

SENEGAL AGRICULTURAL SECTOR ANALYSIS UPDATE

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LIST OF ACRONYMS

ANCAR	Agence Nationale du Conseil Agricole et Rural
AG-SECAL	World Bank Agricultural Sector Adjustment Loan
CDH	Centre de l'Horticulture
CERP	Centre d'Expansion Rurale Polyvalent
CFD	Caisse Française de Développement
CID	Consortium for International Development
CIF	Cost Insurance Freight
CILSS	Comite Inter-Etat de Lutte Contre la Secheresse au Sahel
CNCR	Conseil National de Concertation et de Cooperation des Ruraux
CNCAS	Caisse Nationale de Credit Agricole du Senegal
CONSERE	Conseil Superieur des Ressources Naturelles et de l'Environnement
CPSP	Caisse de Perequation et de Stabilisation des Prix
CRAF	Centre de Recherche en Economie Appliquee
CRODT	Centre de Recherche Oceanographique de Dakar Thiaroye
CSE	Centre de Suivi Ecologique
CSPT	Compagnie Senegalaise des Phosphates de Taiba
CSS	Compagnie Sucriere Senegalaise
DESIM	Division des Semences
DPDA	Declaration de Politique de Developpement Agricole
EIU	Economist Intelligence Unit
ENDA	Environment and Development Action
ESAF	Enhanced Structural Adjustment Facility
EU	European Union
EUROSTAT	European Union Statistical Office
FAO	Food and Agriculture Organization
FCFA	CFA Franc
GDP	Gross Domestic Product
GIE	Groupement d'Interêt Economique
GOS	Government of Senegal
GRAF	Groupe de Recherche-Action-Formation
GRS	Groupe de Reflexion Strategique
GTZ	German Aid Agency
ICRISAT	International Research Institute for the Semi-Arid Tropics
ICS	Industries Chimiques du Sénégal
IFAN	Institut Fondamental d'Afrique du Nord
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IMF	International Monetary Fund
IRRI	International Rice Research Institute
ISRA	Institut Senegalais de Recherche Agricole
ITA	Institut de Technologie Alimentaire
KFW	German Technical Assistance
LAPD	Letter of Agricultural Development Policy
MEPN	Ministere de l'Environnement et de la Protection de la Nature

NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
NRM	Natural Resource Management
OMVS	Organisation pour la Mise en Valeur du Fleuve Senegal
ORSTOM	Office de Recherche Scientifique dans les Territoires d'Outre-Mer
PASCO	Private Sector Adjustment and Competitiveness Credit
PDRG	Programme de Developpement de la Rive Gauche
PISA	Programme d'Investissement du Secteur Agricole
PNAE	Plan National d'Actions pour l'Environnement
PNVA	Programme National de Vulgarisation Agricole
PRDF	Plan Directeur de Développement Forestier
PIIP	Programme Triennal d'Investissements Publics
PVO	Private Voluntary Organization
RSAP	Rice Sector Adjustment Program
SAED	Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal et des Vallées du Fleuve Senegal et de la Faleme
SAF	Structural Adjustment Facility
SAFGRAD	Semi-Arid Food Grains Research and Development
SAL	Structural Adjustment Loan
SASA	Senegal Agricultural Sector Analysis
SEFICS	Société d'Exploitation Ferroviaire et d'Industrie Chimique du Sénégal
SENCHEM	Societe de Commercialisation des Industries Chimiques du Sénégal
SISMAR	Société Industrielle et Sahélienne de Mecaniques de Matériel Agricole de Représentation
SODAGRI	Société de Développement Agricole et Industriel du Senegal
SODEFITEX	Société de Développement des Fibres Textiles
SODEVA	Société de Developpement et de Vulgarisation Agricole
SONACOS	Société Nationale de Commercialisation des Oleagineux
SONAGRAINES	Societe Nationale des Graines
SRDR	Sociétés Régionales de Développement Rural
SZWMP	Southern Zone Water Management Project
UNIS	Union Nationale Interprofessionnelle des Semenciers
USAID	United States Agency for International Development
VAT	Value Added Tax
WARDA	West Africa Rice Development Association
WAEMU	West African Economic and Monetary Union

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EXECUTIVE SUMMARY

The Executive Summary is divided into four parts. First, there is a description of macroeconomic policy since 1993. The second part is a short analysis of some of the impacts of structural adjustment on the agricultural and natural resource sectors. Third, we present some of the remaining constraints to increasing agricultural production. Finally, we suggest some possible ways that USAID might provide support in the agricultural and natural resource sectors.

1 MACROECONOMIC POLICY

In early 1994, the Government of Senegal (GOS) decided to adopt a comprehensive adjustment strategy, including the devaluation of the CFA Franc (FCFA) in coordination with other members of the West African Economic and Monetary Union (WAEMU), in order to achieve sustained economic growth and financial viability over the medium term. In addition to the adjustment of the exchange rate parity, the medium-term strategy involved strong fiscal and monetary policies designed to contain a predicted spike in inflation and restore competitiveness on a lasting basis.

Starting in 1994, the government, with support from the World Bank and other donors, has undertaken a major restructuring of the economy and the agricultural sector. This restructuring includes

- 1 Liberalizing the agricultural sector international trade regime,
- 2 Liberalizing domestic marketing and pricing of all agricultural products,
- 3 Privatizing the production, processing and marketing of groundnuts and rice,
- 4 Developing a new policy on decentralization, and
- 5 Undertaking a structural reform of the Ministry of Agriculture

Macroeconomic policy is on the right track. Sustained support by the donor community will be needed to keep it on track if the benefits of an improved macroeconomy are to be felt by Senegalese farmers.

2 STRUCTURAL ADJUSTMENT AND ITS IMPACT ON AGRICULTURE

Devaluation, structural adjustment and decentralization have resulted in a major shift in paradigm. This shift is having a fundamental impact on the agricultural and natural resource sectors and the impact will likely accelerate over the next few years. As the government moves out of production, marketing and processing, there have been short-term economic impacts on the agricultural system. For example, devaluation has increased prices of imported agricultural inputs. The reduction in demand induced by price increases, in conjunction with reduced availability of credit, has diminished the ability of farmers to purchase agricultural inputs. Finally, the reduced use of inputs has had a negative impact on yields and production. For example, the combination of reduced access to fertilizer due to its increase in price and lack of credit has reduced the amount of fertilizer that has been used in the last three years. Fertilizer sales have declined from 51,595 metric tons in 1993, to 38,600 metric tons in 1994, to 30,701 metric tons in 1995, and to 32,437 metric tons in 1996.

The reduction in the use of agricultural inputs has had a negative impact on yields and production. Since 1988, the last production year analyzed in the USAID Agricultural Sector Analysis, groundnut production and yields have decreased substantially, never approaching 1988 levels. In fact, production and yields have decreased at accelerated rates compared to the previous 20-year period. Between 1988 and 1996, production and yields have decreased on average 2.3 percent and 2.4 percent respectively per year.

The principal cause of the decline in production is the decrease in the use of certified seed and fertilizer for the reasons mentioned above. In the absence of credit for certified groundnut seed or fertilizer, many farmers are responding by employing seeding rates well beyond recommended levels to increase productivity and foregoing the essential rotation of crops. While this may be an effective short-term solution, this practice will have dire medium-term effects on the already limited soil fertility.

As would be expected, the significant decline in groundnut production has had an adverse impact on the amount of raw material entering the SONACOS oil plants. Plants are now running at 30 percent of capacity. The decline in delivered raw material, however, has far outstripped the decrease in groundnut production. This is clearly attributable to the continued development of the parallel market which offers producers substantially higher prices and better service than SONAGRAINES, the GOS parastatal.

Millet and sorghum production and yields have essentially stagnated during the last seven years. Subsequent to the 1994 devaluation, the anticipated substitution of local millet for imported rice has not occurred.

Since the publication of the USAID Agricultural Sector Assessment in 1991, the rice sector has undergone a complete transformation. The January 1994 devaluation and the implementation of the GOS Rice Sector Adjustment Program has had profound impacts on consumers and rice producers. Since devaluation and the concurrent liberalization of the rice trade, the average nominal increase in price of imported broken rice has been 23 percent. The price increase is partially attributable to speculative behavior among rice traders, in addition to the expected effect of devaluation. This has had a severe impact on Senegal's most financially vulnerable groups. Despite increased costs, however, there appears to be no decrease in rice consumption. As a result of liberalization, consumers today have a far greater choice of rice in terms of quality and price. Rice production in the Senegal River Valley is in sharp decline. Despite devaluation, local production remains uncompetitive due to high production costs, decreased availability of credit and poor quality product. It is unlikely that local producers can, in the medium term, be competitive with broken rice imports. If Senegal can improve yield and product quality, it has an opportunity to be competitive in the whole grain rice market.

Since 1989, horticulture has been one of the more dynamic productive activities within the agriculture sector. Prior to devaluation, production trends were already on the rise. This was accentuated after the currency realignment. Devaluation did indeed have the anticipated consequence: import substitution. Exports, however, to both European and regional markets declined slightly. Domestic production, transportation, storage and marketing techniques are rudimentary in nature. With the exception of a handful of commercial-sized growers, production is typically on plots of less than half a hectare. Yields and quality are generally low due to the use

of inappropriate seed varieties, low fertilizer and insecticide use, and frequent problems with saline irrigation water

Senegal is a marginal player in the European market. Green beans, melons and lantern peppers account for over 80 percent of the country's horticultural exports, primarily to France. Senegal's market share is insignificant and its direct competitors during Senegal's growing season are mostly countries who have a long-standing and highly developed agricultural export sector. High air freight costs continue to constrain European export development. Low export volumes prevent wide scale use of different maritime transport options. Opportunities for horticultural export marketing to Europe are very limited. Potential, however, does exist to significantly increase exports to Mauritania and the Cape Verde Islands.

Small scale horticultural production for the local market merits encouragement. In addition to providing good returns on a per hectare basis, its potential impact is far larger. It provides farmers with an economic activity during the dry season, improves nutrition and is a source of revenue for rural women. Perhaps most importantly, it has the potential to slow the rural exodus and can provide capital to permit cereal and cash crop producers to finance inputs to increase their productivity.

3 CURRENT CONSTRAINTS TO AGRICULTURAL DEVELOPMENT

Factors that inhibit agricultural development in Senegal can be found at all levels: the natural resource base, macroeconomic policy, and production and marketing. The following paragraphs summarize some of these problems.

3.1 Resource Base and Natural Resource Management

Since the publication of the 1991 USAID Agricultural Sector Analysis little has changed in the physical resource base. The major physical constraint is the combination of poor soils, inadequate water availability, and a relatively large and rapidly growing population.

Soils that are suitable for agriculture are limited. It is estimated that (a) only 19 percent of the surface area of Senegal has soils that are deemed suitable for agriculture, and (b) these limited soils are suffering from degradation from overuse and erosion. The situation with water supply is equally bad. Rainfall has been decreasing since the 1960s. While the enormous seasonal and annual variations that are typical make trends difficult to detect, this decline shows no signs of reversing. Surface water suffers from (a) strong seasonal and annual variation in flows, (b) chemical pollution from agricultural runoff, and (c) salinization from sea water invasions in the lower basins. Finally, the ground water situation suffers from (a) insufficient knowledge of aquifer capacities, (b) over exploitation of certain aquifers, (c) weak recharge capacities, and (d) excessive mineral content in some aquifers. Associated with this inadequate and deteriorating natural resource base is a population that is growing rapidly and will reach an estimated 9 million in 2000.

