. Member countries of the West African Customs Union (UDEAO)						
A. Ivory Coast, Dahomey and Mali					13.50% except for goods specifically exempted	Normal
1. Goods entirely produced ^{1/} in these countries	Exempted	Exempted	Exempted	Exempted		
2. Goods originating ^{2/} in these countries	Exempted	50% of global tax burden on similar goods imported from member countries of EC, with a minimum tax liability equal to indirect taxes (sales tax on imports plus excise duties)				
B. Upper Volta and Niger	Exempted	Same conditions as for the goods in A. 2.				
C. Mauritania						
1. Goods designated in Appendix of Trade Agreement	Exempted	Exempted	Exempted	Exempted	Exempted	Exempted
2. Other goods entirely produced in or originating from Mauritania	Exempted	Same conditions as for the goods in A.1. and A.2. respectively				
III. Other francophone African countries: Cameroon, CAR, Congo, Gabon, Chad, Togo, Malagasy	Exempted	Normal	Normal	Normal	Normal	Normal
IV. Burundi, Zaire, Somalia	Rebate of 10% on minimum tariff	Normal	Normal	Normal	Normal	Normal
V. Afghanistan, Albania, Angola, Argentina, Bolivia, Ecuador, Ethiopia, Iceland, Iran, Iraq, the two Koreas, Jamaica, Japan, Jordan, Libya, Mexico, Nepal, Portugal, Portuguese Guinea, Salvador, Saudi Arabia, Sudan, Thailand, Uruguay, Yemen	General tariff: 3 times the minimum tariff	Normal	Normal	Normal	Normal	Normal
VI. Other countries not denominated above	Minimum tariff	Normal	Normal	Normal	Normal	Normal

^{1/} Entirely manufactured or harvested in that country.
^{2/} Partly or entirely manufactured with imported inputs.

Source: Ministry of Finance.

Table 5: TAXES ON IMPORT TRADE^{1/}

(In millions of CFA francs)

	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72 ^{2/}
Customs Duty Proper	606	446	483	479	391	454	428	410
Fiscal Duties	3853	3538	3099	3255	2796	2986	2965	3000
Forfeit Tax Substitution for the Turnover Tax (FTRTT)	5234	4986	4726	4830	4289	4883	4745	5400
Surcharge on the FTRTT	569	444	541	578	513	585	562	640
Statistical Tax	207	476	779	750	759	1032	993	1020
Sales Tax on Imports	3790	3217	4447	4651	4242	4056	5800	5400
Total Including Sales Tax on Imports ^{3/}	<u>14367</u>	<u>13167</u>	<u>14076</u>	<u>14543</u>	<u>13491</u>	<u>13996</u>	<u>15493</u>	<u>15250</u>
Total Excluding Sales Tax on Imports	<u>10527</u>	<u>9950</u>	<u>9629</u>	<u>9892</u>	<u>8749</u>	<u>9940</u>	<u>9643</u>	<u>10500</u>

^{1/} The Refinery Tax is shown in the "Excise Duty Category".

^{2/} Projected.

^{3/} This Total also includes two budgetary items, respectively "Compensatory Tax to the TCA" abolished in 1968 and "Other", of negligible yield.

Source: Ministry of Finance

Table 6: SHIFTS IN COMPOSITION OF IMPORTS, 1964, 1969, 1970

(In millions of CFA francs)

	1964	%	1969	%	1970	%
Food	14,025	33.0	15,104	29.4	13,603	25.4
of which						
Wheat and Rice	(6,130)	(14.4)	(6,361)	(12.4)	(5,698)	(10.6)
Fertilizer Chemicals	1,341	3.2	1,403	2.7	1,649	3.1
Oil Products	1,953	4.6	3,825	7.5	2,723	5.1
Pharmaceuticals	568	1.3	1,046	2.0	1,206	2.3
Wood Paper	1,466	3.4	2,105	4.1	2,487	4.6
Textile Fabrics	6,548	15.4	2,436	4.7	3,312	6.2
Base Metals	1,389	3.3	4,278	8.3	2,937	5.5
Machinery Equipment	2,646	6.2	4,862	9.5	4,829	9.0
Electrical Apparatus	1,424	3.4	2,013	3.9	2,270	4.2
Transport Equipment	2,054	4.8	2,234	4.4	3,345	6.2
Sundry	9,068	21.4	11,994	23.4	15,239	28.4
TOTAL	42,500		51,300		53,600	

Note: The categories used in the Study mentioned do not always coincide with the Brussels Customs Classification.

Source: Boubacar Ba, "Commerce Extérieur du Sénégal, 1962-1970"; Dakar, May 1971.

Table 7: TAXES ON DOMESTIC PRODUCTION (EXCISE DUTIES)

(In millions of CFA francs)

	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72 ^{/1}
Excise Taxes								
Alcohol	751	609	596	547	638	566	623	578
Tobacco	777	771	681	661	778	845	963	880
Taxes on Fuel Oils								
Tax on Oil Products	2693	2629	2593	2700	3029	3526	3732	3880
Refinery Tax	1313	1142	1118	1203	1179	1075	1272	1200
Motor Vehicle License Fee	207	205	202	206	215	212	205	220
Taxes on Edible Agricultural Products								
Edible Oils	30	30	30	227	31	127	127	120
Carbonated Beverages	-	-	33	31	36	38	37	38
Coir Nuts	-	-	169	170	176	236	241	180
Green Tea	-	-	88	61	70	71	77	70
Coffee	-	-	-	-	-	56	34	25
Sundry ^{/2}	<u>79</u>	<u>77</u>	<u>77</u>	<u>90</u>	<u>87</u>	<u>91</u>	<u>91</u>	<u>101</u>
TOTAL	<u>5850</u>	<u>5413</u>	<u>5587</u>	<u>5626</u>	<u>6239</u>	<u>6843</u>	<u>7402</u>	<u>7292</u>

^{/1} Projected.

^{/2} Taxes on cinemas, electricity consumption, weapons and chance games.

Source: Ministry of Finance.

Table 8: CURRENT BUDGET REVENUES, FY65-FY72

(In millions of CFA francs)

	1965/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72 (PR)
Direct Taxes	7,642 (20.8%)	8,044 (22.4%)	8,356 (23.5%)	8,384 (23.4%)	9,267 (25.1%)	10,422 (26.8%)	10,887 (26.3%)	11,503 (27.8%)
Old Taxes	1,676 (4.6%)	1,900 (5.3%)	1,929 (5.4%)	1,791 (5.0%)	1,582 (4.4%)	2,112 (5.4%)	2,091 (5.0%)	2,310 (5.6%)
Modern Taxes	5,966 (16.2%)	6,144 (17.2%)	6,427 (18.1%)	6,593 (18.4%)	7,485 (20.7%)	8,310 (21.3%)	8,796 (21.2%)	9,193 (22.2%)
Indirect Taxes	26,720 (72.7%)	25,281 (70.6%)	25,671 (72.2%)	26,001 (72.5%)	25,491 (70.4%)	26,277 (67.5%)	28,654 (69.2%)	28,502 (68.8%)
Taxes on Import Trade	14,367 (39.1%)	13,167 (36.8%)	14,076 (39.6%)	14,543 (40.6%)	13,591 (37.6%)	13,996 (35.9%)	15,493 (37.4%)	15,900 (38.4%)
Export Duties	3,467 (9.4%)	3,207 (9.0%)	2,863 (8.0%)	2,677 (7.5%)	2,582 (7.1%)	1,839 (4.7%)	1,607 (3.9%)	1,235 (3.1%)
Tax on Internal Sales	2,181 (5.9%)	2,565 (7.2%)	2,397 (6.7%)	2,363 (6.6%)	2,353 (6.5%)	2,555 (6.6%)	3,147 (7.6%)	2,800 (6.8%)
Taxes on Domestic Production (Excise Duties)	5,850 (15.9%)	5,413 (15.1%)	5,507 (15.7%)	5,696 (15.9%)	6,239 (17.2%)	6,843 (17.6%)	7,402 (17.9%)	7,292 (17.6%)
Registration and Stamp Taxes	855 (2.3%)	929 (2.6%)	748 (2.1%)	722 (2.0%)	728 (2.0%)	1,044 (2.7%)	1,005 (2.4%)	1,225 (3.0%)
Non-Tax Revenues	2,373 (6.5%)	2,500 (7.0%)	1,772 (4.8%)	1,456 (4.1%)	1,633 (4.5%)	2,235 (5.7%)	1,891 (4.6%)	1,435 (3.5%)
TOTAL	36,735	35,825	35,579	35,841	36,193	38,934	41,432	41,440

Some Relevant Macro-Economic Data

GDP at Factor Costs	181,000	180,600	180,400	182,500	193,000	205,800	220,700
Value of Imports	46,200	44,900	45,600	49,300	54,200	59,100	63,000
Value of Exports	37,900	41,200	45,100	43,600	42,300	45,200	44,200

Some Relevant Ratios

Current Revenue/GDP	20.3	19.8	19.7	19.6	18.3	18.9	18.8
Import Taxes/Import Value	31.1	29.3	30.3	29.5	25.1	24.1	24.6
Export Taxes/Export Value	9.1	7.8	6.6	6.1	6.1	4.1	3.6

SOURCE: Ministry of Finance; Mission calculations.

Table 9: RATE PATTERN OF INHERITANCE TAXES
(In percent)

	Rate on the Bracket of Wealth Inherited (CFAF)			
	1-500,000	500,001-2million	2-10million	over 10 million
Beneficiaries and spouse				
Decujus without children or with one child	7	15	20	25
Decujus with two children	4	10	15	22
Decujus with 3 children	3	8	12	18
Brothers and Sisters	20 ¹	27	33	40
More distant relatives	26	32	38	45
Unrelated Legatees	33	40	45	50

¹ This rate embodies a lower rate on the first CFA 100,000.

Source: Ministry of Finance.

APPENDIX C

VARIABILITY OF PRECIPITATION
IN THE SAHEL-SUDAN
REGION OF AFRICA

APPENDIX C: Variability of Precipitation In
 The Sahel-Sudano Regions of
 Africa

James D. McQuigg
Consultant

June 1974

701 Hitt Street
Columbia, Missouri 65201

Introduction

A series of published monthly precipitation data, assembled originally by the Smithsonian Institution (1) and continued by the U.S. Weather Bureau (2) and the Environmental Data Service (3) were placed on magnetic tape at the National Climatic Center, Asheville, North Carolina. (This series, of course, includes data from meteorological stations in Africa.) In recent times, this series was up-dated at the National Center for Atmospheric Research, to include data for selected stations through 1970. Where possible, this tape has been further modified to include Sahel-Sudano meteorological data since 1970 by the group working with the author at the University of Missouri.

One of the very serious difficulties that arises for any climatologist studying the Sahel-Sudano Region is the fact that consistent, long term data series are few in number, compared to some other regions of the world.

Looking on the positive side of the problem, however, there are more locations from which surprisingly good quality, long-period meteorological records are available (on the magnetic tape already described) from the Sahel-Sudano Region than some non-meteorologists have thought existed.

The material which follows is an attempt to present analysis of the meteorological data which are available, with one purpose in mind. This is to portray the variability of precipitation in this large region. This has been done by three methods:

- 1) To present the "raw" data series for each station in matrix form.
- 2) To present these same data in terms of percentage of the long-term average for each particular location.
- 3) To present the results of fitting a formal frequency distributon (the mixed incomplete gamma) in tabular and mapped form for the .10, .25, .50, .75 and .90 quantiles.

Precipitation Data

The monthly precipitation data series are first presented in the form of two tables for each station. The heading for the first table includes the following information, reading from left to right:

- 1) The World Meteorological Station number. (This is 606000 for the first station in the list.)
- 2) Two numbers, which are used for access to the magnetic tape. (For the first station these are 99204 and 95609.)

- 3) Two numbers, which are the latitude and longitude, to the nearest tenth of a degree. A minus sign preceding latitude means that the location is south of the equator. A minus sign preceding the longitude implies the location is east of the 0° meridian. (In the first example, these numbers are 30 1 22, meaning 30.1° North, 2.2° West.)
- 4) The name of the location. (For the first station, this is Ben-Abbes, Algeria.) The year is indicated in the left column of the body of the table. Then, in the next twelve columns, monthly values of precipitation are shown, to the nearest tenth of a millimeter. For example, the January 1931 value of precipitation for Ben-Abbes is 2.6 millimeters. A trace of precipitation is coded as 1 in this table, meaning .1 millimeter, (as for April and May 1931). Missing values are encoded as 9999.

The second table for each station presents the data from the first table, expressed as accumulative totals within each year, divided by the long term annual average precipitation. For example, the long term annual average for Ben-Abbes is 44.1 mm. The second station, Agadez, does not have so many missing values in the series, so it provides a better illustrative example.

The "raw data" table shows very clearly the monsoon character of the precipitation at Agadez, plus the great amount of variability in the time of onset of the monsoon. Taking the values for June in the second table, the accumulative precipitation (January-June) ranges from .001 to .637 of the average annual total (168.2 mm).

BUJAR	CENTRAL AFRICAN REP	64661C	5.5	-15.6	15	.1	1.5	41.3	12.4	1344	1546	17.1	10.5
BOUCA	CENTRAL AFRICAN REP	64662C	6.5	-15.3	16	.0	2.6	68.8	12.6	1265	1486	16.0	17.5
BOSSAIGNA	CENTRAL AFRICAN REP	64663C	5.3	-17.0	16	.0	27.8	73.7	14.1	1550	1683	18.5	19.34
BAVGUJ	CENTRAL AFRICAN REP	64664C	6.5	-17.4	15	.0	42.0	36.0	11.8	1340	1510	16.0	18.33
BRIA	CENTRAL AFRICAN REP	64665C	4.4	-18.9	29	.0	18.7	81.9	13.4	1417	1531	14.5	17.48
BANGASSOU	CENTRAL AFRICAN REP	64666C	6.5	-22.0	26	.0	17.4	91.7	13.8	1479	1551	17.0	16.4
BRAD	CENTRAL AFRICAN REP	64667C	4.8	-22.8	27	.0	56.5	31.0	13.9	1540	1752	19.5	21.56
BR	CENTRAL AFRICAN REP	64668C	10.3	-22.8	16	.0	21.3	41.6	7.8	792	884	9.76	10.60
BARRAKI	CENTRAL AFRICAN REP	64669C	5.4	-26.5	14	.0	25.5	59.1	12.2	1353	1481	16.12	17.30
AI ANGU	CENTRAL AFRICAN REP	64670C	5.8	-26.7	15	.0	32.8	42.6	11.5	1255	1400	15.44	16.75
FT LAMY	CENTRAL AFRICAN REP	64671C	5.0	-21.2	16	.0	13.8	111.8	13.6	1444	1543	16.1	17.0
BOUSSA	CHAD	64700C	12.1	-15.0	20	.0	27.0	23.2	4.9	518	626	7.14	7.93
MOUNDOU	CHAD	64705C	10.5	16.7	19	.0	31.4	30.1	7.4	825	944	10.60	11.5
PALA	CHAD	64706C	8.6	-16.1	27	.0	46.2	25.5	8.9	1021	1178	13.5	14.77
FT ARCHAMPOULT	CHAD	64709C	9.4	-14.5	20	.0	15.4	65.4	5.2	479	1065	11.51	12.29
FAYA LARGEAU	CHAD	64710C	9.3	-18.4	30	.0	19.2	53.5	5.3	1022	1121	12.19	13.08
ARCFE	CHAD	64750C	13.8	-20.8	29	.0	35.1	13.8	21.8	357	485	5.73	6.52
GAROUA	CAMEROON	64800C	5.3	-13.4	12	.0	30.7	39.7	8.2	973	1047	12.1	13.2
SOKOTO	NIGERIA	65010C	13.0	5.3	43	.0	21.5	27.4	5.1	636	727	8.28	9.24
KANO	NIGERIA	65040C	12.0	-8.5	54	.0	31.1	27.6	6.5	742	846	9.60	10.71
HAUCOURT	NIGERIA	65080C	11.5	-13.1	45	.0	33.4	21.4	4.5	573	671	7.68	8.56
ILORIN	NIGERIA	65101C	8.5	-4.0	15	.0	50.1	26.6	10.2	1159	1333	15.08	16.4

Page 4A

MINNA NIGERIA 65121C 5.6 -6.5 16 .0 20.4 59.4 10.9 11.47 12.57 1366 1465
 JOS NIGERIA 65136C 5.9 -8.9 15 .0 19.2 74.3 12.15 13.15 14.27 1539 1639
 YOLA NIGERIA 65147C 5.2 -12.5 14 .0 21.0 44.3 7.3 8.72 9.70 1759 1857
 LAGOS IKE JA NIGERIA 65201C 6.5 -3.4 75 .0 87.4 20.0 12.5 14.93 17.59 2024 2263
 WARRI NIGERIA 65206C 5.5 -5.7 42 .0 48.6 57.3 22.3 25.14 27.72 3074 3250
 CALABAR NIGERIA 65244C 5.0 8.3 59 .0 147.1 20.6 21.80 25.96 3036 3481 38.93
 ACCRA GHANA 65445C 5.6 0.2 70 .0 57.7 12.7 4.85 5.86 7.14 860 1006
 OUAGADOUGA UPPER VOLTA 65503C 12.4 1.5 29 .0 21.2 20.2 6.65 7.66 8.77 989 1089
 OUIERAKI IVORY COAST 65528C 9.5 7.8 24 .0 31.4 46.8 13.66 14.93 16.56 1850 1967
 ABIDJAN IVORY COAST 65578C 5.3 3.9 28 .0 111.7 18.4 14.79 17.73 21.00 2427 2721
 HARRELI LIBERIA 65607C 6.4 10.4 24 .0 415.2 7.6 16.76 23.69 31.39 3904 4602

IM9001 EXECUTION TERMINATING DUE TO PRORH (LIMIT FOR ERROR NUMBER) 217
 TRAPACK ROUTINE CALLING FROM ISN REG. 14 REG. 15 REG. C REG. 1
 UC135174 00113700 CCCCCC00 00115100
 0000P00A C1135C1C PFC0C1P 0015676C

TRACER PRINT= C1135C1C

It is not unusual to have two years in a row with less than .01 of the average annual total by the end of June. At this station, most of the annual total has fallen by the end of September. The accumulative precipitation for the first nine months at Agadez ranges from .238 to 1.737 of the average annual total.