Two major shifts have, however, taken place in the natural resource management paradigm during this period. The first is the evolution of the concept of decentralization: making the people most closely concerned with the resource responsible for its management. The second is integration: coordinating all the functions relating to natural resource management that were previously widely scattered throughout the government through a newly-established Ministry of Environment and

Protection of Nature under the umbrella of the forthcoming National Environmental Action Plan (NEAP)

Other problems associated with the natural resource base and its management include

- Deforestation is decreasing the availability of fuelwood,
- Natural resource information is poorly organized,
- The land tenure system favors agriculture over forestry,
- Lack of involvement of stakeholders,
- A "command and control" mentality from the center, and
- Lack of management skills at all levels

3 2 Macroeconomic and Agricultural Sector Policy

Starting in 1994, the GOS, with support from the World Bank and other donors, has undertaken a major restructuring of the economy, the agricultural sector and the natural resource sector. This restructuring includes

- 1 Devaluing the FCFA in January 1994 to, *inter alia*, promote primary sector exports and to encourage import substitution,
- 2 Liberalizing the agricultural sector international trade regime,
- 3 Liberalizing domestic marketing and pricing of all agricultural products,
- 4 Privatizing the production, processing and marketing of groundnuts and rice,
- 5 Undertaking a structural reform of the Ministry of Agriculture,
- 6 Developing a new policy on decentralization,
- 7 Developing the National Environment Action Plan, and
- 8 Creating the Ministry of the Environment and Protection of Nature

These policy adjustments are moving in the right direction. However, time will be required for their full implementation and for their effect to be fully felt by the Senegalese farmer. Sustained donor community support will be necessary during this transition period.

3 3 Agricultural Production and Marketing

There have been changes in recent years in (a) the affordability of agricultural inputs, (b) production techniques, and (c) the marketing of agricultural products. Some of these changes are described below. There are many agricultural production and input deficiencies that constrain agricultural production including (a) land quality, (b) credit, (c) seeds, (d) fertilizers & pesticides, and (e) equipment.

The quality of agricultural land in Senegal is deteriorating over time. Soil degradation and erosion result in a reduction in the land that is available for agricultural production and a further reduction in the amount of land in fallow. Increasing population puts further pressure on a diminishing resource. Finally, the need to use or sell peanut hay, millet and cereal stalks for livestock use precludes its exclusive use in improving soil quality.

Short-term credit for cash crops was historically provided by parastatals. As these organizations move out of providing credit, the lack of credit has become an increasingly important constraint. The slack in providing credit has not been taken up by suppliers of inputs or purchasers of outputs, partly because of past poor repayment rates. The consequences of this lack of credit is a reduction in the purchase of other inputs such as improved seeds, fertilizers, pesticides and new agricultural equipment. In summary, the lack of credit causes a decline in the purchase of inputs which in turn results in a reduction of agricultural output.

Policy changes, changing rainfall patterns, and changes in relative prices of inputs and outputs have provoked some changes in production techniques. For example, unavailability of good quality seed and late seeding of groundnuts have had a substantial impact on yields. Some of the reasons invoked include (a) untimely distribution of groundnut seed, (b) absence of farmers' own good quality seed stocks, (c) reducing risk of late rains or early droughts by planting later, and (d) competition for use of seeders and tillers favors food crop production rather than cash crops. Furthermore, imported inputs such as fertilizer and equipment have increased in price more than producer prices causing a decline in the use of these imported inputs.

Marketing is also undergoing significant changes which have had an impact on production and the amount of surplus available for off-farm sales. For example, the decrease in outlets for fertilizer sales and collection points has had a substantial negative impact on groundnut production. At present, certified groundnut seed is available only at SONAGRAINES collection points two months prior to planting season. Moreover, it is sold only in 50 kilogram sacks. The limited number of commercial outlets and the size of minimum purchases hinder acquisition.

Another important constraint for improving agricultural performance is that the linkages between agricultural research and the development institutions are weak. There is evidence that new packages and practices developed by researchers do not always get transferred to farmers. The national agricultural extension service is itself fragmented.

4 POSSIBLE OPTIONS FOR USAID SUPPORT

Senegal is in the midst of a period of tremendous change. During the last four years the GOS has devalued its currency, liberalized both domestic and international trade, disbanded many parastatals, privatized others, and reduced the services and subsidies for yet others, embraced the concept of the market economy and an increased role for the private sector, embarked on a process for revamping policy and investment in agriculture, and started a major process of decentralizing the delivery of government services. These changes, in turn, have had an impact on the meso and micro economies of agriculture. Marketing channels for inputs and products have undergone significant transformation. The price and accessibility of inputs such as fertilizers, improved seeds and pesticides have been altered. Farmers have reacted to these changes by altering the combination of crops and varieties grown and the proportion of inputs used to grow them.

Structural adjustment was essential for macroeconomic and financial reasons. Most of the changes that have taken place at the meso and micro level were required, even though in the short- to medium-term they will be disruptive at times and will create winners and losers. An important role for the donors, USAID included, is to assist Senegal in making this essential transformation from a centralized, state dominated and *dirigiste* economy to a decentralized one where individual consumers, producers, free markets and the private sector make most of the day to day decisions in a liberalized economy.

The following options are proposed within USAID's philosophical framework of private sector promotion, fostering of beneficial competition, providing food security and results-oriented development activities. While all of the activities may not have a direct impact on enhancing productivity, they strive to promote the enabling environment necessary for its accomplishment.

4.1 Supporting Continued Liberalization

First, USAID should consider continuing to provide support for market liberalization, privatization and the development of the private sector both at the macroeconomic level and at the agricultural sector level. Structural adjustment will inevitably result in segments of the economy being hurt and pressure being brought to bear on the GOS to provide relief through such means as import restrictions and price controls. These restrictions and controls, while making short-term political sense, will be harmful to the economy in the longer term. The donors, especially the World Bank and USAID, should provide support to the GOS so that it can resist all possible pressures.

4.2 Decentralization and Natural Resource Management

Second, USAID should consider providing support for both decentralization and the NEAP. The GOS is currently in the process of re-engineering with an aim to fostering greater participation and responsibility by its citizens in governance and defining a cohesive approach to the management of its natural resource base. The process revolves around two major policy changes. The first of these is the Decentralization Law which went into effect on December 31, 1996 and is intended to devolve responsibility for many aspects of governance and natural resource management from the state to regional and local levels. The second initiative is the NEAP, which is now being finalized and is scheduled for adoption after validation in June of this year. It is intended to provide an overall, unified foundation upon which the necessary institutions, regulations and policies for rationally managing natural resources and the environment can be constructed.

The emerging decentralized framework and the adoption of the NEAP are bold and promising initiatives which can provide the means for improving the management of the productive resource base. These initiatives, however, will require the coordinated and sustained support of Senegal's partners. Areas for potential USAID attention include:

1. Strengthening the planning, programming and management capacities of regional, communal and local councils in natural resource management (NRM)-related areas by providing appropriate training and technical assistance, and structuring interventions in a manner that reinforces these local institutions rather than bypassing them, as has so frequently happened in the past,

- 2 Improving the government's ability to provide technical support in agriculture and natural resource management by reinforcing the skills of the future national extension service particularly in new areas included in their expanded mandate such as marketing and farm-level financial advisory services,
- 3 Continuing to support key natural resource management agencies involved in monitoring and coordination activities, and
- 4 Taking a broad, holistic approach that considers the interrelated nature of environmental factors when planning rural development and research interventions, avoiding a concentration on single, isolated production factors

4.3 Support to Agriculture

Finally, USAID might consider continuing support for some of the more traditional interventions in the agricultural sector. Devaluation and the partial withdrawal of the state from supplying inputs and purchasing outputs has resulted in a further reduction in the affordability of agricultural inputs and credit. There is widespread consensus that the affordability of agricultural inputs and agricultural credit are the two most important constraints to increasing agricultural productivity.

USAID interventions in agriculture should be in the context of support for the GOS policy of food security. Current definitions of food security encompass three basic elements: availability, access and utilization. A country cannot achieve food security unless available food supplies are sufficient to provide every person in the country with an adequate diet. The food can be produced domestically or it can be imported commercially or through concessional aid programs. Achieving food security also requires that households have the financial ability to acquire sufficient food. Finally, people can also experience food insecurity when they fail to consume proper diets, even when food is available. Within the context of food security, there are a number of possible interventions in agriculture.

First, USAID might wish to consider developing partnerships with private sector seed, fertilizer and agricultural chemical producers whereby USAID would partially finance promotional efforts of these private sector firms. The private sector firms would reimburse USAID out of increased sales. This option would entail investment in updating improved seed, fertilizer and pesticide demonstration response trials but has the advantage of being (a) private sector oriented, (b) relatively easy to quantify and monitor, and (c) directly linked to the desired result of increased productivity.

Second, increasing farmers demand for productivity-enhancing inputs is, of course, only half of the equation. Facilitating access to affordable credit is a prerequisite for purchasing more inputs. However, experience has shown that credit schemes where the state is the sole lender have not been successful. The recent evolution of rural credit unions merits close examination by USAID. There would appear to be significant needs in financial management training, program and policy development and liquidity.

Third, in addition to agricultural input demand constraints which need to be addressed, increasing the supply of quality seed is also critical. The Institut Senegalais de Recherche Agricole (ISRA), in collaboration with international research centers, has identified improved varieties for most major crops grown in Senegal. The availability of good quality seed in adequate quantities from UNIS is

a major constraint to increased crop production, particularly regarding food crops. During interviews conducted by the team, the Permanent Secretary of UNIS emphasized the need for technical assistance for training in food crop seed production, control and certification.

Another area which might warrant further investigation is in horticultural exports. Although the opportunities for developing significant horticultural export marketing activities are very limited and are, in any case, being supported by the European Union, the non-perishable dried fruit, pulp and herbal tea export market might be examined as demand has increased sharply for nutritional snack foods in health conscious Western markets. The possibility of exporting to the regional market should also be explored.

Finally, we believe that donor coordination in Senegal is less effective than in a number of other countries in which we have worked. We therefore suggest that USAID consider engaging a consultant for a four-week period to undertake two tasks. First, interview the donors, review their documents, analyze the information and prepare a report on what other donors are doing in agriculture, natural resource management and agribusiness. Second, develop a proposal for a donor coordination mechanism so that donors stay current on each other activities.

INTRODUCTION

Purpose of Report

The purpose of this report is to (a) provide an up-to-date agricultural and natural resources management sector analysis, (b) provide options for alternative strategies for the period 1998-2005, and (c) make recommendations on the alternative strategies

Methodology

Three sources of information were used in preparing this report (a) published documents available in USAID and elsewhere in Dakar, (b) interviews with government officials and representatives of the donor community in Dakar and (c) electronic data provided by the Ministry of Finance, USAID and Centre de Suivi Ecologique (CSE) The list of published documents that were reviewed and the list of persons met are presented at the end of the report The team did not make any field trips outside of Dakar during the eight week mission

Organization of Report

The report is divided into five chapters Chapter 1, prepared by James Bucknall, describes the changes that have taken place in macroeconomic policy over the last decade and the impacts that these changes have had on the agricultural and natural resource sectors Chapter 2, prepared by Douglas Brown, discusses the natural resource situation in Senegal, the impact that a growing population is having on these natural resources, and the changes in natural resource management policies that have taken place during the last seven years Chapter 3, prepared by Geoffrey Livingston, examines the impact that structural adjustment and evaluation has had on the production marketing and pricing of Senegal's principal commodities Chapter 4, prepared by Robert Kagbo highlights the changes in production techniques since 1989 Chapter 5, which provides possible options and alternative strategies, was prepared by the team as was the Executive Summary

CHAPTER 1 GOVERNMENT POLICY AND AGRICULTURE

1 1 INTRODUCTION

Senegal is in the midst of major economic and political change which will have a profound impact on agriculture and natural resource management. This change involves macroeconomic policies such as devaluation, structural adjustment, and agricultural sector structural adjustment, a fundamental rethinking of the agricultural sector's programming and investments, and a program of decentralization involving the creation of a new elected level of government and the passing of significant powers from the central government to regional and local governments.

The purpose of chapter 1 is to describe, using a broad brush, some of these changes and the impact that they might have on agriculture and natural resource management. Section 1 2 describes the government's overall structural adjustment program. Section 1 3 and 1 4 describe the agricultural sector structural adjustment program. Sections 1 5 and 1 6 describe the new approach to investment in agriculture, the current investment program in the primary sector, and selected donors' programs in agriculture, environment and natural resource management. Section 1 7 describes what some of the other donors are doing in agriculture and natural resource management. The final section briefly describes the government's new policy and law on decentralization.