Then follows a series of tables, in which the data for each calendar month are arrayed in ascending order. Using the data for Agadez again for illustrative purposes:

- 1) By the end of June, in 18 out of 28 years less than 10% of the annual average total has fallen.
- 2) By the end of September, in 5 out of 24 years, there had been less than 60% of the average annual total precipitation.

The Mixed Incomplete Gamma Distribution Quantile Charts

The mixed incomplete gamma distribution has been widely used in connection with precipitation data. Mooley (4) includes most of the useful references to the use of this distribution. He concluded in his study of Indian monsoon rainfall that it would be best to have 50 to 65 years of sample data to arrive at stable estimates of the parameters of the gamma distribution. For the work that has been done on the Sahel-Sudano data, we have that size sample (or larger) for a few stations, but if we had restricted the work to only these, we would have had a very sparse geographical sample. Thus, in the table that follows, we show the sample size for each location. For the sample sizes considerably less than Mooley's recommendation, the reader should be aware that

the parameter estimates (and the resulting quantile values) are subject to larger sample errors than those with sample size of 50 or more.

The mixed incomplete gamma distribution function is

$$F(x) = q + (1-q) \int_0^x f(t) dt, \text{ if } x \geq 0,$$

where $f(t)$ is the density function

$$(t^{\gamma-1} \exp(-t/\beta)) / (\beta^{\gamma} \Gamma(\gamma)),$$

and q is the probability that the variable is zero (where the estimate of γ is large, (about 27 or more), the density function for the normal distribution is substituted in our algorithm.)

Estimates of γ and β were computed from sample data, using a method presented by Thom (5). These are shown in the following table, together with estimates of x , such that

$$F(x) = .10, .25, .50, .75, \text{ and } .90.$$

(If other investigators wish to have these computed at different risk levels, it is not a difficult thing to do, given the computer algorithm we have at the University of Missouri.)

These same quantile values were plotted on meteorological base charts, and isohyets were drawn, and these are presented as five charts. Again, the user should be aware that some subjective smoothing was accomplished at the time these charts were prepared. No attempt was made to allow for great sophistication with respect to localized differences in precipitation that may be the result of significant differences in terrain.

However, with these limitations, the quantile maps presented are believed to portray a more useful general picture of the precipitation climatology of this tortured region than the usual charts that portray only the average (expected) value.

Concluding remarks:

While it is quite proper for climatologists and others concerned with the question of climate change to look for evidence of change over many centuries, or over millenia, and to be concerned with hypotheses "explaining" such change, some of the policy questions that need to be answered require consideration of variability over one to three decades. Perhaps the following "Scenario" illustrates this point.

Scenario

Rapid growth in human and animal population, together with the introduction (and apparent success) of new crop technology, and changes in the societal political structure of the Sahel-Sudano regions were observed during the two decades following World War II. It is interesting to note that, with some comparatively

minor exceptions, that these were also decades with annual precipitation near (or above) levels regarded as "normal".^{1/}

Now, usher in the years since 1965, during which many places in the Sahel-Sudano regions have received less than 80% of expected annual precipitation, (with some places getting less than 50%).

Could it be that the introduction of technology and the apparent favorable response during the favorable period of precipitation was planned and executed on a perception of the climate as 1) having only a minor impact, or 2) being fixed at some level close to the most recent years of experience, or testing, (which may have been sampled from some part of the 1946-1965 period)?

Recommendation

Planning for future years should include a perception of the climate of the Sahel-Sudano area as a variable feature. Further introduction of, or changes in technology, should clearly allow for the kind of variability that has been apparent over as long a period of record as it is possible to assemble.

^{1/} Figures 1 and 2 show simple arithmetic averages of the annual precipitation (1951-1972) expressed in terms of the ratio of precipitation for a particular year to the long term expected value. Detailed values for particular sample locations are shown in the second table for each station.

SAHEL-SUDANO

PRECIPITATION PATTERNS

16.1° - 22.5° N
30.0°W - 40.0° E

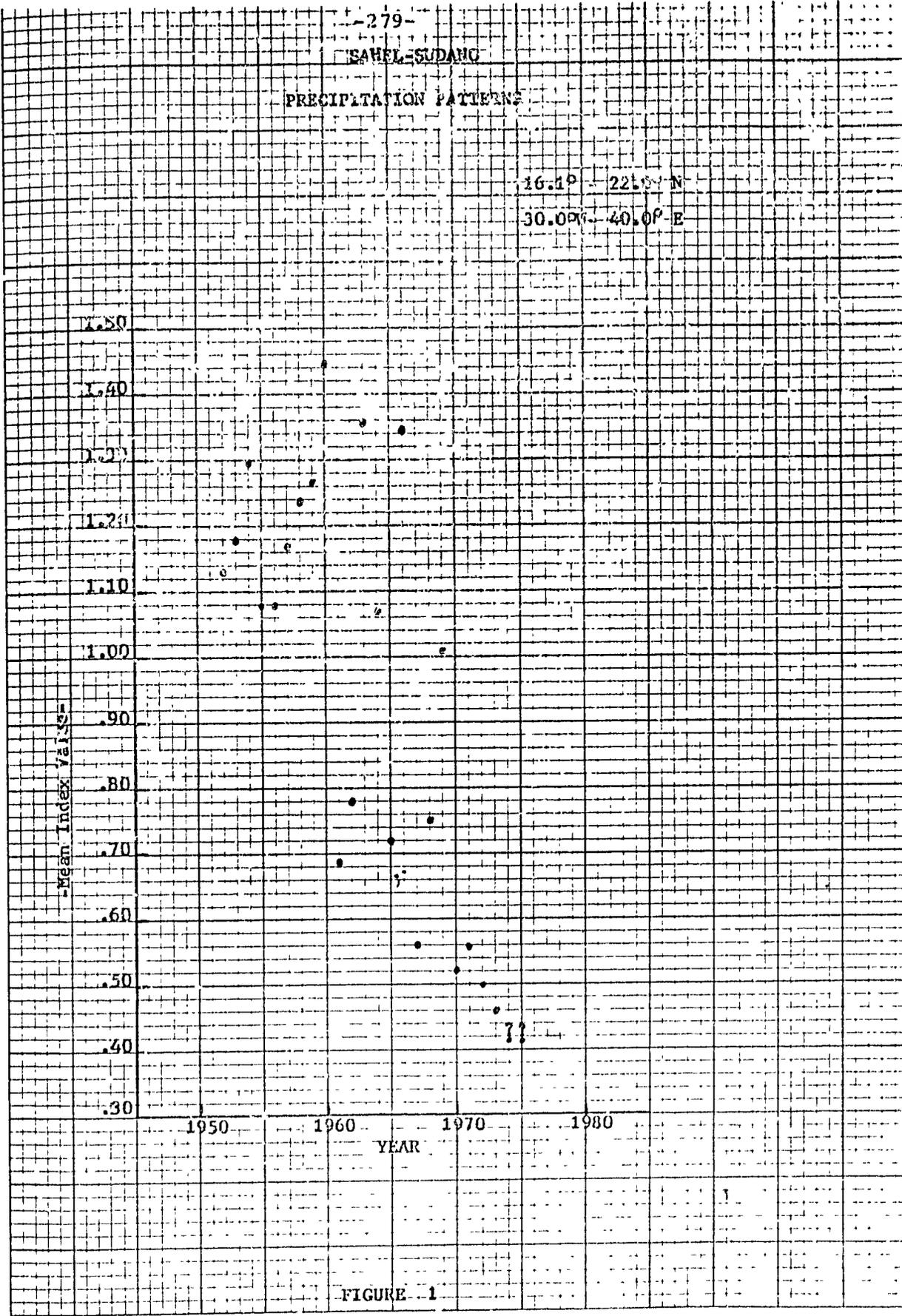


FIGURE 1

PRECIPITATION PATTERNS

12.1° - 16.0° N
30.0° W - 40.0° E

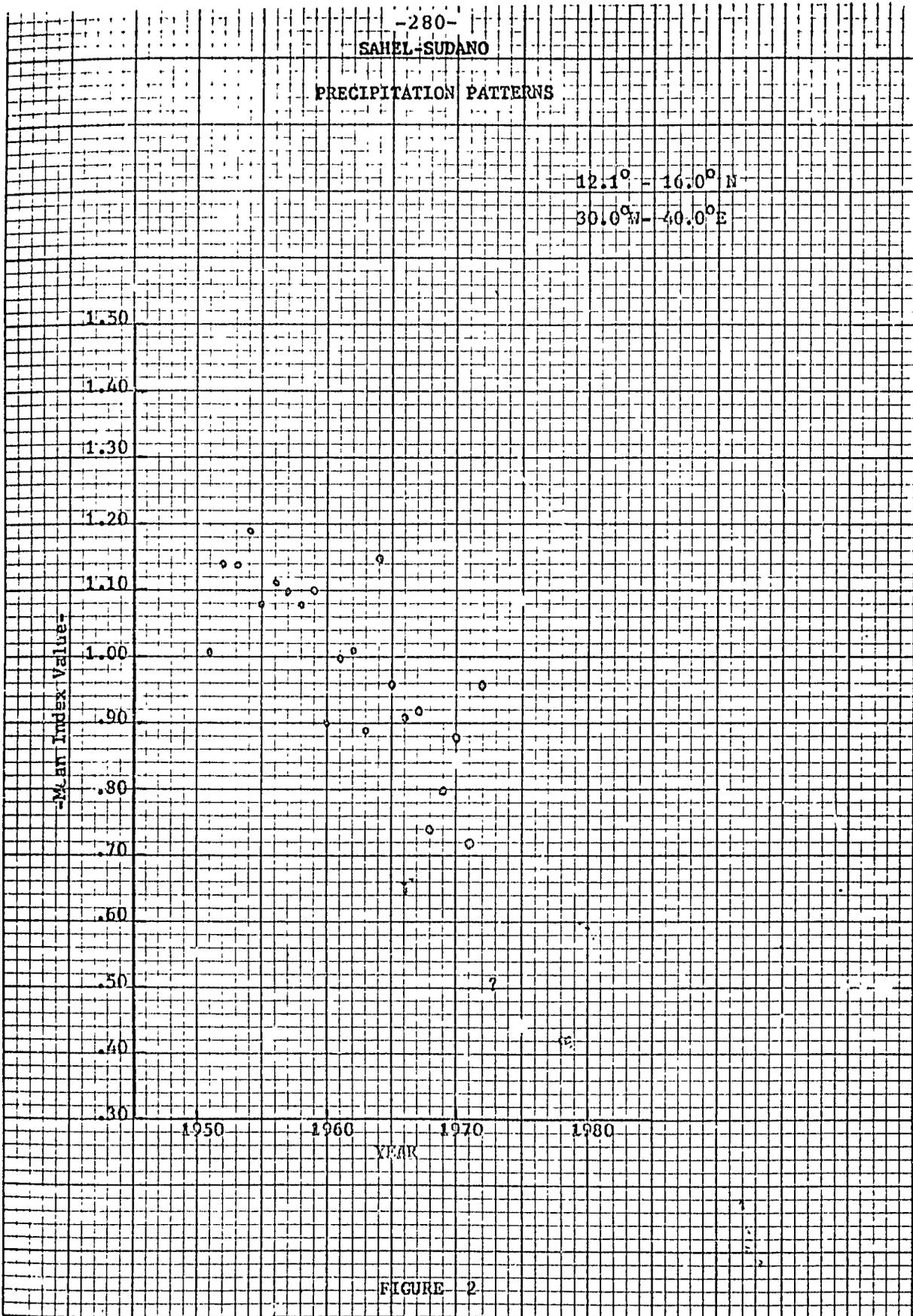


FIGURE 2

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PART II: ECONOMIC DATA

Part A: Basic Economic Data

Part B: Data on Income, Wages, and Monetary Aspects

Part C: Projections of Values of Production and
Exports at Projected World Prices

PART A

BASIC ECONOMIC DATA

ECONOMIC DATA

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Source for Tables 1-14, "An Approach to Recovery and Rehabilitation of the Sudano-Sahelian Region," Special Sahelian Office, United Nations, New York, 74-12093, 1974.

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TABLE 1

Population estimates, annual rates of increase in percent,
and population projections for seven west African countries

	Chad	Gambia	Mali	Mauritania	Niger	Senegal	Upper Volta	Total
<u>Population</u> (in 1,000)								
1960	2,975	362	4,089	950	2,913	3,110	4,400	18,799
1965	3,306	389	4,530	1,050	3,513	3,490	4,858	21,136
1969	3,571	421	4,943	1,146	3,914	3,837	5,278	23,110
1970	3,640	429	5,049	1,171	4,016	3,925	5,384	23,614
1971	3,744	438	5,166	1,201	4,121	4,024	5,513	24,207
1972	3,851	448	5,286	1,231	4,229	4,125	5,645	24,815
1975	4,199	479	5,668	1,330	4,579	4,452	6,058	26,765
1980	4,843	539	6,488	1,518	5,287	5,086	6,883	30,644
<u>Annual</u> <u>Average Rate</u> <u>of increase</u> (in percent)								
1960-65	2.1	1.5	2.0	2.1	4.0	2.3	2.0	
1965-70	1.9	1.9	2.2	2.2	2.7	2.3	2.0	
(60-70)	2.0	1.7	2.1	2.1	3.3	2.3	2.0	
*Current Rate	2.4	2.0	2.4	2.3	3.0	2.4	2.0	

Sources: United Nations Special Sahelian Office 1974;

* Agency for International Development 1974.

The figures included in this table are the tentative estimates, based on the latest available information of population in the seven Sudano-Sahelian countries, as of 1973. The figures are subject to change when complete census figures become available and the effects of the drought are known.

TABLE 2
Per capita GNP, per capita GDP at current prices,
population estimates and real product growth rates

Country	Per Capita GNP	Per Capita GDP	Average annual growth rates of total real product			Population 1974 (millions)	Average annual growth rates of per capita real product		
	1972 (dollars)	1970-71 (dollars)	1960-70 (in percent)	1968-71 (in percent)	1970-72*		1960-70 (in percent)	1968-71 (in percent)	1970-72*
Chad	85	78	0.5	1.0	2.7	4.08	-1.8	-1.3	0.2
Mali	70	70	5.2	5.0	3.5	5.60	3.0	2.8	11.2
Mauritania	175	148	6.9	3.8	5.2	1.28	4.6	1.6	3.0
Niger	120	88	2.4	-2.4	-5.0	4.34	-0.3	-5.0	-7.5
Senegal	285	209	1.0	-3.8	1.0	4.13	-1.4	-6.1	-1.5
Upper Volta	70	59	0.7	2.9	2.0	5.83	-1.4	0.8	0.0
Total of Above			2.3	0.1	1.5	25.26	0.0	-2.2	-0.9
Total Developing Countries	211		5.1	6.0	5.5		2.5	3.3	2.7

Sources: United Nations Special Sahelian Office 1974; United States Agency for International Development 1974.

* Tentative estimates

TABLE 3
GDP at current factor cost by industry, 1968 to 1970
(in million \$ million)

Country	Year	Agriculture	Mining	Manu- ₁ facturing	Con- struction	Commerce	Transport	Total including other
**Chad	1968	109.1	-	14.4	8.3	33.5	6.1	215.0
	1969	135.0	-	17.6	8.3	37.1	6.5	259.3
	1970	136.9	-	18.4	8.5	47.5	8.3	233.0
	1971	135.8	-	23.0	9.4	44.6	9.4	287.4
**Mali	1966/67	102.2	-	15.6	11.1	38.7	7.2	203.3
	1967/68	117.3	-	24.6	11.1	62.4	9.0	255.1
	1969	114.7	-	24.8	12.1	63.7	10.6	264.9
	1970	131.6	-	31.7	10.9	68.8	11.1	298.3
	1971	142.1	-	33.4	10.5	77.8	12.3	326.3
	1972	147.6	-	36.1	10.9	83.1	13.5	345.6
*Mauritania	1968	64.7	41.6	4.0	11.0	10.0	3.0	154.0
	1969	67.0	46.0	4.0	13.0	11.0	3.0	166.0
	1970	71.0	57.0	4.0	16.0	12.0	4.0	189.0
*Niger	1968	156.0	-	17.0	14.0	30.0	7.0	263.0
	1969	165.0	-	18.0	17.0	32.0	8.0	281.0
	1970	175.0	-	19.0	20.0	33.0	9.0	300.0
**Senegal	1967	290.9	8.3	113.4	12.6	117.4	42.8	765.9
	1968	253.1	8.3	121.7	13.7	135.8	44.6	759.8
	1969	272.9	7.9	123.5	13.3	132.5	43.9	778.9
	1970	230.1	7.9	127.8	19.1	142.2	43.9	759.4
	1971	301.8	10.4	128.9	19.1	143.3	42.8	840.4
*Upper Volta	1968	108.0	-	19.0	9.0	30.0	9.0	207.0
	1969	122.0	-	22.0	12.0	34.0	10.0	235.0
	1970	119.0	-	24.0	15.0	38.0	11.0	245.0

Sources: *United Nations Special Sahelian Office 1974;

**Agency for International Development.

1 Manufacturing Industry and Electricity Production.

TABLE 4

Structural Components of Gross Domestic Product

	<u>Year</u>	<u>Chad</u>	<u>Mali</u>	<u>Mauritania</u>	<u>Niger</u>	<u>Senegal</u>	<u>Upper Volta</u>	<u>Six country total</u>	<u>Total: developing countries</u>
<u>The Agricultural Sector</u>									
Agricultural labour as share of total labour force	(in percent) 1970	92	91	87	93	80	87	88	65
Agriculture as share of total GDP	(in percent) 1970	46	44	38	58	30	49	42	27
Average annual growth rate of total production	(in percent) 1963-70	0.3	0.8	2.0	3.4	-2.6	2.1	1.0	2.8
Average annual growth rate of food production	(in percent) 1963-70	0.0	0.4	2.0	2.4	-3.1	0.8	0.4	2.9

The Manufacturing Sector

Share of manufacturing in GDP	(in percent) 1970	8	8	2	6	16	10	10	18
Growth rate of manufacturing in GDP	(in percent) 1960-69	5.2	6.5	12.2	4.1	5.3	1.5	5.0	7.1

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TABLE 4 (cont'd)

Structural Components of Gross Domestic Product

	<u>Year</u>	<u>Chad</u>	<u>Mali</u>	<u>Mauritania</u>	<u>Niger</u>	<u>Senegal</u>	<u>Upper Volta</u>	<u>Six country total</u>	<u>Total: developing countries</u>
<u>Gross Domestic Investment</u>									
Share in GDP	(in percent) 1970	12.7	14.1	27.9	20.2	15.3	19.5 ^{a/}	17.0	17.0
Real growth rate	(in percent) 1960-69	2.7	8.8	2.9	6.6	5.3	11.2	6.1	6.9
<u>Share of Gross National Savings in GDP</u>									
Average	(in percent) 1968-70	-2.8	11.9	23.0	-1.3	4.3	8.9	6.9	16.2
Average annual change	(in percent) 1960-70	-0.7	0.6	3.0	-1.2	-0.2	0.7	0.2	0.2

Source: United Nations Special Sahelian Office 1974.

^{a/} 1969

TABLE 5

Exports, imports and balance of trade summary

Country	Exports*	Imports**	Trade balance	Share of exports	Share of imports	Growth rates of export	Growth rates of import	Export Value	Import value	Principal exports % of total 1970/72
	value 1972 (in millions US dollars)	value 1972 (in millions US dollars)		in GNP 1972 (in percent)	in GNP 1972 (in percent)	value 1968/71 (in percent)	value 1968/71 (in percent)	per capita (in US dollars)	per capita (in US dollars)	
Chad	39	61	-22	12	18	-1.0	22.2	10	16	cotton, 67%
Mali	44	70	-26	12	19	47.1	14.1	8	13	livestock, 35% cotton, 20%
Mauritania	106	69	37	50	32	7.7	17.7	87	57	iron ore, 73%
Niger	54	66	-12	11	13	9.4	8.7	13	16	peanuts and products, 51%
Senegal	216	280	-64	19	25	-6.1	6.6	55	71	peanuts, 47% phosphates, 9%
Upper Volta	20	61	-41	5	16	-8.7	7.6	4	11	livestock, 35% cotton, 24%

Source: Agency for International Development 1974.

* F.O.B.

**C.I.F.

TABLE 6
Share of food imports^{a/} in total imports

<u>Country</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
	(in thousands US dollars)		
<u>Chad</u>			
(1) total imports	33,469	46,160	55,723
(2) total food imports	4,292	9,629	11,202
(3) (2) as percent of (1)	12.8	20.9	20.1
<u>Mali</u>			
(1) total imports	34,298	38,912	44,799
(2) total food imports	7,626	6,101	12,897
(3) (2) as percent of (1)	22.2	15.7	28.8
<u>Mauritania</u>			
(1) total imports	35,298	45,174	55,855
(2) total food imports	9,071		13,077
(3) (2) as percent of (1)	25.7	...	23.4
<u>Niger</u>			
(1) total imports	41,471	48,700	58,368
(2) total food imports	5,651	6,547	8,277
(3) (2) as percent of (1)	13.6	13.4	14.2
<u>Senegal</u>			
(1) total imports	180,381	198,648	192,429
(2) total food imports	67,335	67,949	55,617
(3) (2) as percent of (1)	37.3	34.2	28.9
<u>Upper Volta</u>			
(1) total imports	41,003	49,834	46,659
(2) total food imports	8,815	9,527	9,524
(3) (2) as percent of (1)	21.5	19.1	20.4

SOURCE: United Nations, Yearbook of International Trade Statistics 1970-1971

^{a/} Includes, according to Standard International Trade Classification, Revised (SITC Revised), food and live animals; beverages and tobacco; animal, vegetable oil, fat (0+1+4). Food and total imports, C.I.F.

TABLE 7

Share of Livestock Exports in GDP and Total Exports

		<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
<u>Chad^{a/}</u>								
(1) GDP	000 US\$		225,000					
(2) Total exports	000 US\$	26,000	30,000	32,500	37,700	34,700	35,900	37,600
(3) Exports of live animals and products	000 US\$	9,150	8,840	7,550	9,380	13,630	13,350	13,060
(4) (3) as percent of (1)			3.9					
(5) (3) as percent of (2)		35.2	29.5	23.2	24.9	39.3	37.2	34.7
<u>Mali^{a/}</u>								
(1) GDP	000 US\$		371,000					
(2) Total exports	000 US\$	19,500	26,500	19,000	29,000	31,800	30,000	30,500
(3) Exports of live animals and products	000 US\$	12,010	14,280	10,800	20,600	19,880	17,530	16,150
(4) (3) as percent of (1)			3.8					
(5) (3) as percent of (2)		61.6	53.9	56.8	71.0	62.5	58.4	53.0
<u>Mauritania^{a/}</u>								
(1) GDP	000 US\$			191,000				
(2) Total exports	000 US\$	69,230	72,020	71,760	77,800	95,930	98,410	
(3) Exports of live animals and products	000 US\$	14,700	15,000	14,670	14,640	14,400	14,500	14,600
(4) (3) as percent of (1)				7.7				
(5) (3) as percent of (2)		21.2	20.8	20.4	18.8	15.0	14.7	

TABLE 7 (cont'd)

Share of Livestock Exports in GDP and Total Exports

		1966	1967	1968	1969	1970	1971	1972
<u>Niger^{a/}</u>								
(1) GDP	000 US\$	389,000	395,000	387,000	352,000			
(2) Total exports	000 US\$	46,700	43,500	39,000	35,000	42,000	50,000	
(3) Exports of live animals and products	000 US\$	13,490	13,850	14,470	15,060	15,630	16,160	16,680
(4) (3) as percent of (1)		3.5	3.5	3.7	4.3			
(5) (3) as percent of (2)		28.9	31.8	37.1	43.0	37.2	32.3	
<u>Senegal^{a/}</u>								
(1) GDP	000 US\$	811,000	787,000	833,000	802,000		689,000	
(2) Total exports	000 US\$	148,900	137,300	151,300	123,600	152,000	130,000	170,000
(3) Export of live animals and products	000 US\$	1,230	1,010	720	400	400	300	280
(4) (3) as percent of (1)		.2	.1	.1				
(5) (3) as percent of (2)		.8	.7	.5	.3	.3	.2	.2
<u>Upper Volta^{a/}</u>								
(1) GDP	000 US\$	236,000		316,000				
(2) Total exports	000 US\$	16,600	19,100	22,700	23,000	20,000	20,000	
(3) Exports of live animals and products	000 US\$	10,790	11,680	12,840	10,010	7,370	9,530	8,260
(4) (3) as percent of (1)		4.6		4.1				
(5) (3) as percent of (2)		65.0	61.2	56.6	43.5	36.9	47.7	

SOURCES: From ST/SSO/12, Table 11, based on data from: FAO Trade Yearbook 1972; United Nations National Accounts Statistics 1971; Economic Intelligence Unit 1972; International Financial Statistics, May 1973

PREPARED: MGO/PEV/AP/GS/FP

^{a/} Official export data adjusted to include unrecorded exports of live animals

TABLE 8

Net flow of loans and grants^{a/}

Country	Totals (\$ million)				Per capita (\$)				Net flow as	Net flow as	Net flow as
	Average 1965-68	1969	1970	1971	Average 1965-68	1969	1970	1971	share of GNP 1971 ^{b/} (in percent)	share of imports 1971 (in percent)	share in gross investment 1971 (in percent)
<u>Chad</u>	23.47	21.99	21.26	29.28	6.9	6.1	5.7	7.7	11.3	47.2	86.1
<u>Mali</u>	20.42	20.82	20.11	36.82	4.4	4.3	4.0	7.2	7.2	66.9	96.9
<u>Mauritania</u>	8.76	18.52	17.63	4.77	8.0	16.2	15.1	4.0	2.7	8.4	8.2
<u>Niger</u>	22.38	36.01	45.06	49.48	6.1	9.2	11.2	12.0	15.7	91.6	76.1
<u>Senegal</u>	50.16	49.12	40.76	58.49	14.0	13.0	10.37	14.5	8.4	26.8	47.9
<u>Upper Volta</u>	19.14	24.03	21.89	29.29	3.8	4.6	4.1	5.3	9.6	58.6	53.3
<u>Total of above^{c/}</u>	144.33	170.49	166.71	208.13	6.7	7.5	7.2	8.8	9.2	41.8	55.9
<u>Total Developing Countries</u>	7566.98	8662.29	9570.55	11366.89	4.8	5.2	5.7	6.5	3.2	18.5	(18.9)

Source: United Nations Special Sahelian Office 1974.

a/ Bilateral and multilateral official loan and grant receipts plus guaranteed private export credits (data on a net disbursement basis).

b/ 1971 GNP and gross investment figures used as denominator.

c/ Excluding approximately \$40 million per year in recent years from France to the following five least developed countries: Chad, Mali, Niger, Upper Volta and Dahomey. The available data do not show the allocation among them.

TABLE 9

Sources of Financing of Development Plans (in percent)

	<u>Domestic</u>	<u>Foreign</u>
<u>Chad</u>		
1966-70 Development Plan	37.0	63.0
<u>Mali</u>		
1970-73 Development Programme	17.0	83.0
<u>Mauritania</u>		
Investments 1970-72	5.6	94.4 ^{a/}
<u>Niger</u>		
Public Investment Expenditure 1967/68-1970/71	15.8	84.2
<u>Senegal</u>		
Public Sector Investment 1969/70-1972/73	39.3	60.7
<u>Upper Volta</u>		
Development Plan 1967-69	29.2	70.8

Source: United Nations Special Sahelian Office 1974.

^{a/} Includes private foreign investments by Société des Mines de Fer de Mauritanie (SIFERMA), exploiting iron ore and copper deposits.

TABLE 10

Sources of Government revenue, 1971

	Tax Share in GDP	Direct Taxes	Production and consumption taxes	Export and Import Taxes	Others
	(in percent)	(distribution in percent)			
<u>Chad</u>	17.1	28.7	16.4	45.2	9.6
<u>Mali</u>	13.4	17.6	32.8	35.2	14.5
<u>Mauritania</u>	16.6	19.9	8.7	54.0	17.5
<u>Niger</u>	12.9	27.6	17.6	36.3	18.4
<u>Senegal</u>	18.7	23.3	22.0	46.9	7.8
<u>Upper Volta</u>	10.8	21.9	20.0	45.0	13.1

Source: United Nations Special Sahelian Office 1974.

TABLE 11

Total ODA flows and grant shares in ODA from individual donors and multilateral agencies

	<u>Total ODA (\$ million)</u>				<u>Grants as per cent of ODA</u>			
	1965-68 ^{a/}	1969	1970	1971	1965-68 ^{a/}	1969	1970	1971
<u>Bilateral donors</u>								
Australia	-	-	-	-	-	-	-	-
Austria	0.06	0.13	0.06	0.05	100.0	100.0	100.0	100.0
Belgium	0.10	0.37	0.56	0.70	100.0	100.0	100.0	100.0
Canada	1.25	2.56	9.25	12.86	100.0	100.0	77.0	58.5
Denmark	-	0.05	0.07	0.16	-	-	-	-
France ^{c/}	78.25	90.00	68.00	66.70	95.3	87.8	96.9	102.1
Germany, Fed. Rep.	3.52	12.43	6.88	10.60	66.5	30.7	69.8	54.8
Italy	0.03	0.08	0.23	0.20	66.7	100.0	100.0	100.0
Japan	0.01	0.04	0.01	0.02	100.0	100.0	100.0	100.0
Netherlands	-	-	0.25	0.19	-	-	100.0	100.0
Norway	0.01	-	-	-	100.0	-	-	-
Portugal	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-
Switzerland	0.12	0.29	0.15	0.29	100.0	100.0	100.0	100.0
United Kingdom	0.30	0.17	0.28	0.34	40.0	100.0	100.0	100.0
United States	9.78	13.00	6.00	15.00	94.3	92.3	66.7	100.0
A. <u>Total bilateral</u>	93.43	119.12	91.74	107.11	94.0	82.6	90.9	91.7

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TABLE 11(continued)

Total ODA flows and grant shares in ODA from individual donors and multilateral agencies

	<u>Total ODA (\$ million)</u>				<u>Grants as per cent of ODA</u>			
	1965-68 ^{a/}	1969	1970	1971	1965-68 ^{a/}	1969	1970	1971
<u>Multilateral donors</u>								
IBRD	-2.89	-5.84	-5.92	-7.16	--	--	--	--
IFC	1.23	8.40	9.70	-0.30	--	--	--	--
IDA	1.82	8.01	8.86	12.16	--	--	--	--
IDB	--	--	--	--	--	--	--	--
AFDB	-1.53	-0.66	-0.54	0.46	--	--	--	--
ASDB	--	--	--	--	--	--	--	--
EIB		5.04	6.55	0.21				
EEF		33.09	37.46	57.50	100.0	98.8	98.1	97.1
UNDP		8.38	8.26	10.41		100.8	101.1	101.1
UNICEF	6.50	1.12	0.79	0.88		102.7	103.8	108.0
UNRWA		--	--	--	100.0	--	--	--
UNHCR		0.16	0.36	0.12		106.3	100.0	100.0
WFP		1.09	2.23	3.96		100.0	100.0	100.0
Other United Nations agencies		--	--	0.86		--	--	100.0
B. <u>Total Multilateral</u>	5.13	58.79	67.75	79.10	..	74.1	71.6	91.4
C. = A + B <u>Grand Total</u>	98.56	177.91	159.49	186.21	..	79.8	82.7	91.6

Source: United Nations Special Sahelian Office 1974.