1 2 SENEGAL MACROECONOMIC ADJUSTMENT PROGRAM

1 2 1 Prior to August 1993

In the first two decades following Independence (1960-80), Senegal's economic performance was poor. Senegal experienced the lowest Gross Domestic Product (GDP) growth rate of any African state not affected by war or civil strife. GDP grew on average by 2.1 percent in real terms per annum, compared to a population growth rate of 2.8 percent, resulting in a decline in per capita income. By 1981, all key economic indicators reflected serious financial and structural imbalances: the fiscal deficit stood at 12.5 percent of GDP, the current account deficit reached 25.7 percent of GDP, the inflation rate soared to 12 percent per annum, savings were negative, and total consumption exceeded GDP. The total stock of debt represented over two-thirds of GDP and the debt service represented nearly one-fifth of total exports [Senegal Stabilization, Partial Adjustment and Stagnation, World Bank, 1993].

Between mid-1983 and 1993 the GOS implemented a package of structural and macroeconomic policies under its Medium- and Long-Term Structural Adjustment Program. The adjustment program was aimed at alleviating the obstacles to sustained growth in per capita incomes, controlling predicted inflationary pressures in the national economy, and redressing certain domestic and external financial imbalances.

The discrete components of the adjustment program implemented in the 1980s were supported by successive Stand-by Arrangements from the International Monetary Fund (IMF), as well as

arrangements under its Structural Adjustment Facility (SAF) and the Enhanced Structural Adjustment Facility (ESAF) Major support for the adjustment process was also provided under four World Bank Structural Adjustment Loans (SAL I, II, III and IV) Additional support was provided through bilateral and multilateral creditors and donors, including a large French debt relief agreement [Macroeconomic and Sectoral Adjustment Programs in Senegal, Erikson, 1990]

During the period 1983 to 1993 the GOS took steps to

- Liberalize the national economy,
- Reduce agricultural and industrial production distortions,
- Strengthen public investment programming,
- Initiate reform of the public enterprise sector,
- Reduce its overall fiscal deficit,
- Pursue an appropriate credit policy, and
- Put in place a prudent external debt management policy

These macroeconomic policy changes contributed to a revitalization of the national economy, to a dampening of inflationary pressures and to a strengthening of the country's external sector position

In addition to the general macroeconomic improvements induced by structural adjustment, the program had several elements which bore directly on the agricultural sector These elements included changes in the regulatory environment affecting commercial marketing of agricultural inputs and outputs, efforts to stimulate greater private sector participation, a reduction in the scope of public enterprise involvement in the sector, price policies affecting the terms of trade between rural and urban inhabitants, and a greater effort by government to improve its allocation of budgetary resources

In the agricultural sector, the most significant improvements of the period came in the following areas

- Deregulation of domestic coarse grains markets,
- Elimination of subsidies on most agricultural inputs,
- Reduction in public enterprise involvement in sector activities and greater enforcement of financial accountability through management contracts,
- Willingness to use agricultural price and trade policies to generate improvements in terms of trade and income disparities, and
- Greater control over the allocation of available budgetary resources, coupled with greater transparency in accounting practices

1 2 2 Post August 1993

With the implementation of an Emergency Plan adopted in August 1993, which was aimed at restoring public finances, and devaluation in the FCFA in January 1994, the government has sought to re-emphasize the need for stringent macroeconomic management

In early 1994, the government decided to adopt a comprehensive adjustment strategy, including the devaluation of the FCFA in coordination with other members of the West African Economic and Monetary Union (WAEMU), in order to achieve sustained economic growth and financial viability over the medium term. The medium-term strategy involved, in addition to the adjustment of the exchange rate parity, strong fiscal and monetary policies designed to contain a predicted spike in inflation and restore competitiveness on a lasting basis, and the acceleration of structural reforms aimed at improving incentives for the private sector and strengthening growth.

The adjustment efforts of Senegal were supported initially by a standby arrangement from the IMF. This was replaced in August 1994 by a three-year arrangement under the ESAF. Senegal also received support from the World Bank under an economic recovery credit, a Private Sector Adjustment and Competitiveness Credit (PASCO) and an Agricultural Sector Adjustment Loan (AG-SECAL). Moreover, Senegal benefitted from assistance from other multilateral sources, including debt rescheduling from the Paris Club and other bilateral creditors.

The government's 1994-96 adjustment program, as described in the Sixth Policy Framework Paper (PFP) of July 1994, has four main objectives:

- 1 Achieving a real GDP growth rate of 4.7 percent in 1995 and 4.8 percent in 1996,
- 2 Increasing the investment-to-GDP ratio from 14.1 percent of GDP in 1993 to 16.7 percent in 1996 and improving the efficiency of public investment,
- 3 Achieving primary surpluses in the government's budget, and
- 4 Containing the external current account deficit, excluding official transfers, to 9.8 percent of GDP in 1994.

The government's strategy also included measures to improve public sector management consisting of:

- 1 Adopting a three-year public investment program taking into account the devaluation of the FCFA,
- 2 Reducing the wage bill through an audit of the civil service, and

- 3 Continuing the government's divestiture program by privatizing 12 of the remaining public enterprises over the period covered by the PFP

As a first step immediately after the devaluation, the GOS

- 1 Established a maximum 45 percent limit on import tariffs including the 5 percent stamp duty,
- 2 Reduced the number of Value Added Tax (VAT) rates from five to three, with a maximum rate of 20 percent,
- 3 Increased energy and utilities prices to reflect more realistically their current economic costs of production, and
- 4 Passed through the benefits of the devaluation to agricultural producers

The government also announced its determination to accelerate structural reforms necessary to bolster the supply-response through long-delayed reforms to liberalize external trade, the labor market, and the agricultural sector

1 3 SENEGAL AGRICULTURAL SECTOR ADJUSTMENT PROGRAM

1 3 1 The Agricultural Sector in Senegal An Overview

The agricultural sector, including forestry, livestock and fishery, accounts for a modest share of approximately 20 percent of GDP and for 60 percent of employment. Arable land in Senegal is estimated at 3.7 million hectares of which some 2.3 million hectares are cultivated annually. Rain-fed agriculture predominates with production under irrigation accounting for about 4 percent of cultivated area. On average, export crops, principally groundnuts and cotton, account for about 50 percent of cultivated area with food crops, principally millet, rice, sorghum and maize, comprising the rest. Rangeland is estimated at 12 million hectares, but its productivity is variable. Overgrazing of rangeland is a serious threat while the availability of water resources is the main obstacle to the development and intensification of the livestock sub-sector.

During the second half of the 1980s, total agricultural production registered a modest increase of 2.7 percent per annum. While this was better than the early 1980s, which was poor as a result of droughts, it was still barely enough to keep up with population growth. This modest performance has been accompanied by

- A sharp decline in traditional exports, especially groundnut oil and cake,
- Large deficits of parastatals involved in groundnut and cotton exports,
- Degradation of soils due to the combined effect of drier than normal rainy seasons, soil erosion, salinization, acidification, deforestation, and overgrazing, and
- High overall population growth, coupled with a rural exodus of young men and women

1 3 2 Past Agricultural Sector Adjustment Performance

One of the main constraints to sustainable growth in Senegalese agriculture has been the involvement of the state in all aspects of agricultural production and marketing. The state has been omnipresent in input pricing and distribution, imports of agricultural products and agricultural inputs, setting and administering the prices of most agricultural commodities, and in the processing and marketing of agricultural products.

Past SALs have attempted to address this constraint. SAL I included a number of policy reforms to begin liberalizing the agricultural sector. The government, however, was not able to implement certain reforms and the second tranche of the reform was canceled in June, 1983. The thrust of SAL II & III consisted of revitalizing agriculture to increase and diversify agricultural production and exports. The strategy consisted of

- 1 Fostering private sector initiative through a change in incentive policies and a progressive withdrawal of the state from direct involvement in production activities,
- 2 Liberalizing the internal and external trade regime,
- 3 Achieving greater efficiency of public investments, and
- 4 Reforming public agencies

The record of SAL II was generally good. Significant progress was made on

- 1 The development of cereals production through the provision of adequate protection for domestic cereals and the liberalization of internal marketing and pricing,
- 2 The liberalization of the groundnut sector with the Government withdrawing from seed distribution and with the elimination of subsidies to cover oil milling costs,
- 3 The decontrol of fertilizer imports and the reduction of price subsidies, and
- 4 The scaling back of the activities of the Societe d'Aménagement et d'Etude des Terres du Delta Fleuve Senegal (SAED) and the Societe pour le Développement des Fibres Textiles

(SODEFITEX), the rural development agencies responsible for irrigation and cotton development respectively

Under SAL III, the achievements of SAL II were consolidated and the reforms extended to include

- 1 Establishing a weekly price information system for the major cereals markets,
- 2 Reducing the farmgate prices of groundnuts in response to a sharp drop in international prices, rationalizing the Société Nationale de Commercialisation des Oléagineux (SONACOS) operations to reduce costs and initiating external management and financial audit of this oil milling parastatal,
- 3 Completely eliminating fertilizer subsidies in 1988/89 and totally decontrolling compound fertilizer imports,
- 4 Decontrolling meat prices and eliminating the monopoly on hide and skin trade, and
- 5 Developing coherent policies on pricing and farm credit

The SALs, however, were less successful in eliminating rents associated with import monopolies. No progress was made on the liberalization of rice imports. There were significant delays in the adoption of measures for SONACOS under SAL III and the privatization of SONACOS, proposed under SAL IV, was not achieved. Regarding sugar, the government was not prepared to address the issue of Compagnie Sucrière Sénégalaise (CSS) monopoly and eliminate its excessive fiscal advantages.

The devaluation of the FCFA has considerably changed the situation. Rents associated with the import of rice have vanished. SONACOS no longer earns huge margins on imports of vegetable oil and CSS margins on the imports of sugar have been appropriated by the GOS [Senegal Agricultural Sector Adjustment Credit, World Bank, 1995]

1.3.3 The Government's Medium-Term Agricultural Sector Strategy

Between 1991 and 1993, there was a hiatus in World Bank and GOS dialogue as the government failed to undertake reforms agreed with the Bank, especially in the rice and groundnut subsectors. In the fall of 1993, the government reopened formal discussions on the AG-SECAL with the Bank and various other donors. As a result of these discussions, the government announced, in June 1994, its intention to prepare a new sectoral strategy and program based on the need to

- 1 Create an environment conducive to agricultural investment,
- 2 Give support to new and innovative agricultural technology,

- 3 Develop rural infrastructure,
- 4 Give more attention to the management of natural resources,
- 5 Leave decisions concerning production practices to producers and private sector initiatives, and
- 6 Focus the government's role on the provision of production-supporting social infrastructure and services to improve efficiency of service delivery [Declaration de Politique de Developpement Agricole (DPDA), June 1994]

These general principles were fully reflected in the Letter of Agricultural Development Policy (LAPD) of April 1995. In this LAPD, the government sets out six main objectives for its medium-term agricultural development strategy:

- 1 A target agricultural growth rate of 4 percent per annum,
- 2 Improved food security through intensification of production,
- 3 The creation of agricultural employment to increase rural purchasing power,
- 4 Improved management of natural resources guided by a National Environment Action Plan (NEAP),
- 5 Promotion of private sector investment, and
- 6 Improved efficiency in public sector resource management

To ensure the successful implementation of the agricultural sector program, the government has established an interministerial committee to monitor the implementation of the program.

1.3.4 Overview of Bank and Donor Support

As a result of this positive dialogue between the government and the donors, the Bank and the government agreed to the AG-SECAL. The overall objective of the Bank's assistance to Senegal in the agricultural sector is to promote sustainable agricultural growth. To this end, the program supported by the AG-SECAL has four elements:

- 1 Liberalizing domestic marketing and pricing of all agricultural products,
- 2 Reforming the agricultural trade regime through liberalizing external trade in those agricultural products still under government control, including

- Eliminating all prior authorizations for the import of rice, vegetable oils, groundnut oil seeds, sugar, and wheat flour, and
 - Determining appropriate protective tariffs for these key agricultural commodities, and, in the case of cotton and groundnuts, linking domestic producer prices to world prices
- 3 Privatizing the production, processing and marketing of agricultural products in those subsectors still dominated by parastatals, namely groundnuts and rice (SONACOS and the Caisse de Péréquation et de Stabilisation des Prix (CPSP)), and
 - 4 Preparing a three-year rolling investment program for the agricultural sector which respects clear sectoral priorities established in consultation with donors

The adjustment program has successfully completed the first three of these objectives and, through the Groupe de Réflexion Stratégique (GRS), the government is currently working on the fourth

1 3 5 The Policy Reform Program

These general policy reforms have been accompanied by specific reforms in the principal agricultural sub-sectors of cereals, groundnuts, cotton and sugar. These more specific reforms are described below.