^{a/} Total official flows.^{b/} As percent of total official flows.^{c/} Excluding approximately \$40 million per year in recent years from France to the following five least developed countries: Chad, Mali, Niger, Upper Volta and Dahomey. The available data do not show the allocation among them.

TABLE 12
Fuel Imports as Percentage of Total Imports^{a/}
 (total and fuel imports in thousands U.S. dollars)

Country	1967	1968	1969	1970
<u>Chad</u>				
(a) Total Imports	37,464	33,469	46,160	55,723
(b) Fuel Imports	5,518	5,528	7,596	3,621
(c) (b) as percent of (a)	14.7	16.5	16.5	15.5
<u>Guinea</u>				
(a) Total Imports	34,190	34,298	38,912	44,799
(b) Fuel Imports	2,607	2,662	3,435	4,007
(c) (b) as percent of (a)	7.6	7.8	8.8	8.9
<u>Mauritania</u>				
(a) Total Imports	36,885	35,298	45,174	55,855
(b) Fuel Imports	1,348	2,616		4,322
(c) (b) as percent of (a)	3.7	7.7		7.7
<u>Niger</u>				
(a) Total Imports	45,972	41,471	48,700	58,368
(b) Fuel Imports	2,732	2,320	2,067	2,318
(c) (b) as percent of (a)	5.9	5.6	4.2	4.0
<u>Senegal</u>				
(a) Total Imports	157,357	180,381	198,648	192,429
(b) Fuel Imports	1,150	5,556	14,842	9,621
(c) (b) as percent of (a)	0.7	3.1	7.5	5.0
<u>Upper Volta</u>				
(a) Total Imports	36,094	41,003	49,834	46,659
(b) Fuel Imports	2,357	2,762	3,300	3,825
(c) (b) as percent of (a)	6.5	6.7	6.6	8.2

Source: United Nations Special Sahelian Office 1974.

a/ Special Imports C.I.F.

TABLE 13

Technical assistance disbursements(Bilateral contributions from DAC member countries plus contributions from multilateral agencies)

Country	Totals (\$ million)				Per capita (\$)			
	Average 1962-66	1969	1970	1971	Average 1962-66	1969	1970	1971
<u>Chad</u>	1.6	10.8	9.7	12.3	0.5	3.0	2.6	3.2
<u>Mali</u>	2.9	7.1	7.7	9.3	0.7	1.4	1.5	1.8
<u>Mauritania</u>	0.4	5.0	4.2	4.6	0.4	4.4	3.6	3.8
<u>Niger</u>	2.0	11.8	12.9	11.9	0.6	3.0	3.2	2.9
<u>Senegal</u>	2.6	21.2	20.1	20.2	0.8	5.6	5.1	5.0
<u>Upper Volta</u>	2.6	9.5	8.0	9.6	0.5	1.8	1.5	1.7
<u>Total of above</u>	12.1	65.4	62.6	67.9	0.6	2.9	2.7	2.9
<u>Total Developing Countries</u>	1080.7	1838.4	1794.2	2051.9	0.7	1.1	1.1	1.2

Source: United Nations Special Sahelian Office 1974.

TABLE 14

Sectoral composition of national development plans

<u>Country</u>	Total expenditures planned	Agricultural and rural development	Mining Industry and Energy	Economic infra-structure ^{a/}	Health Welfare Education	Administrative services and other
		(as a <u>percent</u> of total planned investment)				
<u>Chad</u> (in billions CFA francs)						
1966-1970 Plan original estimate	47.2	28.4	14.1	33.5	23.5	.5
1966-1970 Plan revised estimate	26.2	31.8	16.6	28.4	22.1	1.1
1971-1980 Targets (tentative) ^{b/}	57.8	36.2	11.6	42.7 ^{c/}	9.5	2.0
<u>Gambia</u> (in millions DZnasi)						
2nd Development Programme 1967/68-70/71	22.9	14.0	25.0	39.0	17.0	5.0
3rd Development Programme 1971/72-73/74	26.8	21.0	7.7 ^{d/}	54.0	9.1	8.2
<u>Mali</u> (in millions Mali francs)						
1970-1973 Plan original estimate	77.6	25.8	19.2	32.1	12.9	10.0
1970-1973 Plan revised estimate	99.4	23.9	24.0	33.1	13.5	5.5
<u>Mauritania</u> (in billions CFA francs)						
1970-1973 Plan revised estimate	55.0	16.5	33.4	33.9	16.2 ^{1/}	k/
<u>Niger</u> (in billions CFA) ^{e/}						
Public investment expenditure 1967/68-70/71	19.2	32.0 ^{f/}	3.0 ^{g/}	33.0	14.0	18.0
<u>Senegal</u> (in billions CFA francs) (public investment only)						
3rd Development Plan 1969/70-72/73	121.9	35.3	-	39.6 ^{h/}	12.0	17.7
4th Development Plan 1973/74-76/77	177.4	50.0	9.0	29.0 ^{i/}	10.0	2.0
<u>Upper Volta</u> (in billions CFA francs)						
1967-1970	27.5	26.0	20.0	30.2	17.8	3.8
1972-1976	63.2	30.0	20.6	23.3	13.4	7.2

Source: United Nations Special Sahelian Office 1974.

Footnotes on next page.

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TABLE 14 (continued)

Sectoral composition of national development plans

(Footnotes)

- a/ "Economic infrastructure" includes transportation and communication;
- b/ Priority I - public investment only - targets being revised;
- c/ Includes 10 percent for "public utilities";
- d/ Includes estimate of two percent for manufacturing, included in the plan in Agriculture;
- e/ Actual public investment within the framework of 10-year "Development Perspectives";
- f/ Includes water resources development;
- g/ Mining exploration was chiefly financed by private investment not included here;
- h/ Of which 21.5 percent for housing;
- i/ Of which 15 percent is for housing and water development;
- j/ Includes "defense" (5.8), information and miscellaneous (4.3 percent);
- k/ Included in other sectors.

TABLE 15

Zone	Annual precipitation	Rainy Season	Areas (in 1000 sq. km) and % of totals						
			Chad	Mali	Mauritania	Niger	Senegal	Upper Volta	Total
Desert	below 100 mm		539 (42%)	422 (34%)	515 (50%)	443 (35%)	0	0	1932 (37%)
Sub-desert	100-300 mm	JA	193 (15%)	335 (27%)	433 (42%)	532 (42%)	43 (22%)	0	1492 (28%)
Sahel	300-650 mm	JJA	218 (17%)	186 (15%)	75 (7.3%)	253 (20%)	73 (37%)	41 (15%)	841 (16%)
Sudan	650-900 mm	JJAS	180 (14%)	99 (8%)	0	38 (3%)	55 (28%)	107 (39%)	476 (9%)
Woodland	over 900 mm	MJJAS	154 (12%)	136 (11%)	0	0	49 (25%)	96 (35%)	445 (8%)
Riparian	river valleys		0	62 (5%)	7 (0.7%)	0	12 (6%)	30 (11%)	1058 (2%)
TOTAL			1284 (100%)	1240 (100%)	1030 (100%)	1267 (100%)	197 (100%)	274 (100%)	5292 (100%)

Climatic Zones of the Sahel-Sudan Region

Table 16

Area, Population, and Population Density
of the Sahel-Sudan Region

	Area (hectares) $\times 10^8$	Population $\times 10^6$	Population Density (per hectare)
Chad	1.284	3.710	0.03
Mali	1.240	5.020	0.04
Mauritania	1.030	1.117	0.01
Niger	1.267	4.020	0.03
Senegal	.197	3.930	0.20
Upper Volta	.274	5.380	0.20
Total	5.292	23.117	0.04
Western Europe	3.003	319.663	1.06
India	3.268	547.000	1.67
Australia	7.686	12.550	0.02
U.S.A.	7.827	207.483	0.27
U.S.S.R.	22.402	243.900	0.11

TABLE 17
GDP at current Factor Cost by Industry, 1969
 (Industrial origin in US \$ million)

Country	Agriculture	Mining	Manufacturing and Electricity	Construction	Commerce	Transport	Total inc. other
MAURITANIA	67.0 (40.4%)	46.0 (27.7%)	4.0 (2.4%)	13.0 (7.8%)	11.0 (6.6%)	3.0 (1.8%)	166.0
MALI	208.0 (49.1%)	-	29.0 (6.8%)	23.0 (5.4%)	73.0 (17.2%)	12.0 (2.8%)	424.0 (100%)
SENEGAL	191.9 (30.9%)	2.0 (0.3%)	87.0 (14.0%)	21.0 (3.4%)	150.0 (24.1%)	41.0 (6.6%)	621.3
UPPER VOLTA	117.0 (49.4%)	-	22.0 (9.3%)	12.0 (5.1%)	38.0 (16.0%)	18.0 (7.6%)	237.0
NIGER	165.0 (59.6%)	18.0 (6.5%)	12.0 (4.3%)	34.0 (12.3%)	9.0 (3.3%)	19.0 (6.9%)	277.0
CHAD	105.0 (48.4%)	-	14.0 (6.5%)	13.0 (6.0%)	38.0 (17.5%)	3.0 (1.4%)	217.0
GHANA	862.7 (42.0%)	37.0 (1.8%)	348.0 (17.0%)	107.0 (5.2%)	261.0 (12.7%)	84.0 (4.1%)	2,053.7
IVORY COAST	384.6 (35.8%)	3.0 (0.3%)	147.0 (13.7%)	70.0 (6.5%)	164.4 (15.3%)	99.0 (9.2%)	1,075.0

Source : United Nations ECA, Survey of Economic Conditions in Africa, 1970.

TABLE 18

ECONOMIC CHARACTERISTICS

	<u>Chad</u>	<u>Mali</u>	<u>Mauritania</u>	<u>Niger</u>	<u>Senegal</u>	<u>Upper Volta</u>
Percent of total export in cotton	82%	10%	---	5%	---	28%
Percent of total export in livestock	12%	48%	---	19%	---	37%
Percent of total export in ground nuts	9%	9%	---	60%	54%	17%
Percent of total export in iron ore and concentrates	---	---	90%	---	---	---
Share of exports in total GNP	13%	3%	44%	14%	17%	8%
Imports of machinery and transportation equipment	29%	43%	39%	---	20%	25%
Import as percent of Gross Domestic Capital Formation	24%	22%	37%	---	34%	25%

TABLE 19

WEST AFRICA

DROUGHT RELIEF FUND PROJECT

Population and GNP Per Capita in 1970,
and Annual Growth Rates (1960-70)

Countries	Population (Millions)	GNP Per Capita (US \$)	Growth Rate Population GNP per Capita (percent)	
Upper Volta	5.38	60	2.1	-0.5
Mali	5.02	70	2.1	4.4
Niger	4.02	90	2.9	-2.0
Senegal	3.87	230	2.1	0.0
Chad	3.64	80	1.8	0.4
Mauritania	1.17	140	1.9	4.5
Total of Above	23.10	103	2.2	1.2
Total Developing Countries	1,674.03	211	2.7	2.3

Sources: World Bank Atlas, 1972 for African Countries.

UNCTAD Secretariat for total developing countries.

TABLE 20
WEST AFRICA
DROUGHT RELIEF FUND PROJECT

The Agricultural Sector

Countries	Agricultural labor as percent of total labor force	Percent share of agriculture in total GDP	Average annual growth rates of agricultural production (percent)		Average annual growth rates of food production (percent)	
	1970	1970	1963-70	1968-71	1963-70	1968-71
Chad	92	46	0.3	-0.7	0.0	0.5
Mali	91	44	0.8	2.9	0.4	3.5
Mauritania	87	38	2.0	1.8	2.0	1.8
Niger	93	53	3.4	1.7	2.4	1.7
Senegal	80	30	-2.6	4.0	-3.1	4.3
Upper Volta	87	49	2.1	0.5	0.8	0.0
Total of above	88	42	1.0	1.7	0.4	1.9
Total Developing Countries	65	27	2.8	2.1	2.9	2.1

Source: UNCTAD Secretariat

TABLE 21
WEST AFRICA

DROUGHT RELIEF FUND PROJECT

Growth and Level of Manufacturing Production,
Gross Domestic Investment and Gross Domestic Savings

Countries	Growth and level of Manufacturing		Gross domestic Investment		Gross Domestic Savings As percent of GDP	
	Share of Manufacturing in GDP 1970	Growth rate of real GDP arising in manufacturing 1960-69	Share in GDP 1970	Real Growth rate 1960-69	Average 1968-70	Average annual change 1960-70
Chad	8	5.2	12.7	2.7	-2.8	-0.7
Mali	8	6.5	14.1	8.8	11.9	0.6
Mauritania	2	12.2	27.9	2.9	23.0	3.0
Niger	6	4.1	20.2	6.6	1.3	-1.2
Senegal	16	5.3	15.3	5.3	4.3	-0.2
Upper Volta	10	1.5	19.5 ^{a/}	11.2	8.9	0.7
Total of above	10	5.0	17.0	6.1	6.9	0.2
Total Developing Countries	18	7.1	17	6.9	16.2	0.2

Source: UNCTAD Secretariat

^{a/} 1969

TABLE 22
WEST AFRICA

DROUGHT RELIEF FUND PROJECT

Country	Export Value 1971 (\$ Millions)	Exports as % of GNP 1970	Growth Rates of Exports Value		Exports Value Per Capita 1971 (\$)	Increment in Export Value Per Capita 1965-71 (\$)
			1960-62/ 1968-70	1968/71		
Chad	28	11.6	7.4	-1.9	7	-1
Mali	35	6.5	6.6	47.1 ^{1/}	7	3
Mauritania	90	49.4	54.5	7.7	75	20
Niger	38	10.2	7.2	9.4	9	2
Senegal	125	21.7	2.7	-6.1	31	-6
Upper Volta	16	5.9	18.9	-8.7	3	-
Total of above	332	15.6	8.4	2.1	14	1
Total Developing Countries	59,960	15.2	7.4	11.7	34	10

Source: UN Monthly Bulletin of Statistics: national sources: OECD, Overall Trade by Countries, Series A

^{1/} Reflects better recording of trade statistics and reduction in smuggling.

TABLE 23
WEST AFRICA
DROUGHT RELIEF FUND PROJECT
Imports

Countries	Imports value 1971 (\$ Millions)	Imports as percent of GNP 1970	Growth Rates Imports value		Growth Rate of Imports volume 1960-62/68-70	Imports value per Capita 1971(\$)	Increment in imports value per Capita 1965-71(\$)
			1960-62/ 1968-70	1968/71			
Chad	62	23.6	7.2	22.2	5.8	16	7
Mali	55	9.2	1.0	14.1	-0.5	11	2
Mauritania	57	31.1	5.2	17.7	2.9	48	25
Niger	54	18.4	12.1	8.7	10.5	13	2
Senegal	218	27.6	3.9	6.6	2.4	54	8
Upper Volta	51	15.4	7.6	7.6	6.0	9	1
Total of above	497	20.4	5.2	10.4	3.7	21	5
Total of Developing Countries	61510	15.4	6.5	11.5	4.7	35	10

Sources: United Nations, Monthly Bulletin of Statistics, national sources; OECD, Overall Trade by Countries, Series A.

TABLE 24

WEST AFRICA

SAHEL-SUDANO PROJECT -

Imports

Countries	Imports value 1971 (\$ Millions)	Imports as percent of GNP 1970	Growth Rates Imports value		Growth Rate of Imports volume 1960-62/68-70	Imports value per Capita 1971(\$)	Increment in imports value per Capita 1965-71(\$)
			1960-62/ 1968-70	1968/71			
Chad	62	23.6	7.2	22.2	5.8	16	7
Mali	55	9.2	1.0	14.1	-0.5	11	2
Mauritania	57	31.1	5.2	17.7	2.9	48	25
Niger	54	18.4	12.1	8.7	10.5	13	2
Senegal	218	27.6	3.9	6.6	2.4	54	8
Upper Volta	51	15.4	7.6	7.6	6.0	9	1
Total of above	497	20.4	5.2	10.4	3.7	21	5
Total of Developing Countries	61510	15.4	6.5	11.5	4.7	35	10

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Sources: United Nations, Monthly Bulletin of Statistics, national sources; OECD, Overall Trade by Countries, Series A.

TABLE 25

<u>Aid to the Sahel-Sudano Countries 1969-1971</u>					
1969-1971 over annual		<u>bilat.</u>	<u>mult. lat.</u>	<u>total</u>	<u>per capit.</u>
	Mali	13.6	11	24.6	5.05
	Mauritania	3.7	9.2	12.9	11.34
	Niger	25.4	9.4	34.8	8.9
	Senegal	31.4	19.	50.4	13.29
	Upper Volta	14.9	10.	24.9	4.72
	Tchad	17.	8.4	25.4	7.24

Source: United Nations Statistical Yearbook, 1972

TABLE 26
World Bank and IDA Credits
Cumulative Net Total of Initial Commitments

Country	June 1970		June 1971		Change	
	Bank	IDA	Bank	IDA	Bank	IDA
	millions U.S. dollars					
Chad	--	5.9	--	8.1	--	+2.2
Mali	--	16.8	--	16.8	--	--
Mauritania	66.0	9.7	66.0	9.7	--	--
Niger	--	8.2	--	13.9	--	+5.7
Senegal	7.5	17.1	4.0	24.1	-3.5	+7.0
Upper Volta	--	0.8	--	7.0	--	+6.2

Total Net Official Receipts of Financial Aid From DAC Countries and
Multilateral Agencies as Percentages of Imports and the GNP

Country	Aid as Percentage of Imports		Aid as Percentage of GNP	Aid per Capita (U.S. dollars)	
	67-69	68-70	68-70	67-69	68-70
Chad	44.7	47.8	8.9	5.2	5.4
Mali	45.5	72.7	4.3	3.4	3.9
Mauritania	36.6	--	4.8	7.3	--
Niger	50.2	54.0	10.7	5.9	7.5
Senegal	26.4	20.4	6.7	11.4	11.5
Upper Volta	47.8	--	7.0	3.5	--

Source: United Nations, Survey of Economic Conditions in Africa, 1971

TABLE 27

Net Official Receipts of Bilateral Financial Aid from DAC Countries
1967-1970

<u>Country</u>	<u>Annual Averages in millions U. S. dollars</u>		
	<u>1967-69</u>	<u>1968-70</u>	<u>Change</u>
Chad	10.07	10.16	+0.09
Mali	7.89	9.32	+1.43
Mauritania	4.53	3.35	+1.18
Niger	15.83	20.20	+4.37
Senegal	29.37	28.03	-1.34
Upper Volta	12.25	11.29	-0.96

Net Official Receipts of Financial Aid from Multilateral Agencies
1967-1970

<u>Country</u>	<u>Annual Averages in millions U. S. dollars</u>		
	<u>1967-69</u>	<u>1968-70</u>	<u>Change</u>
Chad	7.8	8.35	+ .55
Mali	8.43	9.28	+ .85
Mauritania	3.66	9.80	+6.14
Niger	6.78	8.40	+1.62
Senegal	12.66	14.15	+1.49
Upper Volta	5.74	7.39	+1.65

Source: United Nations, Survey of Economic Conditions in Africa,
1971

TABLE 28
WEST AFRICA

DROUGHT RELIEF FUND PROJECT

Share of food imports in total imports

Value in ,000\$

Country		1965	1966	1967	1968	1969	1970
Chad	Total Imports I.	30500	29700	37500	33500	46200	55700
	Total food imports II.	3193	3799	5768	4326	8661	10441
	1) For industry	820	733	2413	1856	1790	3916
	2) For consumption	2373	3016	3375	2330	6871	6495
	Share of food imports in total imports (per cent) III.	10.5	12.8	15.4	13.1	18.7	18.7
Mali	Total Imports I.	42900	36000	26900	34300	38900	44800
	Total food imports II.	8389	7552	4141	6706	6038	12322
	1) For industry	1478	1673	1004	1394	1250	1755
	2) For consumption	6911	5879	3137	5312	4838	11067
	Share of food imports in total imports (per cent) III.	19.5	21.0	14.3	19.5	15.6	28.6
Mauritania	Total Imports I.	24672	23003	35335	35676	42500	65900
	Total food imports II.	2127	3197	6253	9048	9179	12939
	1) For industry	122	536	197	416	1192	1332
	2) For consumption	2005	2631	6061	8632	7937	11627
	Share of food imports in total imports (per cent) III.	8.5	13.9	17.0	25.4	21.6	23.2
Niger	Total Imports I.	37650	45021	49338	41471	46700	53400
	Total food imports II.	4292	5594	6534	4548	5696	6994
	1) For industry	593	1239	1173	835	1166	2376
	2) For consumption	3694	4305	5411	3713	4530	4618
	Share of food imports in total imports (per cent) III.	8.55	12.4	14.3	11.0	11.7	12.0
Senegal	Total Imports I.	159914	154283	157538	160990	193666	192400
	Total food imports II.	58096	56026	57196	64031	63531	52193
	1) For industry	7929	8993	7689	7830	15459	10237
	2) For consumption	50167	47023	49307	56181	48072	41906
	Share of food imports in total imports (per cent) III.	36.3	36.2	35.3	35.4	32.0	27.1
Upper Volta	Total Imports I.	37133	37330	34094	41003	48334	46700
	Total food imports II.	8103	9607	8462	8120	9024	8916
	1) For industry	2313	4231	3316	2948	3794	3406
	2) For consumption	5795	5246	5116	5172	5230	4910
	Share of food imports in total imports (per cent) III.	22.4	25.6	23.4	19.8	18.5	18.3

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TABLE 29
WEST AFRICA

DROUGHT RELIEF FUND PROJECT

Production, Imports and Exports in 1970,
of Principal Agricultural Products and Fish

Q = Thousand metric tons,
V = Thousand US dollars

		Chad	Mali	Mauritania	Niger	Senegal	Upper Volta	Total
<u>1. Beef and Veal</u>								
Production	Q	54	50	27	46	36	30	243
	V	49,199	45,555	24,600	41,911	32,800	27,333	221,397
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	36	n.a.	-	31	-	13	80
	V	32,709	5,940	-	28,062	-	7,197	73,907
<u>2. Mutton and Lamb</u>								
Production	Q	12	33	15	29	10	14	113
	V	6,209	17,074	7,761	15,035	5,174	7,244	53,467
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	-	-	-	1	-	6	7
	V	-	-	-	724	-	2,897	3,621
<u>3. Milk</u>								
Production	Q	212	197	209	241	144	95	1,093
	V	14,840	1,379	14,630	16,870	10,030	6,650	64,419
Imports	Q	1	n.a.	-	-	14	-	15
	V	35	n.a.	-	-	1,001	-	1,036
Exports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
<u>4. Fish</u>								
Production	Q	120	90	30	4	189	5	433
	V	50,203	37,656	12,552	1,674	79,078	2,092	183,259
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	0	n.a.	7	-	8	-	15
	V	84	1,351	3,729	-	4,091	-	9,255
<u>5. Millet and Sorghum</u>								
Production	Q	715	600	81	1,120	405	890	3,811
	V	32,175	32,400	4,574	21,600	21,670	48,060	160,479
Imports	Q	-	-	-	-	39	-	39
	V	-	-	-	-	2,105	-	2,105
Exports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-

1/ All values were computed by using 1970 world average export unit values from FAO sources.

TABLE 29 (Continued)

Q = Thousand metric tons
V = Thousand US dollars 1/

		Chad	Mali	Mauritania	Niger	Senegal	Upper Volta	Total
6. Rice								
Production	Q	33	138		37	98	34	310
	V	4,551	19,030		5,102	13,514	4,689	46,886
Imports	Q	-	-	-	-	119	-	119
	V	-	-	-	-	16,438	-	16,438
Exports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
7. Cassava								
Production	Q	55	155		200	159		569
	V	3,044	8,579		11,070	8,483		31,176
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
8. Groundnuts								
Production	Q	115	158		235	537	68	1,119
	V	24,024	33,006		49,092	129,072	13,790	248,984
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	85	18		158	537	8	806
	V	17,756	3,677		33,464	129,072	1,683	185,652
9. Cow Peas								
Production	Q			10	150		96	256
	V			1,025	15,375		9,840	26,240
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
10. Cotton Lint								
Production	Q	37	22		3		8	70
	V	22,281	13,218		1,807		4,818	42,153
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	39	14		3		13	69
	V	23,486	8,672		1,566		8,070	41,793
11. Cotton Seed								
Production	Q	67	37		6		12	122
	V	4,509	2,490		404		808	8,211
Imports	Q	-	-	-	-	-	-	-
	V	-	-	-	-	-	-	-
Exports	Q	-	18		1		-	20
	V	-	1,225		88		-	1,312

1/ All values were computed by using 1970 world average export unit values from FAO sources.

Part B: Data on Income, Wages, and Monetary Aspects

Legal Minimum Hourly Wage for Agriculture (in CFAF)

	1966	1967	1968	1969	1970	1971	1972	1973
Chad	18.5	18.5	18.5	18.5	26	26	26	26
Mali							27*	
Mauritania (urban & remote eastern regions)			32.4	37.3				
(rural)			27.9	32.3				
Niger	24	24	24	24	27	27	27	27
Senegal (Dakar area)	38.2	38.2	43.9	43.9	43.9			
(remainder)	35.5	35.5						
Upper Volta (urban)	25.1	25.1	25.1	25.1	27	27	27	29
(rural)	21.4	21.4	21.4	21.4				

Legal Minimum Hourly Wage for Non-Agriculture (in CFAF)

Chad (urban & north)	22	22	22	22	30	30	30	30
(remainder)	20	20	20	20				
Mali							32*	
Mauritania (urban & some remote eastern regions)			36.0	41.3				
(rural)			30.9	35.7				
Niger	27	27	27	27	30	30	30	30
Senegal (Dakar area)	44.0	44.0	50.6	50.6	50.6			
(remainder)	40.9	40.9						
Upper Volta (urban)	29	29	29	29	31	31	31	34
(rural)	24.7	24.7	24.7	24.7				

- Sources: "Niger - Recent Economic Developments" World Bank SM/73/170 June 1973.
 "Upper Volta - Recent Economic Developments" World Bank SM/73/277, Dec 1973
 "Chad - Recent Economic Developments" World Bank SM/73/97, May 1973
 Surveys of African Economics, Volume 3, IMF, 1970
 "Les Conditions d'installation d'entreprises industries" EEC, 1972

* Figure is in Malian francs. (MF 1 = CFAF .5)

Urban-Rural Income Distribution

- CHAD:
1. For salaried workers, in 1970, the average annual wage income was CFAF 316,000.
 2. Assuming family of four, this is CFAF 79,000 per capita.
 3. National per capita income = CFAF 22,000.
 4. Traditional farmers living south of the Chari river have estimated per capita income of CFAF 6,000.
 5. Herders in the richest livestock area of the north have per capita income of CFAF 4,800.

("Chad's Economic Development: Constraints and Potential" World Bank, July 2, 1973.)

- MALI:
1. The lowest incomes are concentrated in the countryside where most Malians live, but the extent of the rural-urban income disparity is unknown.

("Recent Economic Developments in Mali," World Bank, September 5, 1973.)

- MAURITANIA:
1. 10% of population lives in towns and is in the modern sector (1970).
 2. Per capita GNP is ten times higher in the modern sector (\$510) than the traditional sector (\$52) in 1970.
 3. In 1969, the average annual wages for salaried workers = CFAF 45-50,000 (\$160-200).

(The Current Economic Situation and Prospects of Mauritania)

- NIGER:
1. In 1969, salaried workers = 1.6% of labor force. Wage bill = 14.5% of national income.
 2. Consequences of recent economic developments have not been equally shared and the gap between rural and urban has widened.

("Economic Position and Prospects of Niger" World Bank, May, 1972.)

SENEGAL:

1. Average farmer's annual cash income = CFAF 10,000 - 40,000.
Average urban annual income = CFAF 250,000 - 300,000.
Average expatriates annual income = CFAF 2.2M - 2.5M.
2. Minimum annual salaries:

unskilled laborer	CFAF 100,000
skilled laborer	CFAF 275,000
foreman	CFAF 700,000
engineer	CFAF 900,000
chief executive	CFAF 2.4 - 2.5 M
3. Modern sector includes:
85,000 salaried in industry and service
63,000 salaried in public sector
50,000 self-employed (workshops and petty trade).

("The Economy of Senegal" World Bank, August 15, 1973)

UPPER VOLTA:

1. In 1970 per capita GDP = \$59.
2. The rural sector in 1970:
89% of population
43% of national income
percapita income = \$28.
only \$11 of this \$28 constituted "mone-
tized" income from cash crops.
3. Average urban income in Ougadougou estimated in 1970 at 7 times higher than rural income in west of country and 5 times higher than income in the central agricultural Massi area.

("Current Economic Position and Prospects of Upper Volta" World Bank, January, 1972.)

4. Almost 39% of the income accruing to households represented imputed income in the non-monetary sector.
5. Annual per capita monetary income for rural sector = \$12.
6. Wage earners represent less than 2% of the labor force but they earn 19% of the monetary income of households.

("Upper Volta--Recent Economic Developments" IMF, December 11, 1973.)

	Salaried Workers						Total Labor Force (Year)
	1966	1967	1968	1969	1970	1971	
<u>Chad</u>							
Public					13,050		
Private					13,216		
Total					26,266		1.6M (1970)
<u>Mali</u>							
Public							
Private							
Total							
<u>Mauritania</u>							
Public	12,000	10,500	10,500				
Private	8,288	8,815	8,886				
Total	20,288	19,315	19,386				0.6M (1970)
<u>Niger</u>							
Public	11,877	12,976	12,729	14,000			
Private	12,635	12,666	13,513	14,351			
Total	24,512	25,642	27,242	28,351			1.9M (1969)
<u>Senegal</u>							
Public			48,000			63,000	
Private			70,000			85,000	
Total			118,000			148,000	1.6M (1972)
<u>Upper Volta</u>							
Public		10,000				18,200	
Private		11,000				16,000	
Total		21,000				34,200	

Sources: Surveys of African Economies, Volume 3, IMF, 1970.

"Economic Position and Prospects on Niger" World Bank, July, 1973.

"Chad's Economic Development--Constraints and Potential" World Bank, July, 1973.

"The Economy of Senegal" World Bank, August, 1973.

"Upper Volta-Recent Economic Developments" IMF, 1973.

Upper Volta: Income of Households--1968

<u>Income</u>	CFAF (x 10 ⁹) <u>Amount</u>	<u>% of Total</u>
Wages paid to nationals	8.77	11.8
Traditional Sector	0.84	1.2
Modern Sector	2.84	3.8
Government Employees	5.09	6.8
Wages paid to foreigners	3.19	4.3
Private Sector	1.21	1.6
Government Advisors	1.98	2.7
Social Security	0.30	0.40
Income of the Self-employed	57.32	76.80
Monetary	28.55	38.2
Non-monetary	28.77	38.6
Transfers	4.99	6.7
TOTAL	<u>74.57</u>	<u>100.0</u>

("Upper Volta--Recent Economic Developments" IMF, Dec. 11, 1973.)

1972

	Hourly Wages				Manager
	Laborer		Technician		
	Unskilled	Skilled	Ordinr'y	Special- ized	
Chad	.13	.25	.30	.40	.73
Mali*	.06	.12	.15	.18	.35
Mauritania	.18	.21	.28	.36	.48
Niger	.12	.16	.25	.37	.67
Senegal	.20	.23	.28	.64	1.10
Upper Volta	.12	.18	.24	.34	.78

("Les Conditions d'Installation D'Enterprises Industries,"
EEC, 1972)

* Conversion from MF to CFAF at (MF) 1 = (CFAF) .5

	GROWTH RATES * MALI				
	<u>69</u>	<u>70</u>	<u>71</u>	<u>72</u>	
PRIMARY SECTOR	-3.6	7.8	2.2	4.3	TRADITIONAL SECTOR
TERTIARY SECTOR	2.1	3.5	6.5	6.3	MODERN SECTOR

IN NIGER DURING THE DECADE OF THE 62-72, INVESTMENT
EXPENDITURES INCREASED AT AN ANNUAL RATE OF ABOUT 10 PERCENT,
COMPARED TO A GDP GROWTH RATE OF 1.5 PERCENT.