1 3 5 1 Cereals

The GOS has five objectives in reforming the sector:

- 1 Liberalize all imports, subject to an import levy that would provide partial stabilization of domestic prices,
- 2 Remove all controls on domestic trade,
- 3 Privatize rice milling,
- 4 Transfer most irrigation operation and maintenance costs to producers, and
- 5 End price controls and public sector intervention in the paddy and rice markets

This Rice Sector Adjustment Program (RSAP) is supported through an agreement signed by USAID and the GOS. The implementation of the RSAP has gone fairly smoothly. The private sector, when finally freed from needless restrictions from the public sector, has done a good job in keeping the country supplied with rice [Senegal Rice Policy Reform Program. Second Situation Report, January 1997].

1 3 5 2 Groundnuts

Actions under the AG-SECAL in the groundnut sector are centered on a number of structural adjustment measures

- 1 Breaking the monopoly of SONACOS and the privatization of SONACOS and the Societe National de Graines (SONAGRAINES),
- 2 Liberalizing the domestic pricing and marketing of groundnuts,
- 3 Elimination of prior authorization requirements for vegetable oil imports,
- 4 Permitting unrestricted export of unprocessed oilseed groundnuts,
- 5 Regarding confectionary groundnut activities, government activities will be limited to creating new seed varieties, encouraging expansion of production, and the creation of a "Groundnuts from Senegal" label

1 3 5 3 Cotton

The quasi-permanent financial crisis in SODEFITEX led the GOS to put in place an emergency adjustment program in 1987 with assistance from the French aid agencies, particularly the Caisse Française de Developpement (CFD) These reforms, supported by all donors, but under CFD leadership, emphasized the following

- 1 Improvements in technical performance and internal (SODEFITEX) cost saving measures,
- 2 The linking of seed-cotton prices to international fiber prices and the elimination of direct government role in the setting of seed-cotton prices,
- 3 The demarcation of SODEFITEX costs between commercial activities and public service activities in relation to financing and distribution of benefits,
- 4 Greater management autonomy relative to the state, and
- 5 Greater involvement of producer organizations in the management of all activities related to the subsector

Specific measures included in the AG-SECAL included

- 1 Liberalization of marketing of seed cotton and cotton fiber, and
- 2 Preparation of an action plan for the cotton subsector based on the *lettre de mission*

1 3 5 4 Sugar

In the LAPD, the government proposes to liberalize the sugar subsector by eliminating all barriers to entry in the

- 1 Cultivation of sugar cane,
- 2 Sugar processing and refining
- 3 Imports of sugar, and
- 4 Marketing of sugar

To these ends, the government signed a new agreement with CSS in January 1995. This new agreement

- 1 Eliminates all monopoly privileges on sugar cane production, sugar imports, sugar processing and refining, and sugar distribution,
- 2 Eliminates prior authorizations for imports and replaces them with tariff protection,
- 3 Eliminates all special fiscal and tax benefits, and
- 4 Fully liberalizes prices and margins in the sugar market

1 3 5 5 Other Agricultural Reforms

A number of other reforms were included in the AG-SECAL including

- 1 In fruits and vegetables, the government agreed to leave this subsector strictly to private initiative and not to interfere in the pricing, import and marketing of products, and proposed to eliminate prior authorizations on potatoes, onions and bananas originating from zones outside of the WAEMU,

- 2 With respect to agricultural inputs, the GOS agreed to remove all prior authorizations for the import of agricultural inputs (except for health, phytosanitary or environmental protection), and
- 3 Regarding land tenure and natural resource management, a major study of land tenure practices is being carried out

1 4 STRUCTURAL ADJUSTMENT AND TRADE

It is still too early to say definitely what the long-term impact of devaluation and the macroeconomic structural adjustment programs have had on the economy of Senegal. However, early indications are positive. Table 1 1 shows the percentage real growth in GDP in the year prior to devaluation and the two subsequent years for the seven FCFA area countries. In 1993, the year prior to devaluation, the real growth of GDP in Senegal was -2 0 percent. In the two years subsequent to devaluation, GDP grew 2 0 percent and 4 5 percent respectively. Senegal's performance was in the bottom half of the seven countries. Benin, Côte d'Ivoire, Mali and Togo performed better than Senegal and Burkina Faso, and Niger fared worse.

Table 1 1 Real GDP Growth, Percentage

Country	1993	1994	1995
Benin	3 2	3 2	6 3
Burkina Faso	0 5	1 2	4 0
Côte d'Ivoire	-1 1	1 8	6 5
Mali	-4 5	2 4	5 2
Niger	0 2	1 4	4 0
Senegal	-2 0	2 0	4 5
Togo	-13 7	16 3	8 8

Source: Economist Intelligence Unit (EIU) Country Report, Q4, 1996

There was almost no inflation in Senegal in 1993. Table 1 2 shows that, as expected, inflation spiked in 1994 in all seven countries. In the case of Senegal it rose 32 3 percent in 1994 but declined to a reasonable 8 0 percent in 1995. Regarding inflation performance, there was not a great deal of variation between the seven countries: some did slightly better than Senegal and some did slightly worse.

Table 1 2 Consumer Price Inflation, Percentage

Country	1993	1994	1995
Benin	0.5	38.5	14.5
Burkina Faso	1.7	24.7	7.8
Côte d'Ivoire	2.2	26.0	12.0
Mali	0.9	28.0	8.0
Niger	-1.2	35.3	11.0
Senegal	0.5	32.3	8.0
Togo	-3.6	41.0	7.2

Source: EIU Country Report, Q4, 1996

Table 1 3 shows that, again as expected, exports from Senegal increased as a result of the devaluation. This was also true for the Côte d'Ivoire and Togo. Exports declined in the other four countries of the FCFA area.

Table 1 3 Exports, FOB, \$million

Country	1993	1994	1995	% Increase 93-95
Benin	341	301	300	-12.0
Burkina Faso	277	226	226	-18.0
Côte d'Ivoire	2,652	2,875	3,380	27.4
Mali	341	320	420	-23.2
Niger	238	226	230	-3.4
Senegal	719	794	890	23.8
Togo	136	162	222	63.2
Total CFA Region	6,697	6,898	7,663	14.4

Source: EIU Country Report, Q4, 1996

Table 1 4 shows that imports into Senegal increased over the period 1993 to 1995 by 17.5 percent. Comparing data in Tables 1 3 and 1 4 shows that imports into Senegal between 1993 and 1995 increased by \$193 million whereas exports from Senegal increased by only \$171 million.

Table 1 4 Imports, FOB, \$million

Country	1993	1994	1995	% Increase 93-95
Benin	539	366	380	-44.3
Burkina Faso	643	365	365	-43.2
Côte d'Ivoire	1,801	1,566	1,950	8.2
Mali	446	422	480	7.6
Niger	244	245	220	-9.8
Senegal	1,102	1,027	1,295	17.5
Toga	251	212	332	32.3
Total CFA Region	7,019	6,197	7,017	0.0

Source: EIU Country Report, Q4, 1996

1.5 SENEGAL INVESTMENT PROGRAM IN AGRICULTURE

As mentioned above, one of the four pillars of the World Bank-supported GOS program was preparing a three-year rolling investment program for the agricultural sector which respects clear sectoral priorities established in consultation with donors. The Unité de Politique Agricole (UPA) prepared a first draft of the Programme d'Investissement du Secteur Agricole (PISA) in 1996. However, upon reflection, the government and some of the donors thought it advisable to form a special group to study the issues in greater depth.

1.5.1 GRS/PISA

As a result of this decision, Le Groupe de Réflexion Stratégique sur le Programme d'Investissement du Secteur Agricole (GRS/PISA) was created by Decree on July 5, 1996 by the Minister of Agriculture. The objective of the GRS/PISA, as described in the decree is to formulate, within the context of the LAPD, recommendations on:

- 1 Long-term strategic choices in agriculture which are coherent with other government objectives and the rational management of natural resources,
- 2 Ways and means of reconciling the objectives of the agricultural producers and marketers with the objectives and constraints of the government, and
- 3 The preparation of programs and investment projects in the agricultural sector [Groupe de Réflexion Stratégique, Rapport d'Etape, April 1997]

The GRS/PISA is made up of the following people

Cheikh Amidou Kane, Abdoulaye Sene	President, Ancien Ministre du Plan et de la Cooperation, Ecrivain Vice President, Chef de la Mission d'Aménagement des Vallées Fossiles au Ministère de l'Hydraulique
Baba Dioum	Rapporteur, Coordinateur de la Conférence des Ministres de L'Afrique de l'Ouest et du Centre (CMA/AOC)
Jacques Faye	Rapporteur, former Directeur General de l'Institut Sénégalais de Recherche Agricole (ISRA)
Abdoulaye Diagne Emmanuel Ndione	Directeur du Centre de Recherche en Economie Appliquée (CRAF) Coordonnateur de Groupe Recherche - Action - Formation (ENDA- GRAF)
Abdoulaye Bara Diop	Ancien Directeur de l'Institut Fondamental d'Afrique du Nord (IFAN)
Safiétou Touré Fall Galaye Sall	Chercheur à l'Institut Senegalais de Recherche Agricole (ISRA) Directeur du Service de l'Alimentation et de la Nutrition Appliquée au Sénégal
Mame Cor Sène	Directeur de l'Unité de Politique Economique au Ministère de l'Economie, des Finances et du Plan
Malick Sarr	Directeur de la Production et du Développement rural à la Société d'Aménagement et d'Exploitation des Terres du Delta (SAED)
Ibrahima Seck	Président de la Commission Environnement et Développement Durable du Comité National de Concertation des Ruraux (CNCR)
Oussouby Toure	Secrétaire Permanent du Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE)

The GRS is supported by a five-person secretariat and has opened its own bank account, thus permitting it to commence its work in earnest. In its first phase of activities, the GRS has initiated a number of studies. Terms of reference have been developed for several studies, consultants have been engaged, and two or three members of the GRS have been appointed to each group of consultants to act as a Steering Committee. This first phase consists of the following five studies:

- 1 Identification of Strategies for Ameliorating Rural Poverty,
- 2 The Role of the Private Sector in Agriculture and Agro-business,
- 3 Institutional Reform and Cooperation for Implementation of Rural Policies and Strategies,
- 4 Identification of New Sources of Growth in the Agricultural and Agro-Industrial Sectors, and
- 5 Long-Term Vision for Agriculture

The Steering Committee of each study has engaged 3-5 consultants for a period of approximately 10 weeks to conduct each study. The schedule for completing these studies is

- | | |
|--|----------------|
| ● Organization and conduct study | April/May 1997 |
| ● First Preliminary Draft in GRS | May 20, 1997 |
| ● Circulation of First Draft to Partners | May 31, 1997 |
| ● Discussion of Final Report | June 10, 1997 |

In addition to these five principal studies, the members of the GRS have decided to commission a number of secondary studies, including

- Livestock,
- Rural Credit,
- Horticulture,
- Water management,
- Supply of Agricultural Inputs,
- Rural Infrastructure, and
- The Senegal River Valley

Finally, the GRS has established a policy and has developed a program for involving as wide a range of participants as possible. With this in mind, the GRS engaged an FAO expert to help them organize a workshop on horticulture. The workshop was held on March 12, 1997 and brought together many actors from the public sector, the private sector and producer organizations. A second workshop on horticulture is planned for May 2, 1997. Two symposia are also planned: the first to discuss the initial draft and the second to review and reflect on the suggestions and recommendations of the GRS on the long-term vision and the revised PISA [Groupe de Reflexion Strategique, Rapport d'Etape, April 1997].

1.5.2 The Programme Triennal d'Investissements Publics

The Programme Triennal d'Investissements Publics 1997-1999 (PTIP) has a total value of 867,963 million FCFA for the three-year period of which 261,655 million FCFA was in the primary sector.

1 5 2 1 Primary Sector Public Investment by Sub-Sector

Table 1 5 and Figure 1 1 show the amount of money that will be spent in the various sub-sectors on the primary sector and the percentage that this is of the total. More detailed information of the primary sector PTIP is presented in the Annex tables, A1 1, A1 2 and A1 3. The three largest sub-sectors, agriculture (42 0 percent), rural and agricultural water (19 2 percent), and institutional support (15 4 percent) account for two-thirds of total investment in the primary sector. Most of the agricultural investments are in the Saint Louis region, most of the rural and agricultural water investments are classified as multi-regional, and most of the institutional support is in the Saint Louis and multi-region.