FAILURE OF THE PRODUCTIVITY PROGRAM IN CHAD WAS ATTRIBUTED TO THE DROUT.

ESTIMATES OF PRIVATE CAPITAL FLOWS FROM
SENEGAL 1963 - 1971

Estimates of private capital flows for each individual year were arrived at using the following relationship:

$$I_t = S_t^d + S_t^{fo} + S_t^{fp}$$

where I_t = total investment in year t.

S_t^d = gross national savings in year t.

S_t^{fo} = net inflow of foreign public aid during year t (includes grants and loans from FAC, EEC, the U.S., and other donor countries, as well as loans from the World Bank Group)

S_t^{fp} = net inflow of private foreign capital during year t.

From information available in the IMF Surveys of African Economics, Vol. 3, and the World Bank report on the Economy of Senegal, Vol. V, it was possible to estimate I_t , S_t^d and S_t^{fo} from the respective I_t , gave us an estimate of S_t^{fp} for each year.

According to the Calculations which are shown in the accompanying table, there is a net outflow of private capital in each year from 1963 to 1970. Only in 1971 do we have a net inflow.

(All figures are in billions CFAF)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	
I_t^*	21.8	24.1	24.5	16.6	28.4	20.8	45.8	31.7	60.2	Row 1
S_t^{d**}	16.0	16.4	17.9	15.2	23.0	11.4	29.3	24.1	34.9	Row 2
S_t^{fo***}	9.7	9.9	11.5	12.2	12.3	14.9	17.0	15.0	19.9	Row 3
S_t^{fp****}	-3.9	-2.2	-4.9	-10.8	-6.9	-5.5	-0.5	-7.4	5.4	Row 4

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* Obtained from Table 2.20. The Economy of Senegal, Vol. V, I.B.R.D., August 1973. All subsequent references are to this publication.

** Obtained from Table 2.20 " " " " "

*** Figures for 1963-65 are obtained by adding the total investment aid and the total amount of technical assistance for these years given in Tables 3.20 and 3.21 respectively. Figures for the remaining years are taken from Table 3.16. These tables give estimates of gross inflows of foreign public assistance.

(Table continued)

According to footnote 1 of Table 44, pg. 608 in the IMF Surveys of African Economics Vol. 3, interest paid on foreign loans represented CFAF 0.18 billion in 1965, CFAF 0.22 billion in 1966 and CFAF 0.26 billion in 1967. For 1963 and 1964, we assume interest payments to be CFAF 0.15 billion, and for the remaining years, CFAF 0.3 billion. These are subtracted from the gross inflows to obtain net inflows of foreign public capital inflows which are shown in this row.

**** Obtained by subtracting from each figure in row 1 the sum of the figures directly below it in rows 2 and 3.

OPTIMAL RESERVES (West African Monetary Union)
(Millions of C.F.A. Francs)

	(1) h	(2) m	(3) Reserves (1969)	(4) Optimal Reserves (a)	(5) Optimal Reserves (b)	(6) R-1969 R-opt. (a)
Ivory Coast	1,292.8	0.30	19,260	7,833.1	5,540.3	2.46
Dahomey	167	0.30	2,237.5	1,011.8	844.8	2.21
Upper Volta	170.3	0.23	6,497	1,097.1	926.8	5.92
Mauritania	149.1	0.16	1,559	532.1	532.1	2.93
Niger	266.3	0.28	1,298	1,640.9	1,374.6	0.79
Senegal	791.4	0.53	3,894	4,145.3	3,353.9	0.94
Togo	193.2	0.38	6,609	1,104.7	911.5	5.98
Total	3,030.		45,297	17,365	14,484	2.61

DISCOUNT RATES AT THE B.C.E.A.O. (West Africa Central Bank)

1967-1971

Discount rates	1967 %	1968 %	1969 %	1970 %	1971 %
- short-term paper	3.0	3.0	3.0	3.0	3.0
- government paper	5.0	5.0	5.0	5.0	5.0
- medium term paper	3.5	3.5	3.5	3.5	3.5
- gvt-overdraft	3.5	3.5	3.5	3.5	3.5

Source: Banque Centrale des Etats de l'Afrique de l'Ouest.

FINANCIAL INTERMEDIATION IN THE FRANC AFRICA

(1968)

Country	Currency	M ₁	Quasi-money
	M ₂ %	M ₂ %	M ₂ %
Chad	54	94	5
Congo B.	46	92	7
Dahomey	47	95	5
Gabon	33	92	8
Ivory Coast	36	76	23
Mauritania	43	87	13
Niger	52	90	10
Senegal	37	93	7
Togo	37	83	17
Upper Volta	60	97	3
Mali	50	98	2

FINANCIAL INTERMEDIATION IN STERLING

(1968)

Country	Currency	M ₁	Quasi-money
	M ₂ %	M ₂ %	M ₂ %
Ghana	36	73	27
Kenya	21	69	31
Tanzania	31	83	17
Uganda	37	69	31
Nigeria	37	66	44

EVOLUTION OF CONSUMERS PRICES IN VARIOUS UNDERDEVELOPED COUNTRIES
(1963-1972)

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Niger	100	101	105	116	117	114	125	126	131	144
Ivory Coast	100	101	104	109	111	117	122	133	131	132
Senegal	100	103	106	109	107	108	113	116	119	123
Upper Volta	100	102	101	103	98	99	108	110	112	109
France	100	103	106	109	112	118	124	131	138	147
Nigeria	100	101	105	115	111	113	122	138	160	165
Ghana	100	112	141	148	139	153	161	167	175	--
Cameroun	100	106	108	110	114	116	118	121	126	134
Chili	100	146	188	231	273	346	452	598	718	1,277

Source: I.M.F., International Financial Statistics.

**Part C: Projections of Values of Production and
Exports at Projected World Prices**

1970 PRODUCTION OF PRINCIPAL AGRICULTURAL & FISH PRODUCTS
FOR SIX COUNTRIES OF SAHEL SUDAN AREA
(IN THOUSAND METRIC TONS)

COMMODITY	CHAD	MALI	MAURITANIA	NIGER	SENEGAL	UPPER VOLTA	TOTAL
BEEF	54	50	27	46	36	30	243
MUTTON	12	33	15	29	10	14	113
FISH	120	90	30	4	189		438
SORGHUM & MILLET	715	600	81	1120	405	890	3811
RICE	33	138	-	37	98	34	340
GROUND NUTS	115	158	-	235	535	68	1,111
COTTON LINT	37	22	-	3	-	8	70

COMMODITY PRICE FORECAST IN TERMS OF
CURRENT U.S. \$ PER METRIC TON

COMMODITY	1970	1974	1975	1980	1985	1990
BEEF	1,881.5	3,520	4,000	6,000	8,920	11,840
FISH MEAL	176	570	577	601	876	1,151
SORGHUM & MILLET	51	115	120	127	174	221
RICE	181	460	460	420	575	734
GROUND NUTS	209.7	393	384	425	630	835
COTTON	718.6	1,540	1,474	1,826	2,288	2,750

- A. Forecast prices for 1969, 1974, 1975, 1980 and 1985 are based on Forecase made by international Agencies in 1974.
- B. Forecast for 1990 is based on 1980 and 1985 linear increase.
- C. Price for 1970 is derived by distributing the increase or decrease between 1969 - 1972
- D. (1) 1000 kg = 1 metric ton
(11) 2.2 lb = 1 kg

COMMODITY PRICE FORECASTS IN 1974 CONSTANT TERMS

Commodity	Unit	ACTUAL PRICES		FORECAST PRICES				
		1967-69	1972	1974	1976	1978	1980	1985
Petroleum	US\$/barrel	2.28	2.61	8.65	8.65	8.65	8.65	8.65
Sugar (World)	¢/lb.	4.1	10.0	18.0	10.1	8.4	8.5	9.0
Beef	¢/kg.	-	343	352	354	359	377	419
Hides & Skins	¢/lb.	32.4	42.6	42.0	43.0	43.0	45.0	45.0
Wheat	\$/MT	117	98	210	168	142	120	125
Rice	\$/MT	347	202	460	378	313	265	270
Maize	\$/MT	89	77	120	109	99	90	93
Grain Sorghum	\$/MT	86	77	115	102	91	80	82
Groundnut Oil	\$/MT	516	595	739	591	539	495	540
Groundnuts	\$/MT	322	372	393	320	290	267	296
Cotton	¢/lb.	53	52	70	65	52	52	52
Wool	¢/kg.	304	330	480	380	300	300	350
Logs (Lauan)	\$/m ³	70	56	95	87	91	95	100
Logs (Niangon)	\$/m ³	65	66	105	92	96	100	105
Bauxite	\$/MT	21.1	16.5	21.0	25.0	29.0	30.0	30.0
Iron Ore	\$/MT	12.8	10.9	10.0	9.5	11.0	13.0	14.0
Manganese Ore	¢/LTU	110.7	88.6	110.0	88.0	80.0	90.0	85.0

COMMODITY PRICE FORECASTS
(in current dollars)

Commodity	Unit	Actual Prices		Forecast Prices			
		1967-69	1972	1974	1976	1980	1985
Petroleum	US\$/barrel	1.30	1.90	8.65	10.30	13.75	18.00
Sugar (World)	¢/lb.	2.3	7.3	18.0	1.20	13.5	18.0
Beef	¢/kg.	-	250	352	423	600	892
Hides & Skins	¢/lb.	18.5	31.0	42.0	51.3	71.5	95.7
Wheat	\$/MT	67	71	210	200	190	265
Rice	\$/MT	198	147	460	450	420	575
Maize	\$/MT	51	56	120	130	143	198
Grain Sorghum	\$/MT	49	56	115	122	127	174
Groundnut Oil	\$/MT	295	426	739	704	787	1,148
Groundnuts	\$/MT	184	261	393	381	425	630
Cotton	¢/lb.	30	38	70	66	83	104
Wool	¢/kg.	174	240	480	453	477	744
Logs (Lauan)	\$/m ³	40	41	95	104	150	213
Logs (Niangon)	\$/m ³	37.2	48.1	105.0	110.0	160.0	223.0
Bauxite	\$/MT	12.0	12.0	21.0	29.8	47.8	63.80
Iron Ore	\$/MT	7.2	7.9	10.0	11.3	20.7	30.0
Manganese Ore	¢/LTU	63.2	64.5	110.0	104.9	143.0	180.7

Note: Sterling projections assume £1 = \$2.3.

6 COUNTRIES

Total Production (in Constant 1974 Dollars)

		(\$ millions)					
		1970	1974	1975	1980	1986	1990
using price of sorghum	Beef	563.7	593.9	595.9	636.1	707.0	777.9
	Cotton (lint)	90.3	121.1	116.5	89.3	89.3	89.3
	Peanuts	455.0	515.2	478.9	350.1	388.0	425.9
	Millet & Sorghum	334.4	471.6	445.7	327.9	336.3	344.7
	Rice	108.0	180.7	164.7	104.2	106.1	108.0
	Corn	21.1	30.3	28.8	22.8	23.6	24.4
	Iron ore	103.3	86.8	84.6	112.8	121.5	130.2
	Total	1675.8	1999.6	1915.1	1643.2	1771.8	1900.4

1969 output (1000 MT)

Beef	168.7	} FAO	1) Assuming production stable at 1969 level
Cotton (lint)	78.0		
Peanuts	1,311.0		
Millet & Sorghum	4,101.0		
Rice	393.0		
Corn	253.0		
Iron ore	8,678.0		