Table 1 5 Primary Sector Public Investment by Sub-Sector

Sub-Sector	Millions of FCFA	Percentage
Agriculture	107,764	42 0
Livestock	6,152	2 4
Water and Forestry	28,421	10 9
Fisheries	22,893	8 7
Rural Agricultural Irrigation	50,278	19 2
Primary Research and Studies	3,884	1 4
Institutional Support/Strengthening	40,522	15 4
Total	261,655	100 0

Source: Electronic data provided by the Ministry of Finance

1 5 2 2 Investment by Sub-Sector and Region

Table 1 6 and Figure 1 2 show the primary sector PTIP by regions. The Saint Louis region receives 30 5 percent of the total investment in the primary sector. The next two largest regions are "multi-regional" and "national" receiving 25 9 percent and 20 8 percent respectively. The remaining nine true regions receive 22 8 percent combined.

Table 1 6 Primary Sector Public Investment by Region

Region	Millions of FCFA	Percentage
Dakar	3,381	1 3
Ziguinchor	8,371	3 2
Diourbel	1,185	0 5
Saint-Louis	79,458	30 5
Tambacounda	6,768	2 5
Kaolack	6,693	2 5
Thies	4,983	1 9
Louga	348	0 1
Fatick	5,479	2 1
Kolda	22,827	8 7
Multi-Regional	67,893	25 9
National	54,270	20 8
Total	261,655	100 0

Source: Electronic data provided by the Ministry of Finance

1 5 2 3 Primary Sector Public Investment by Major Funding Source

Table 1 7 and Figure 1 3 show the primary sector PTIP by major source of funds. No single source of funds dominates the primary sector. The five largest sources are European Union (11 5 percent), the Government of Senegal (10 4 percent), Japan (9 8 percent), the World Bank Group (8 9 percent), and the Federal Republic of Germany (8 8 percent).

Table 1 7 Primary Sector Public Investment by Major Funding Source

Source of Funding	Millions FCFA	Percentage
European Union	30,139	11 5
Government of Senegal	27,329	10 4
Japan	25,757	9 8
World Bank	23,271	8 9
Federal Republic of Germany	22,968	8 8
African Development Bank	15,165	5 8
Republic of China	15,000	5 7
France	11,708	4 5
USAID	8,261	3 2
Others	82,057	31 4
Total	261,655	100 0

Source: Electronic data provided by the Ministry of Finance.

Figure 1 1 Primary Sector
FTIP by Sub-Sector

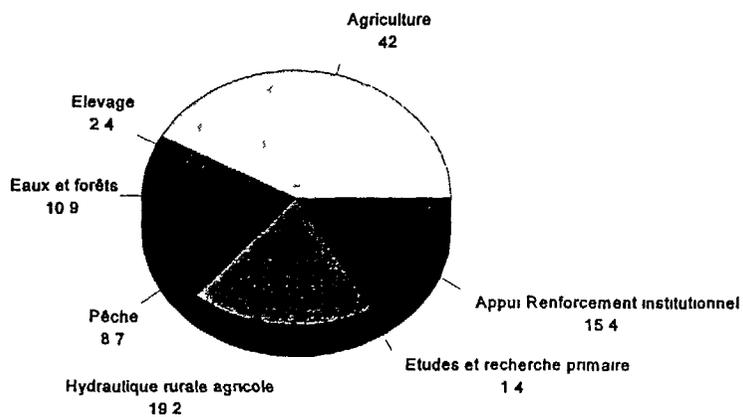


Figure 1 2 Primary Sector
PTIP by Region

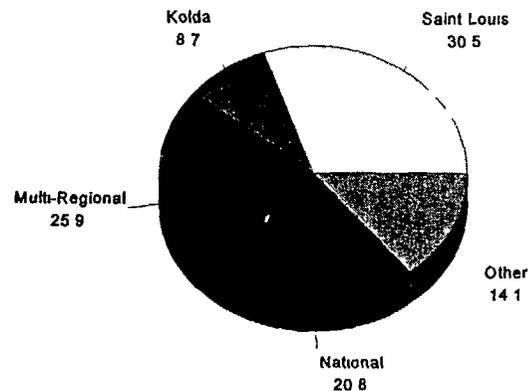
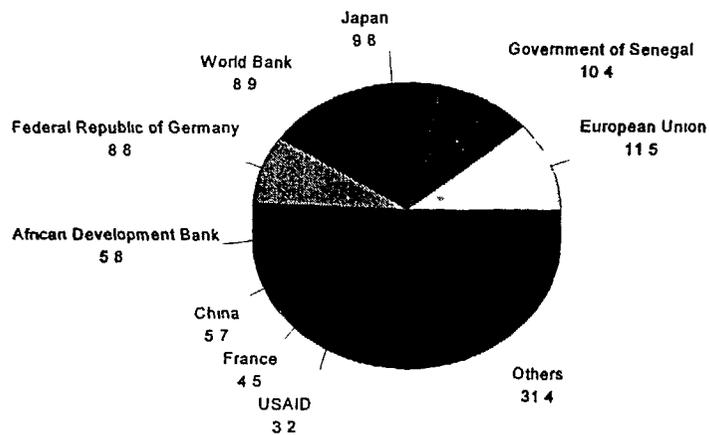


Figure 1 3 Primary Sector
PTIP by Major Funding



1.6 DECENTRALIZATION

In the same way that structural adjustment will have an enormous impact on the macroeconomy of Senegal, the policy of decentralization potentially will have a similar impact on the government and administration of the country. There are well-known constraints with the centralized government of Senegal: distance, tardiness in decision making and program implementation, and lack of accountability. The primary objective of decentralization is to remove these constraints. [Patrick Hubert, *Decentralisation: les objectifs du gouvernement, La Decentralisation au Senegal*, 1994]

Decentralization has been a continuing government policy since Independence. The law of January 13, 1960 divided the country into seven regions, which were further divided into *cercles*, and finally the *cercles* were divided into *arrondissements*. The three levels of government were administered by a Regional Governor, a *Commandant de Cercle*, and a *Chef d'Arrondissement* respectively. At the level of the *arrondissement*, a Centre d'Expansion Rurale Polyvalent (CERP) was created. The purpose of the CERP was to coordinate rural development services.

The law was modified by decree on April 3, 1964 making the Regional Governor a delegate of the President. The *cercle* became a *Departement* administered by a *Prefet*. Regrettably, due to a poor definition of powers at each of the levels, this administrative system became dysfunctional.

Another law was passed on May 29, 1972 to help overcome this problem and a further law was passed on October 8, 1990. As a result of this evolution, Senegal consisted of 48 *Communes* and 320 *Communautes Rurales* for a total of 368 *collectivites locales*. [Textes de Lois de la Decentralisation, 1996]

On June 25, 1992, the Prime Minister created by Decree four working groups which were charged with the responsibility of developing a policy of further decentralization including local financing, planning and budgeting, institutional development and decentralization. On September 24, 1992, the President announced that he proposed to submit to the National Assembly an Act on decentralization. This Act, *Textes de Lois de la Decentralisation*, became law in 1996.

The essence of the law is to create 10 new *collectivites locales* at the regional level, thus increasing the number of *collectivités locales* to 378: 10 *Conseils Regionals*, 48 *Communes* and 320 *Communautes Rurales*, and then to transfer significant additional responsibilities from the State to these *Conseils Regionals*, *Communes* and *Communautes Rurales*.

In the future, the region will be the principal administrative unit. Each region will have the same status, the same responsibilities, and proportional human and financial resources to carry out these new responsibilities. The objective of decentralization is to allow each region to promote its own economic, social and cultural development and natural resource management.

The regions will be the basic judicial and financial unit. Each unit will be administered by a *Conseil Régional*. The regional governor, as representative of the state, will be responsible for the legal control of all government organs in the region.

1.6.1 The Conseil Régional

The regional counselors who, together, make up the *Conseil Régional*, are elected for a five-year period by universal suffrage. The number of counselors per region depends on the population of the region, ranging from 42 in regions with less than 800,000 inhabitants to 62 in regions with more than 1,500,000 inhabitants. The region is responsible for promoting economic development, education, social services, health, culture and science. The regions' actions will be complementary to those of the State, the *Communes* and the *Communautes Rurales*.

The *Conseil Régional* elects a President and Cabinet (Bureau) from its members. The *Conseil Régional* also creates four commissions: (a) judicial and administrative, (b) education, health, social & cultural, and youth & sports, (c) finance, planning and economic development, and (d) environment, and rural and urban development. The *Conseil Régional* has the right to enter agreements with other bodies such as other regions, the *Communes* and the *Communautes Rurales*.

1.6.2 The Communes

Communes are administered by a *conseil municipal*. Councillors are elected for a five-year period. The largest *communes* can be further divided into *communes arrondissements*. The role of the *conseil municipal* is local planning and programming within national and regional guidelines. The municipal council is responsible for all areas transferred to it under the law.

The mayor is supported by assistants, the number being a function of the size of the *commune* up to a maximum of 18. Both the mayor and the assistants are elected from the members of the municipal council. The mayor and his assistants comprise the *bureau municipal*. The municipal council may enter into agreements with other *communes* and *communautes urbaines*.

1.6.3 The Communaute Rurale

A *Communaute Rurale* is a legal entity made up of a number of neighboring villages. The *Communaute Rurale* is governed by a *conseil rural* and a *président du conseil*. Rural counselors are elected for a five-year period and the president and two vice-presidents are elected from the counselors. The *conseil rural* is responsible for all matters that are delegated to it under the law, including: (a) use of rural land, (b) natural resource management, (c) building permits, (d) budgeting, (e) human resource investments, and (f) all other local matters. The president, in the name of the state, publishes and administers laws and regulations, administers local policing, and ensures local law and order. The president is also responsible for budget preparation and financial administration.

The *Communaute rurale* has the right to enter agreements with other *Communes* and *Communautes rurales*

During the first stage of decentralization, the following sectors are transferred to the *collectivites locales* (*Regions, Communes* and *Communautes rurales*)

- Property,
- Environment and Natural Resource Management,
- Health, Population and Social Services,
- Youth and Sports,
- Culture
- Education,
- Planning,
- Land Management, and
- Buildings and Lodgings

It should be noted that agriculture has not been decentralized in this first round of decentralization

1 7 MAJOR DONOR ASSISTANCE PROGRAMS

1 7 1 The Netherlands

The general objective of the Netherlands cooperation in Senegal is to contribute to sustainable development. In order to attain this objective, three criteria have been developed which all activities must satisfy

- Poverty Alleviation,
- Improvement of the Environment, and
- Support for Women in Development

All potential interventions must impact on each of these three criteria positively, or, at the very least, must not have a negative effect. The Netherlands has three different types of intervention

- Projects which conform to GOS development priorities,
- Support for NGOs (Non Governmental Organizations), and
- Special embassy projects

The Netherlands has chosen two sectors for intervention in Senegal (a) sustainable natural resource use, and (b) food security. The history of Dutch involvement in Senegal started with emergency food aid in the 1970s during the drought. Over time, this support turned towards food security, then reforestation and finally sustainable natural resources management. The following paragraphs

provide a thumbnail sketch of the principal projects being funded by the Netherlands. The total value of Dutch aid is some \$9 million per year.

- 1 **Support for the Center for Forest Recycling** The purpose of this project is to develop the capacity of the Department of Water and Forests within the Ministry of Environment and Nature Protection. Activities include policy development support, training, and technology transfer.
- 2 **Redevelopment of Old Forests in the Fleuve Valley** The long-term objective is to support the policy of self-sufficiency in energy by (a) the redevelopment and maintenance of a stable ecological area for agro-sylvo-pastoral development in the fleuve region, (b) the development with the cooperation of the local people, of inputs for forests, and (c) the development of irrigated agriculture.
- 3 **Village Reforestation in the North West Peanut Basin** The long term objective is to contribute to (a) the struggle against desertification and general improvement of the environment, and (b) an improvement of living conditions and an increase in revenues of the rural population.
- 4 **Forestry Development in Rural Senegal** The objective is to provide institutional support to the Department of Water and Forests, to contribute to the struggle against desertification, to provide basic needs such as firewood and forage, and to preserve natural resources.
- 5 **Forestry Seed Center** The objective is to provide forestry seeds in order to aid in reforestation, to contribute to the struggle against desertification, to provide basic needs such as firewood and forage, and to preserve natural resources.
- 6 **Effects of the Chemical War Against Locusts on the Environment** The purpose of the project is to establish an ecotoxicological unit in Senegal in which national and international researchers can undertake studies on the impact of the use of pesticides in Africa.
- 7 **A Rapid Alert Food Security Information System** The purpose of the project is to assist in (a) developing indicators, (b) improving the reliability of information, (c) improving the technical capacity of national services, and (d) improving collaboration between all participating institutions.
- 8 **Support for Coordination of the Senegal Forest Action Plan** The objective is to build up the capacity of the Group in the Ministry of the Environment and Nature Protection which is responsible for coordinating the Senegal Forest Action Plan.
- 9 **Ile à Morphil Project** The principal objective of this project is to develop rice culture and polyculture on the Ile à Morphil.

1.7.2 Germany

The Federal Republic of Germany's cooperation with Senegal is through two federal institutions: GTZ for technical cooperation and KfW for financial cooperation. In addition to this federal government-supported cooperation, a number of German foundations are active in Senegal, namely the Friedrich Naumann Foundation, the Friedrich Eber Foundation and the Conrad Adenauer Foundation. Finally, there are a number of German NGOs that are active in Senegal.

The GTZ concentrates its efforts in three areas (a) human resources, (b) financial services, and (c) logistical services. The GTZ has a number of projects in agriculture and natural resource management

- 1 **Technical Assistance for the Management and Protection of Natural Resources** The purpose of the project is to support institution building, through the provision of technical assistance, in the Ministry of the Environment and the Protection of Nature (MEPN) and Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE) which are charged with the development and execution of the Plan National d'Actions pour l'Environnement (PNAE)
- 2 **Pastoral Development in the Ferlo** The objective of this project is to provide pastoral communities with the means to manage ecological, social and economic change
- 3 **Self-Government and Management of Natural Resources in Sine Saloum** The global objective of the project is to contribute to the guarding of basic natural resources through decentralization
- 4 **Integrated Production Systems for Natural Resource Protection in Moyenne Casamence**

For its part, the KFW is financing two agricultural projects and is planning to finance two other projects

- 1 **Irrigation of Nianga** The objective of the project is the increase in rice production through the development and maintenance of irrigation infrastructure, introducing improved cultivation techniques, and improved organization and management
- 2 **Irrigation of Boundoum** The purpose of the project is to increase rice production through rehabilitation and increasing the area under cultivation, by increasing yields, and by increasing the amount of double cropping

The two projects in the pipeline are

- 1 **Irrigation of N'Galenka, and**
- 2 **Irrigation of Nianga and Casier C Sud [LA COOPERATION SENEGALO ALLEMANDE, 1996/97]**

1 8 SUMMARY AND CONCLUSIONS

1 8 1 Summary

In 1993 the macro economy and the agricultural sector economy faced a number of structural problems including

- 1 A currency that was severely overvalued relative to other currencies outside of the CFA zone,

- 2 An international trade regime that was rife with non tariff barriers such as state import and export monopolies, quantitative restrictions in the form of prior authorities to import, and price controls,
- 3 A domestic trade regime that was even more restrictive because of price controls, numerous monopolies and monopsonies, and a plethora of parastatals that were inefficient, non-transparent and required frequent injections of subsidies to remain in existence,
- 4 A private sector which was mistrusted by the GOS, which mistrusted the GOS, and which faced numerous government policy changes which made planning extremely difficult,
- 5 Government policy, planning and implementation institutions which were overstaffed, underfinanced and generally control oriented rather than service oriented, and
- 6 An agricultural sector public investment program which was not coherent from a policy and program point of view and was almost completely reliant on external donors as a source of funding and therefore often satisfied individual donor priorities as much as Senegalese priorities

To overcome these constraints, the GOS, with support from the World Bank and other donors, has undertaken a major restructuring of the economy and the agricultural sector. These measures include

- 1 Devaluation of the CFA Franc in January 1994,
- 2 Major overhaul of the international trade regime, especially the agricultural sector international trade regime through liberalizing external trade in those agricultural products still under government control, including
 - Eliminating all prior authorizations for the import of rice, vegetable oils, groundnut oil seeds, sugar, and wheat flour, and
 - Determining appropriate protective tariffs for these key agricultural commodities, and in the case of cotton and groundnuts, linking domestic producer prices to world prices
- 3 Liberalizing domestic marketing and pricing of all agricultural products,
- 4 Privatizing the production, processing and marketing of agricultural products in those subsectors still dominated by parastatal, namely groundnuts and rice (SONACOS and CPSP),
- 5 Undertaking a structural reform of the Ministry of Agriculture, and

- 6 Creating the GRS which will undertake studies, prepare a coherent policy and program framework for investment in the agricultural sector and prepare a three-year rolling investment program for the agricultural sector

The impact of devaluation has already been felt as have preliminary results of the liberalization of the internal and external trade regime

1 8 2 Conclusions

- 1 The GOS recognized in 1993 that the macroeconomic situation was insupportable, that structural adjustment was necessary, and, with significant support from the World Bank and several other major donors, has embarked on a comprehensive and coherent structural adjustment program starting with devaluation in January 1994
- 2 Many of the reforms were policy reforms in the agricultural sector in general and in the rice, groundnut, cotton, and sugar sub-sectors in particular. With considerable support from the World Bank, USAID, France and the European Union, the GOS is undertaking comprehensive reforms in these sub-sectors
- 3 There are dozens of donors who have active projects in agriculture and natural resource management in all parts of Senegal. There is no evidence that either the GOS or the donors are effectively coordinating this collection of projects. The ensemble of projects is not coherent
- 4 The GOS has recognized this lack of coherence in its investment program but experienced considerable difficulty in developing a coherent program for agriculture and natural resource management that would provide a structure within which the GOS and the donors could prioritize their individual investment efforts
- 5 As a result of this difficulty in developing a coherent framework for agricultural development, the GOS has created the GRS, with support from the World Bank and others, which is charged with developing a comprehensive agricultural program and a set of prioritized projects in support of this program
- 6 The combination of macroeconomic adjustment, agricultural sector adjustment, decentralization, and the development of an agricultural sector program and prioritized projects being put in place by the GOS is an essential, comprehensive and coherent set of programs which bode well for the medium- and long-term future
- 7 Notwithstanding the hope for the medium- and long-term, there remain numerous constraints for the supply of many agricultural inputs, and numerous problems with the

production and marketing of agricultural products in Senegal. Some of these problems are going to be aggravated by the recent round of structural adjustments.

- 8 It is difficult to forecast with any accuracy the effects that this comprehensive program of adjustment will have on all of the players in agriculture, whether they be importers, exporters, wholesalers, retailers, traders, transporters, consumers or producers. The only thing that can be said with certainty is that the system will be shaken up, that there will be problems, constraints and opportunities, and that there will be winners and losers.

CHAPTER 2 NATURAL RESOURCES

The primary focus of this chapter is on the changes that have occurred in the natural resource base affecting agriculture and the natural resources of Senegal since the publication of the 1991 USAID Senegal Agricultural Sector Analysis (SASA) [USAID,1991]. It is quite clear that not much will have changed in the physical resource base in such a short time span. The land surface area of the nation remains unchanged, as does the proportion of it, 19 percent, that is suitable for agriculture. There are indications that the rainfall continues to decrease, but annual variability is so great that analysis of a five-year period is meaningless. The surface and ground water resources have not changed significantly. While there is every reason to believe that the well documented degradation of the vegetation and wildlife resources continues, the change in such a short time span is probably marginal. Essentially, the natural resource base is the same as it was in 1991.

Very important changes have occurred in Senegal, however. Two major shifts have taken place in the country's natural resource management paradigm during this period. The first is the evolution of the concept of decentralization, making the people most closely concerned with the resources responsible for their management. The second is integration, coordinating all of the functions relating to natural resource management that were previously widely scattered throughout the government by a newly established Ministry of Environment and Protection of Nature under the umbrella of the forthcoming National Environmental Action Plan (NEAP). To set the stage, this chapter will briefly recapitulate the situation of the natural resource base, noting, where appropriate, the changes that have occurred since the SASA was published. Then the recent structural transformations that have occurred in the natural resources management system are discussed. The chapter concludes with some suggestions on possible areas of intervention.

Natural Resources form a complex, interconnected web of elements. Each element is inextricably intertwined with every other. Alterations in one part of the web reverberate throughout the system, producing impacts on many, if not all of the other elements. Thus, there is no "natural" starting point or organizational framework on which to base a discussion of natural resources. To facilitate comparison, this chapter has been organized to loosely correspond to the structure of the SASA. It is of the utmost importance, however, that the reader keep in mind the interconnectivity of all the elements as they are discussed individually.

2.1 LAND RESOURCES

Senegal has a surface area of 196,720 square kilometers, approximately one fifth (19 percent) of which is considered suitable for agricultural uses, one third (32 percent) of which is classified as suitable for forest or savanna, and the remaining half (48 percent) is non-cultivable [CONSERE, 1995, p. 25]. These aggregate figures show a 0.6 percent decrease in arable land, a 3.4 percent increase in forest and pasture and a 2.5 percent decrease in non-classified when compared to the figures reported in the 1991 Senegal Agricultural Sector Analysis [1991, p. 41]. These differences probably do not represent significant change, however. First, as the analysis points out [cf. p. 35], estimates of arable land vary widely, and second, there is a 1 percent internal discrepancy between the row and column totals of the table itself.

The aggregate figures cited above contain a great deal of regional variation. A more detailed examination of the country is needed to obtain a clear view of Senegal's land use potential. The Senegal Natural Resources Management Assessment Final Report (SNRMA) [USAID, 1990], partitions the country into six regions, which are referred to as agro-ecological zones. This regionalization is most often used as the framework for the discussion of spatial differences in natural resources. Most data relating to agriculture are organized by administrative regions. Figure 2.1 is a map showing the location of these zones along with Senegal's regional boundaries.

The agro-ecological zone map (Figure 2.1) is an example of one of the key constraints in natural resource management: lack of a coherent natural resources management database. This map shows that there is wide variation between the agro-ecological zone boundaries which are the basis of much data relative to environmental management, and the regional administrative boundaries, which are the basis for many other important data sets. The World Bank [1994] concluded that, "there are no time series [data] that objectively indicate the extent of environmental changes in Senegal." The problem is not that there is a lack of data. As can be seen in Table 2.1, which gives a partial list of the natural resource management related databases that are available for the country, data are plentiful. The problems are structural. The World Bank cites a variety of factors: (1) weak demand from potential users, (2) data organized to describe problems but not structured to formulate solutions, (3) incompatibilities between data sets (different map projections, incompatible nomenclatures, etc.), (4) weakness of the agencies managing and distributing the information, (5) lack of assessment of data reliability, and (6) the lack of key information infrastructure, especially a digital mapping database.