TOTAL PRODUCTION OF EXPORT GOODS IN CONSTANT 1974 DOLLARS

\$
BILLION

includes {
Beef
Cotton (int)
Peanuts
IRON ORE

1.5

1.4

1.3

1.2

1.1

1.0

6 COUNTRY
AGGREGATE

① ASSUMING PRODUCTION
STABLE AT 1969 LEVELS

② USING WORLD BANK
COMMODITY PRICE
PROJECTIONS

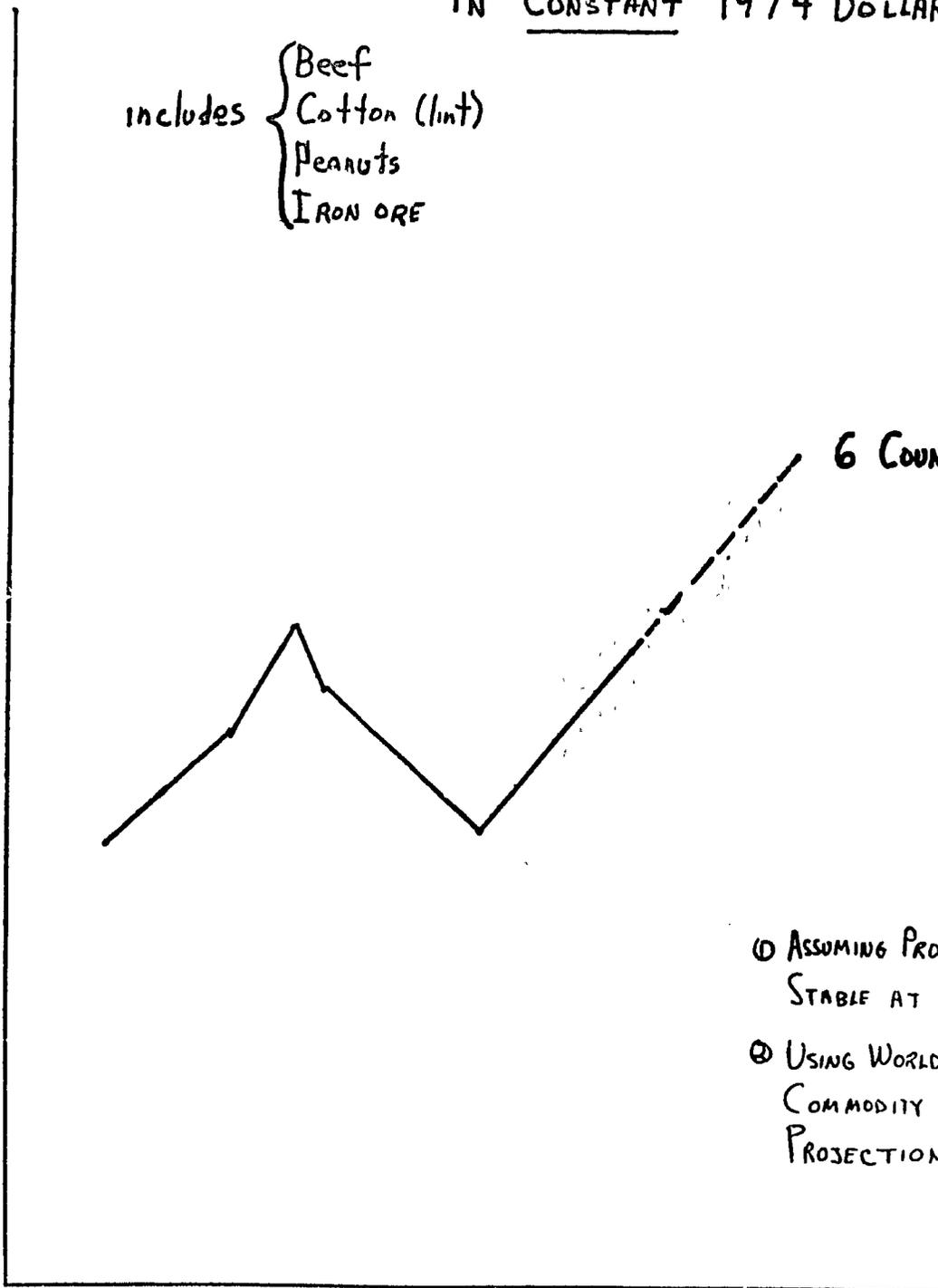
1970

1975

1980

1985

1990



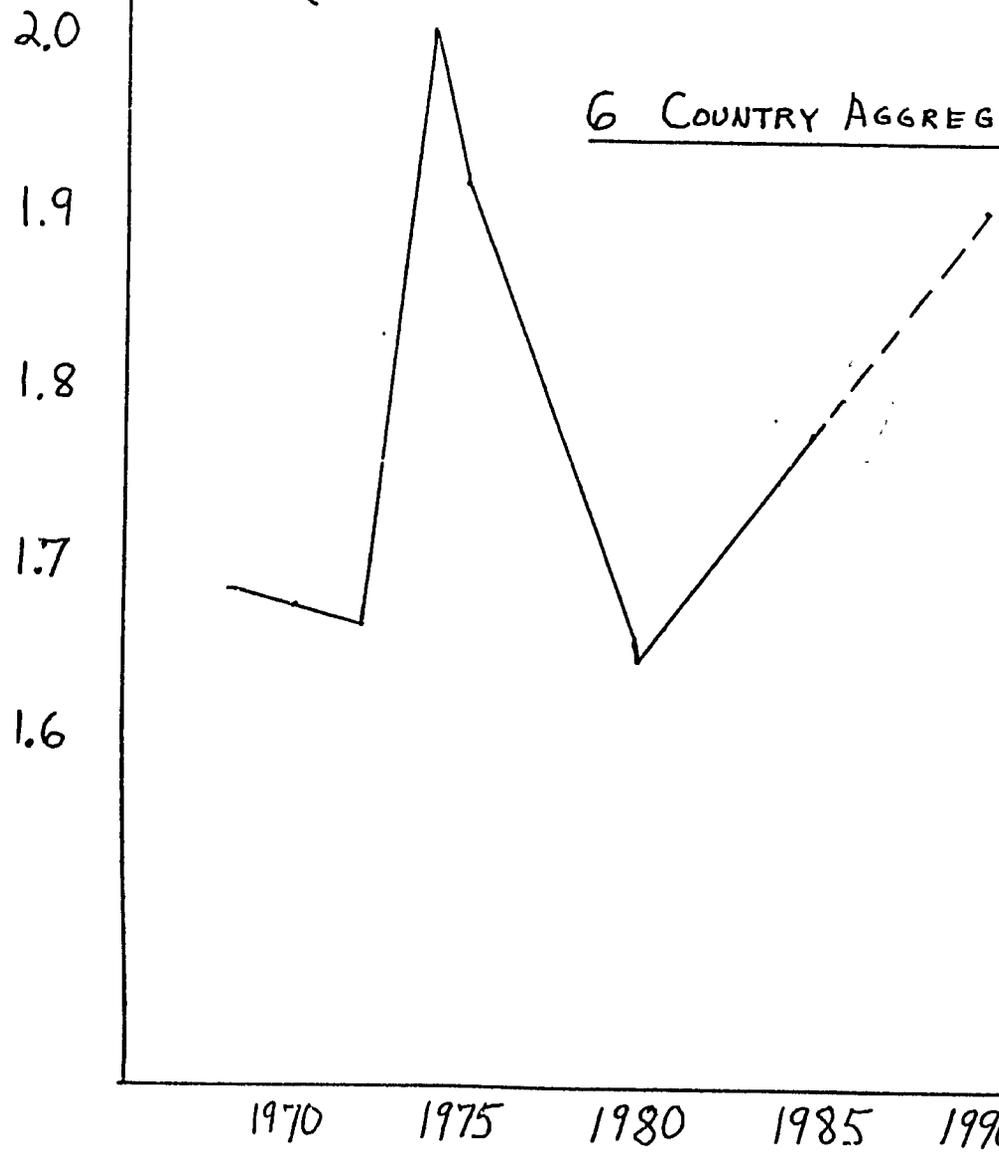
TOTAL PRODUCTION IN CONSTANT 1974 DOLLARS

\$ BILLION

- includes {
- Beef
 - Cotton (lint)
 - Peanuts
 - MILLET & SORGHUM
 - Rice
 - CORN
 - IRON ORE

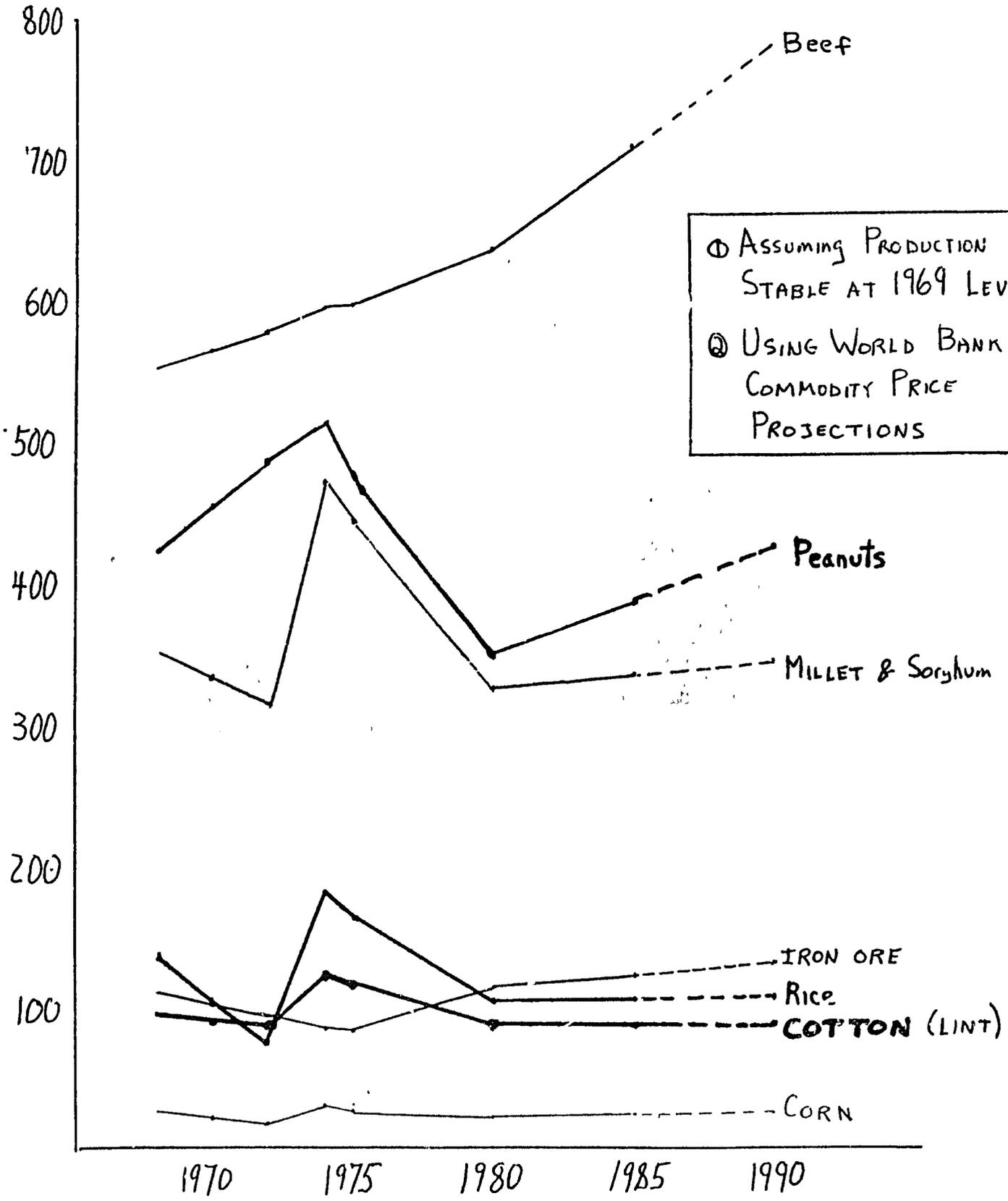
- ① ASSUMING PRODUCTION STABLE AT 1969 LEVELS
- ② USING WORLD BANK COMMODITY PRICE PROJECTIONS

6 COUNTRY AGGREGATE



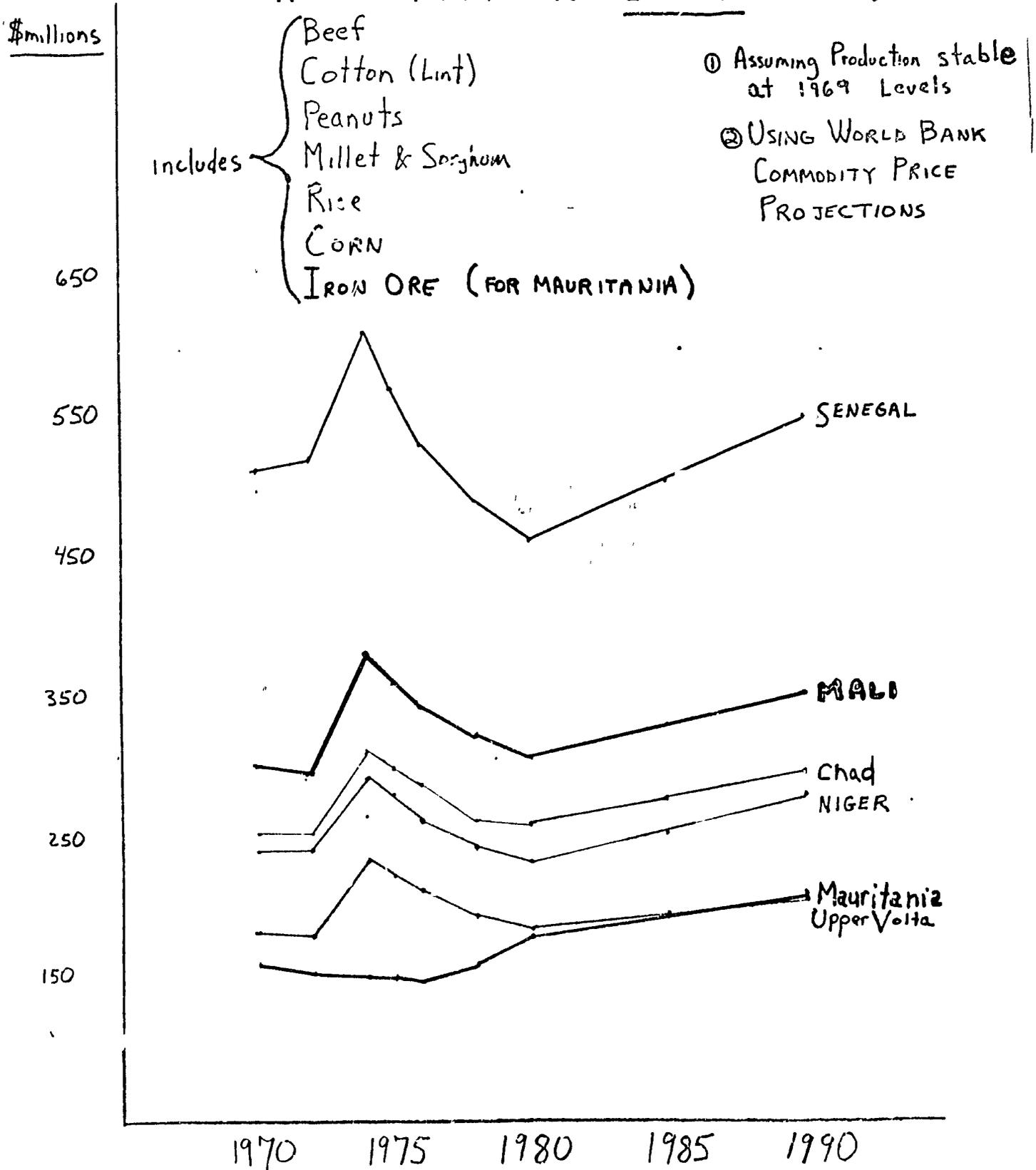
6 COUNTRY AGGREGATE PRODUCTION IN CONSTANT 1974 DOLLARS

\$Million

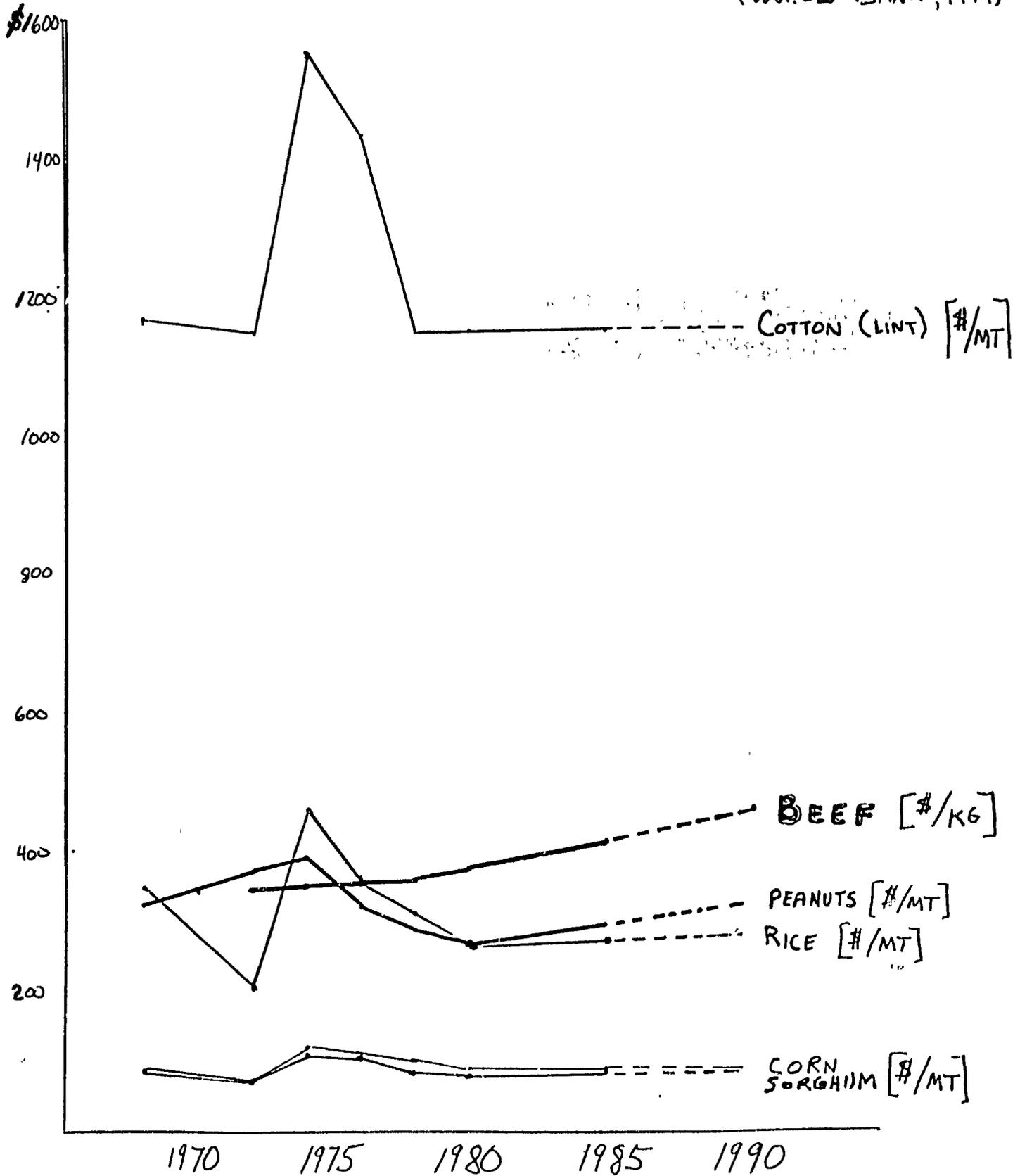


① ASSUMING PRODUCTION STABLE AT 1969 LEVEL
② USING WORLD BANK COMMODITY PRICE PROJECTIONS

PRODUCTION IN CONSTANT 1974 DOLLARS



COMMODITY PRICE FORECASTS IN CONSTANT 1974 DOLLARS (WORLD BANK, 1974)



CHAD

Total Production (in Constant 1974 Dollars)

		(\$ millions)					
		1970	1974	1975	1980	1985	1990
using price of sorghum	Beef	108.2	114.0	114.4	122.1	135.8	149.5
	Cotton (lint)	46.2	62.1	59.7	45.8	45.8	45.8
	Peanuts	39.9	45.2	41.0	30.7	34.0	37.3
	Millet & Sorghum	53.1	74.9	70.7	52.0	53.4	54.8
	Rice	10.2	17.0	15.5	9.8	10.0	10.2
	Corn	1.0	1.4	1.3	1.1	1.1	1.1
	Total	258.6	314.6	302.6	261.8	280.1	298.7

1969 output (1000 MT)

Beef	32.4	} FAO
Cotton (lint)	40	
Peanuts	115	
Millet & Sorghum	651	
Rice	37	
Corn	12	