ZONES AGRO-ÉCOLOGIQUES

REPUBLIQUE DU SENEGAL
BASE DE DONNEES ENVIRONNEMENTALES

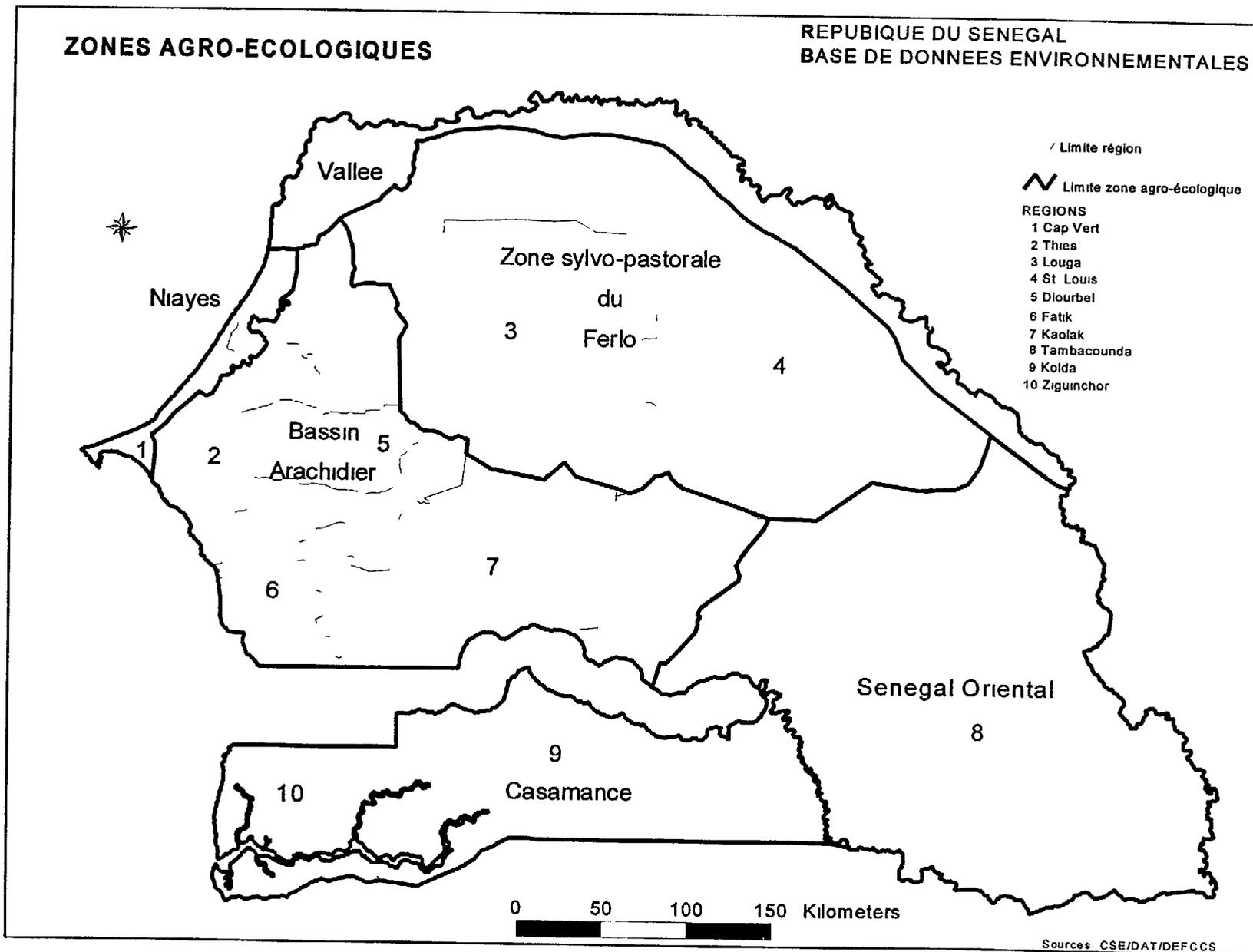


Figure 2 1 Agro-Ecological Zones

Table 2 1 Senegal NRM Data

1 500,000 maps of vegetation cover, forests, erosion risks and rangeland resources produced for the Plan de Développement Forestier du Sénégal (1982)
Rangeland Maps for northern Senegal produced by ISRA (1973)
A countrywide Integrated Resource Inventory which includes land use, land suitability, land cover and morphopedology [Stancioff, et al , 1986]
A digitized database of the Stancioff Inventory created by EROS Data Center (1991)
A 1:1,000,000 soil map produced by ORSTOM
Numerous soil maps produced by the Soils office of Senegal at various scales
Water resource database compiled by the Direction de l'Hydraulique
Rangelands monitoring database from 1980 onwards at the Centre de Suivi Ecologique (CSE)
NOAA/AVHRR satellite receiving station and data archive at the CSE
Meteosat receiving station at ISRA's Centre de Recherche Océanographique de Dakar Thiaroye (CRODT)

Source CONSERE, 1995

The Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE) [1995, p 142] reiterates and amplifies these comments, noting the following constraints in the environmental information system

- Absence of a global and coherent documentation policy,
- Lack of an environmental documentation focal point capable of maintaining a functional information network,
- Absence of basic documentation centers outside Dakar and the big cities,
- Lack of interaction between collection, storage, treatment, and distribution of information between organizations concerned with the environment,
- Absence of common data structures,
- Absence of any evaluation of the validity of information that is distributed, and
- Insufficiency of numeric databases (especially cartographic coverage)

The World Bank concludes that at least part of the blame for this situation should be shouldered by the donor community who have "focused on specialized studies, driven by their own concerns, and neglected the structuring impact that a critical mass of key information, widely distributed, could have on environmental management "

One important exception to this generalization is the long-term environmental monitoring activities of EROS Data Center [Tappan, et al, 1992, Tappan and Wood, 1995], in conjunction with the Centre de Suivi Ecologique (CSE). These activities are greatly enhancing the CSE's ability to manage and disseminate natural resource information. The CSE is treated at greater length later in this chapter.

Table 2.2 contains a breakdown of land use/potential by agro-ecological zone. The percentage of the national territory occupied by each agro-ecological zone is listed in the last row of this table. The data in Table 2.2 show that about two thirds (65 percent) of Senegal's potentially arable land is actually in production. This is a 3 percent increase over the figure reported by the SASA. This increase can hardly be considered significant, however, since the Ministry of Agriculture, Department of Statistics figures (Durufle, 1996) for 1986 to 1996 show more than 5 percent variation around the mean number of hectares in use for this period. The graph in Figure 2.2 clearly shows that this figure is well within the annual variation and there has been no discernable trend for the last ten years.

Table 2.2 also demonstrates that there is considerable regional variation in the percentage of arable land in use, ranging from a high of 81 percent in the Peanut Basin to a low of 40 percent in Casamance and 41 percent in Senegal, Oriental.

Table 2.2 Land Use and Land Potential By Agro-Ecological Zone (X 1,000 ha)

Land Type	Casamance	Sénégal Oriental	Bassin Arach	Zone Sylvo Past	Fleuve Sénégal	Niayes	Total Sénégal
Arable Lands							
Rainfed	297.3	161.5	1 748.9	107.8	40.0	17.2	2 372.7
Irrigated	1.2	0.8	0.6		60.0	6.4	69.0
Recessional				-	30.0		30.0
Not cultivated	451.5	237.7	419.2	42.2	170.0	12.6	1 333.2
Total	750.0	400.0	2 168.7	150.0	300.0	36.2	3 804.9
Percent of arable land in use	39.8%	40.6%	80.7%	71.9%	43.3%	65.2%	65.0%
Forest and Pasture	685.0	2 000.0	760.8	2 395.5	750.0	89.3	6 324.6
Unclassified and unsuitable	1 400.0	3 000.7	1 313.2	1 888.1	1 785.8	154.7	9 542.5
TOTAL	2 835 (14.4%)	5 400.7 (27.5%)	4 242.7 (21.6%)	4 077.6 (20.7%)	2 835.8 (14.4%)	280.2 (1.4%)	19 672 (100%)

Source: CONSERE, 1995, p. 25

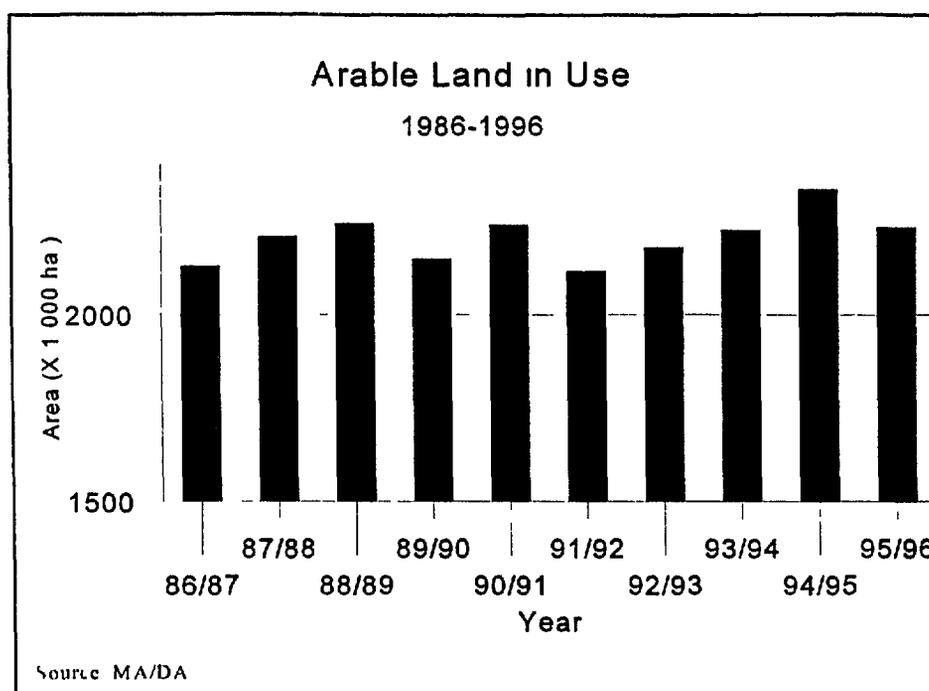


Figure 2 2 Arable Land In Use

The data in Table 2 2 were compiled from diverse sources but considerable caution needs to be taken when using these, or any other available statistics about the Senegalese natural resource base. Table 2 3 contains a comparison of statistics derived from different land classifications, and it is readily apparent that the areas vary enormously, depending on the source [World Bank, 1994, p 28]. The discussion below is based on the data in Table 2 2 because it reflects the numbers being used by CONSERE, but the problems are obvious, and should not be forgotten.

Table 2.3 Sample of Land Classifications From Different Sources (Square Kilometers)

	WRI, 1992	USAID, 1991	EROS, 1992	PAFS, 1992
Cropland	23,500	21,690	40,000	
Arable land		38,500	80,000	
Pastures	31,000	49,000		
Steppe			32,000	54,000
Savanna			43,061	91,500
Forest	106,000	83,000	43,813	22,700
World Resource Institute, 1992, compilation USAID, 1991, from the Plan Cerealier 1986 EROS Data Center, 1992, from original data Plan d'Action Forestier Senegalais (PAFS), 1992, from 1980 data				

A combination of soil and climatic potential determines the opportunity for rainfed agriculture. Taking these factors into account reveals large variation in regional potentials, as follows [CTSPAF, 1995, p. 22]

- **Senegal River Valley** — most of these regions have a notable low rainfed agriculture potential due to acute soil or climatic constraints. Close to 50 percent of the soils in the Senegal River Valley are only slightly suited or completely unsuitable for agriculture, and a further 37 percent are poor soils, suffering from relatively severe constraints. Only 13 percent of the region has soils favorable to agricultural development.
- **The Peanut Basin** — potentials in this region vary considerably. Diourbel Region is very homogenous, having a climate favorable to short cycle crops and 85 percent of the soils are classified as being poor or of low productivity. The remaining 15 percent of the soils are of better quality. The climatic conditions in the Thiès region are similar, except in the Tivavouane Department where 20 percent of the land fall in climatic zones poorly suited or unsuitable to rainfed agriculture. Seventy five percent of the soils are poor and 13 percent are unsuitable for all agricultural production. Fatick and Kaolack Regions have the best soil-climatic conditions of the Peanut Basin. Climatic conditions are suitable for medium to long cycle crops, except in certain parts of Fatick and Gossas Departments where they permit short cycle crops. The soil quality is poor to medium except in the Foundiougne where 1/3 of the soils are medium to good.
- **The Casamance** — This zone benefits from very advantageous soil-climatic conditions for rainfed agriculture. It receives adequate rainfall for medium to long cycle crops and 75 percent of the soils are relatively good.

- **Senegal Oriental** — This zone is the best endowed in terms of climate for rainfed agriculture. It receives adequate rainfall over its entire extent to grow long cycle crops with little risk. Its soils are very diverse, of extremely unequal quality, sometimes stony, with great variation in relief, all factors which limit intensive agriculture over large areas.

Information about Niayes and the Sylvo-pastoral zone was not available.

In addition to rainfed agriculture, Senegal has the following potentials for irrigated agriculture:

- **The Senegal River Valley** — The studies of the Organisation Pour La Mise en Valeur du Fleuve Sénégal (OMVS) and Société de Développement Agricole Industriel (SODAGRI) estimate that a potential 240,000 hectares are available for irrigated agriculture as a result of the development of the Diama and Manantali dams. About one fifth of this potential has been actually exploited between Dagana and Bakel in the form of large projects, village scale irrigated perimeters, and small private perimeters.
- **Other regions** — The Gambia River system in the Tambacounda Region is an important water resource for irrigation. An estimated 100,000 hectares could be irrigated by proposed dam projects (Kekreti and Samba-galou). These estimates are based solely on approximate water availability. Low population densities and onchocerciasis could pose important limitations to their exploitation.