1) Assuming production stable at 1969 level

2) Using commodity price projections of World Bank

MALI

Total Production (in Constant 1974 Dollars)

		(\$ millions)					
		1970	1974	1975	1980	1985	1990
using price of sorghum	Beef	125.3	132.0	132.4	141.3	157.1	172.9
	Cotton (lint)	20.8	28.0	26.9	20.6	20.6	20.6
	Peanuts	42.4	47.9	43.5	32.6	36.1	39.6
	Millet & Sorghum	74.4	105.0	99.1	73.0	74.9	76.8
	Rice	32.7	54.7	49.9	31.6	32.1	32.6
	Corn	10.5	15.1	14.4	11.3	11.7	12.1
	Total	306.1	382.7	366.2	310.4	332.5	354.6

1969 output (1000 MT)

Beef	37.5	} FAO
Cotton (lint)	18	
Peanuts	122	
Millet & Sorghum	913	
Rice	119	
Corn	126	

1) Assuming production stable at 1969 level

2) Using commodity price projections of World Bank

MAURITANIA

Total Production (in Constant 1974 Dollars)

		(\$ millions)					
		1970	1974	1975	1980	1985	1990
using price of sorghum	Beef	51.9	54.7	54.9	58.6	65.1	71.6
	Cotton (lint)	0	0	0	0	0	0
	Peanuts	0	0	0	0	0	0
	Millet & Sorghum	9.0	12.7	12.0	8.8	9.0	9.2
	Rice	0.3	0.5	0.4	0.3	0.3	0.3
	Corn	0.3	0.5	0.4	0.4	0.4	0.4
	Iron Ore	103.3	86.8	84.6	112.8	121.5	130.2
	Total	164.8	155.2	152.3	180.9	196.3	211.7

1969 output (1000 MT)

Beef	15.5	} FAO (Minerals Yearbook 1971, p.1007)
Cotton (lint)	0	
Peanuts	0	
Millet & Sorghum	110	
Rice	1	
Corn	4	
Iron Ore	8678	

1) Assuming production stable at 1969 level

2) Using commodity price projections of World Bank

NIGER

Total Production (in Constant 1974 Dollars)

		(\$ millions)					
		1970	1974	1975	1980	1985	1990
using price of sorghum	Beef	84.5	89.0	89.3	95.4	106.0	116.6
	Cotton (lint)	4.7	6.2	6.0	4.6	4.6	4.6
	Peanuts	71.8	81.4	73.8	55.3	61.3	67.3
	Millet & Sorghum	72.5	102.2	97.0	71.1	72.9	74.7
	Rice	10.7	17.9	16.3	10.3	10.5	10.7
	Corn	0.2	0.2	0.2	0.2	0.2	0.2
Total		244.4	296.9	282.6	236.9	255.5	274.1

1969 output (1000 MT)

Beef	25.3	} FAO
Cotton (lint)	4	
Peanuts	207	
Millet & Sorghum	889	
Rice	39	
Corn	2	

1) Assuming production stable at 1969 level

2) Using commodity price projections of World Bank

SENEGAL

Total Production (in Constant 1974 Dollars)

		(\$ millions)					
		1970	1974	1975	1980	1985	1990
using price of sorghum	Beef	135.3	142.6	143.0	152.7	169.7	186.7
	Cotton (lint)	4.7	6.2	6.0	4.6	4.6	4.6
	Peanuts	276.2	312.8	283.3	212.5	235.6	258.7
	Millet & Sorghum	49.7	70.0	66.1	48.7	49.9	51.1
	Rice	44.8	75.0	68.3	43.2	44.0	44.8
	Corn	4.1	5.9	5.6	4.4	4.6	4.6
	Total	514.8	612.5	572.3	466.1	508.4	550.5

1969 output (1000 MT)

Beef	40.5	} FAO
Cotton (lint)	4	
Peanuts	795	
Millet & Sorghum	929	
Rice	163	
Corn	60	

1) Assuming production stable at 1969 level

2) Using commodity price projections of World Bank

UPPER VOLTA

Total Production (in Constant 1974 Dollars)

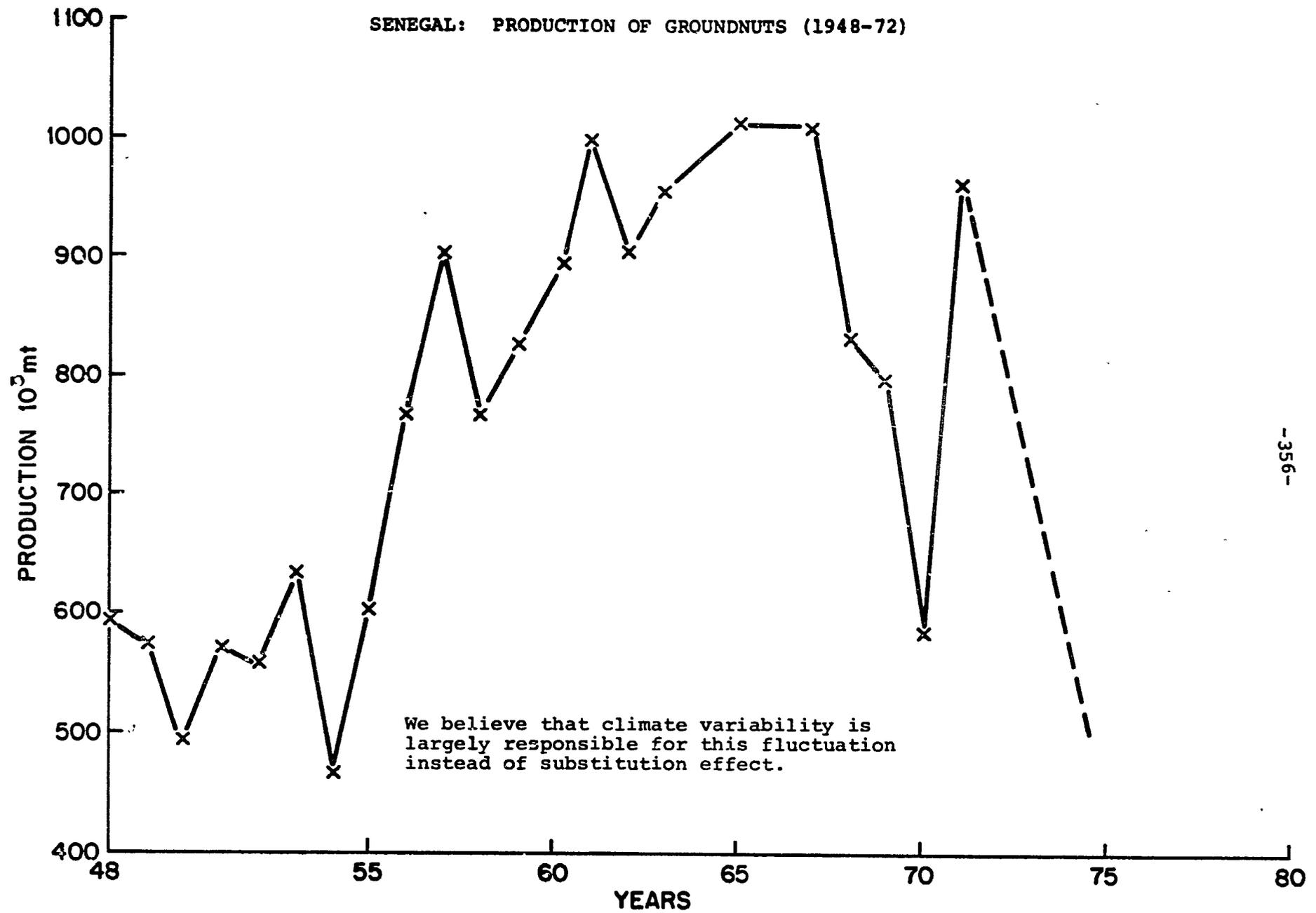
		(\$ millions)					
		1970	1974	1975	1980	1985	1990
using price of sorghum	Beef	58.5	61.6	61.8	66.0	73.3	80.6
	Cotton (lint)	13.9	18.6	17.9	13.7	13.7	13.7
	Peanuts	24.7	27.9	25.3	19.0	21.0	23.0
	Millet & Sorghum	75.7	106.8	100.8	74.3	76.2	78.1
	Rice	9.3	15.6	14.3	9.0	9.2	9.4
	Corn	5.0	7.2	6.9	5.4	5.6	5.8
Total		187.1	237.7	227.0	187.4	199.0	210.6

1969 output (1000 MT)

Beef	17.5	} FAO
Cotton (lint)	12	
Peanuts	71	
Millet & Sorghum	609	
Rice	34	
Corn	49	

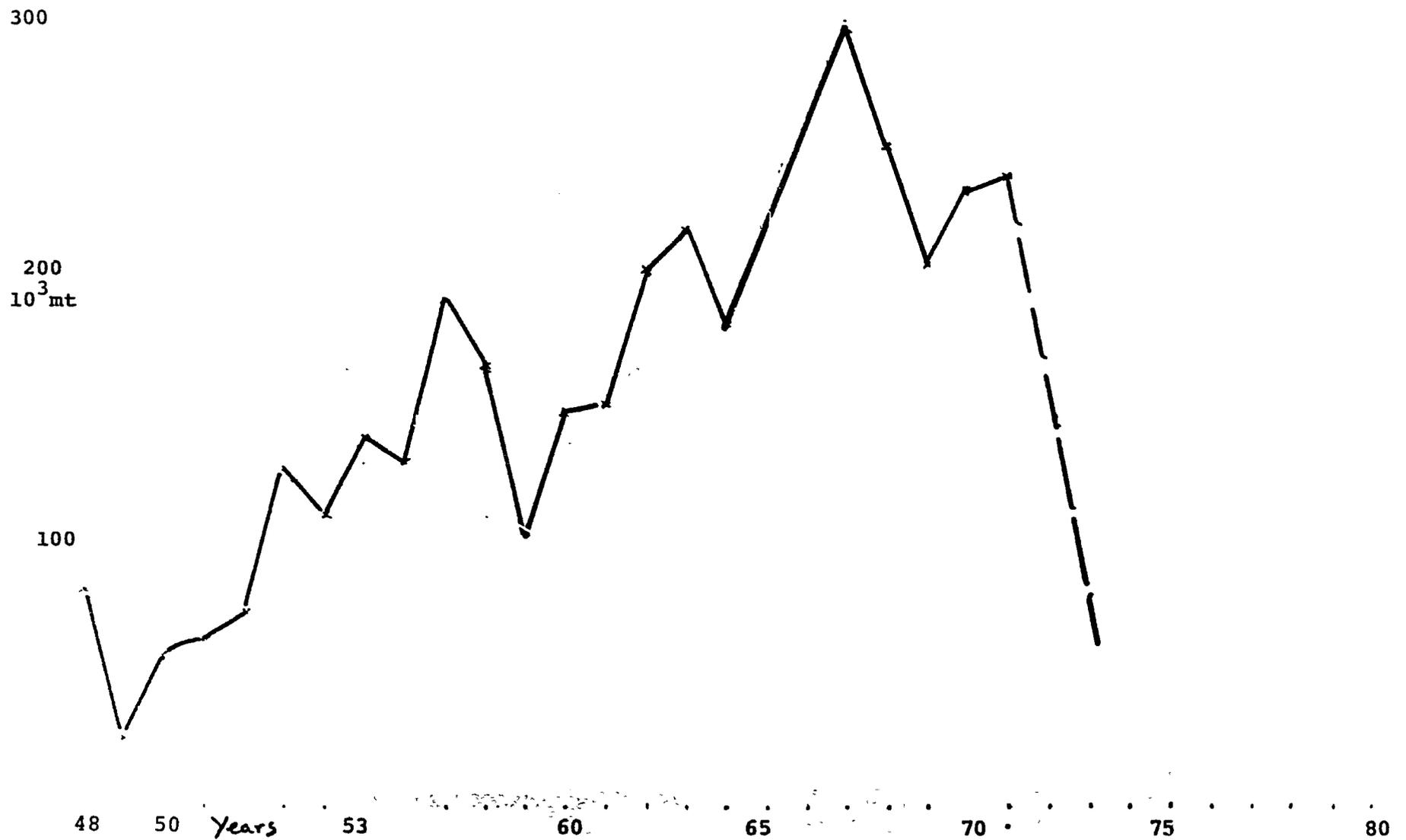
1) Assuming production stable at 1969 level

2) Using commodity price projections of World Bank

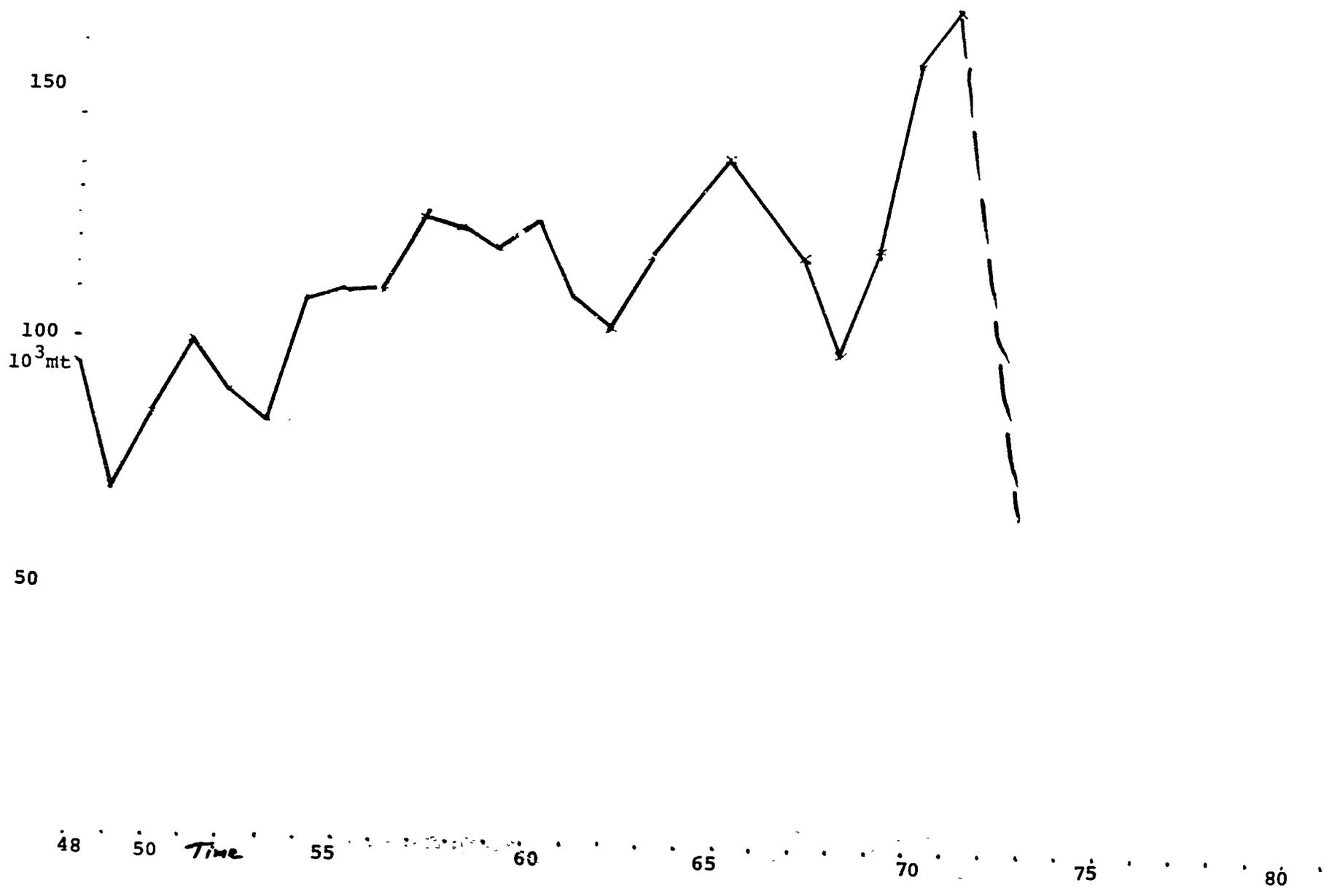


400
10³ mt

NIGER: PRODUCTION OF GROUNDNUTS



200
10³mt
MALI: PRODUCTION OF GROUNDNUTS



160
10³mt

UPPER VOLTA: PRODUCTION OF GROUNDNUTS

140

120

100

80

60

40

20

48

50

55

60

65

70

75

80