In the Kolda and Ziguinchor Regions various anti-salt and retention dams, which are completed or under construction, will permit the recovery of 70,000 hectares of fluvio-maritime land, more or less contaminated with salt. Interventions by SODAGRI and the USAID Southern Zone Water Management Project in the Anambe Basin will permit the irrigation of 20,000 hectares. In the Ferlo region, the Fossil Valley Regeneration Project should provide irrigation potential whose extent is now under study. Irrigation potential is a great deal less in the other regions, principally because of insufficient surface water. Fatick and Kaolack Regions have some sites suitable for small dams to irrigate limited areas. In the Louga and Thies Regions the Cayor Canal will allow, after its completion, the irrigation of 8,500 hectares.

- **Groundwater irrigation** — Two thirds of the country, notably the Ferlo, Saloum and Casamance zones and the Niayes sector, theoretically have exploitable hydrogeologic resources. Only in Senegal Oriental is the geology particularly unfavorable. Some 100,000 hectares have been identified as irrigable by ground water. The high extraction cost of this water requires it be used for high value added crops, particularly horticulture. The climate is favorable for the cultivation of vegetables for export to Europe in the Niayes, Gandiolas, Delta and the lower Senegal Valley. In the other regions the severe climatic conditions reduce the possibility of vegetable production, even of traditional local varieties.

The map in Figure 2.3 illustrating the location of lands with agricultural potential was extracted from the CSE environmental database [Stancioff, et al, 1986], and shows all of the areas that were classified as having average potential for agriculture (no areas of high potential for agriculture were identified by the study). The statistics derived from the database indicate that 8,885.9 thousand hectares fall in this category. The comparable figure from Table 2.2 is 3,804.9 hectares. The map in Figure 2.4 was also extracted from the same database, and shows all the lands identified as being used for rainfed agriculture, vegetable or fruit production or irrigated agriculture. The database statistics put the number of hectares in these three categories at 4,280,000.

Table 2.4 contains a summary of the principal constraints to the sustainable use of the land classified by agro-ecological zone.

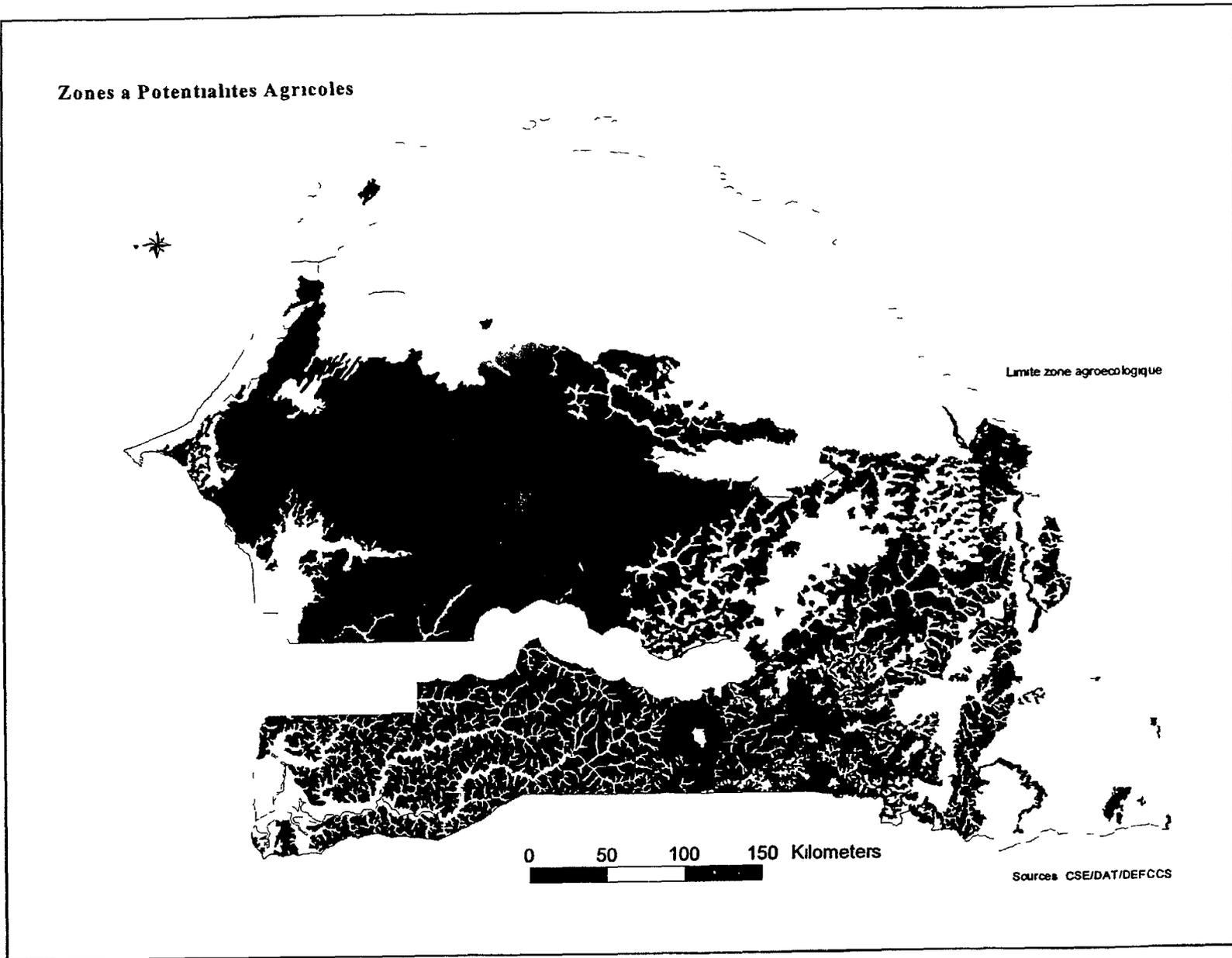


Figure 2 3 Areas with Agricultural Potential

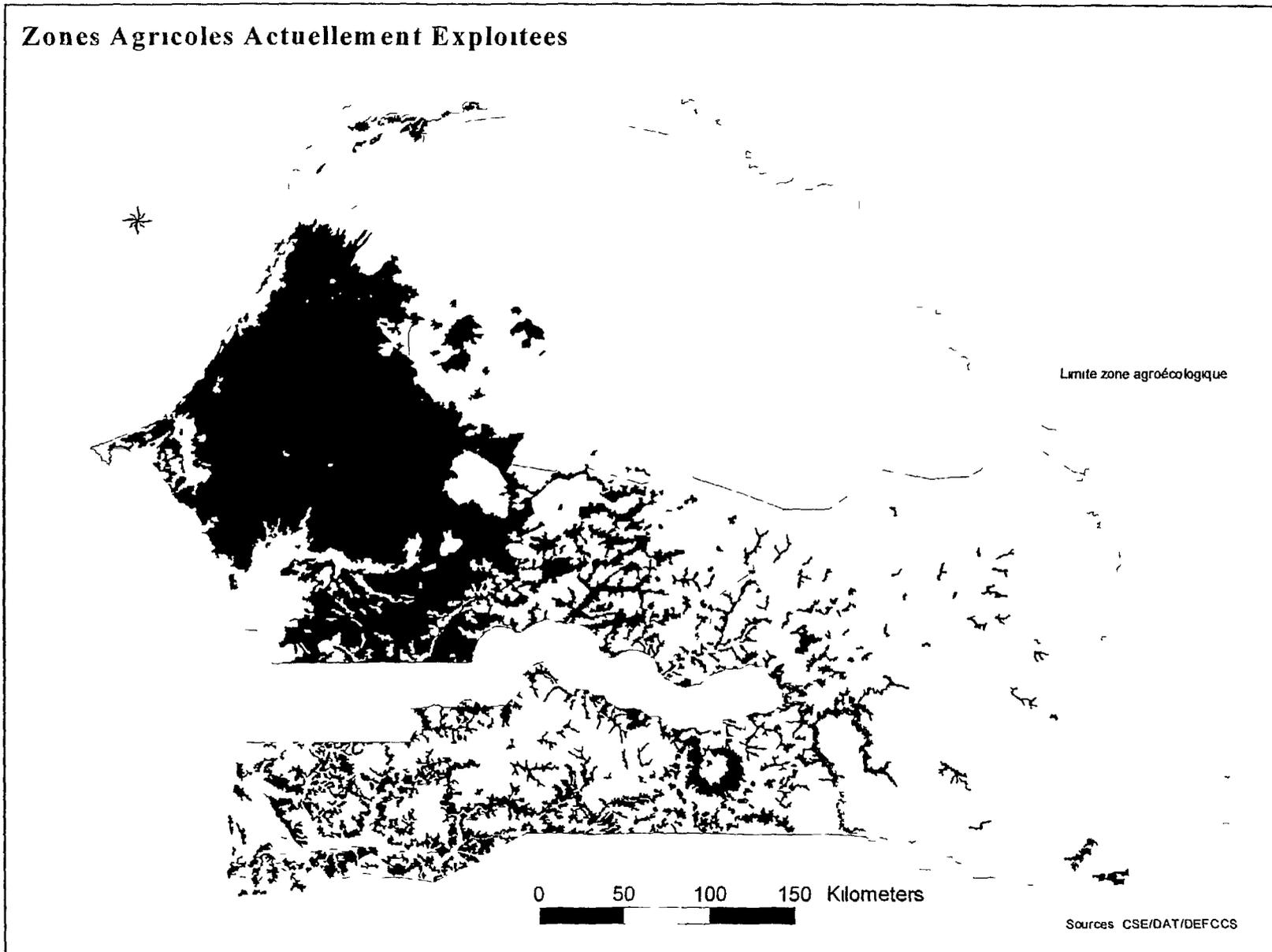


Figure 2.4 Areas Classified as being in Agricultural Production

Table 2 4 Factors in the Degradation and Constraints to the Sustainable Use of Land Resources Classified by Agro-Ecological Zone

Agro-Ecological Zone	Principal Constraints
Vallée Sénégal	limited and irregular rainfall salinization of the heavy poorly drained soils in the lower Bogue pollution from runoff of agricultural chemicals reduction in recessional cultures pasture potential fisheries reproduction and vegetation due to flood controls changes in the ecology and bird nesting conditions of Djoudj reserve
Zone Sylvopastorale du Fouta	limited and irregular rainfall severity of climate conditions lack of surface water soil poverty overexploitation of pasturage destruction of vegetation cover trampling of soils and vegetation by grazing animals brush fires destroy vegetation cover degrade soils and reduce carrying capacity wind erosion
Casamance	marine incursions into river channels acidification of lowland soils erosion of shallow soils over lateritic base weak drainage flow salinization of lowlands degradation of the mangroves increasing salinization of the rice paddies
Bassin Archaïque	lack of surface water very degraded soils vulnerable to wind erosion lowered soil fertility and weak regeneration of soils due to the abandonment of fallowing destruction of soil structure of the heavy soils of the Sine and Saloum Valleys acidification of the highland soils overexploitation and reduction of pastures reduction in woody vegetation and impoverishment of herbaceous vegetation aquifers often mineralized and lowered in levels during the past decades ground water pumping for Dakar exceeds the recharge limits of the aquifer
L'Imbricounda (Sénégal Oriental)	large areas of poor soils in the highlands excessive relief shallow soils over lateritic base soils vulnerable to wind and gully erosion after deforestation deterioration of vegetation due to charcoal production frequent brush fires onchocerciasis in the valleys
Ndiayes	insufficient rainfall advance of the "live" sand dunes reactivation of movement of old dunes salinization of soils and wells decline of vegetation on the dunes sand invading the lowlands risk of breaking the equilibrium between fresh and salt water in the subsoil and the danger of sea water intrusion

Source CONSERE, 1995 p 26

Figure 2 5 was extracted from the CSE environmental database and shows the location of land that is classified as being in agricultural production but is located on land classified as unsuitable for agriculture There are 1,045 7 thousand hectares that fall in this classification

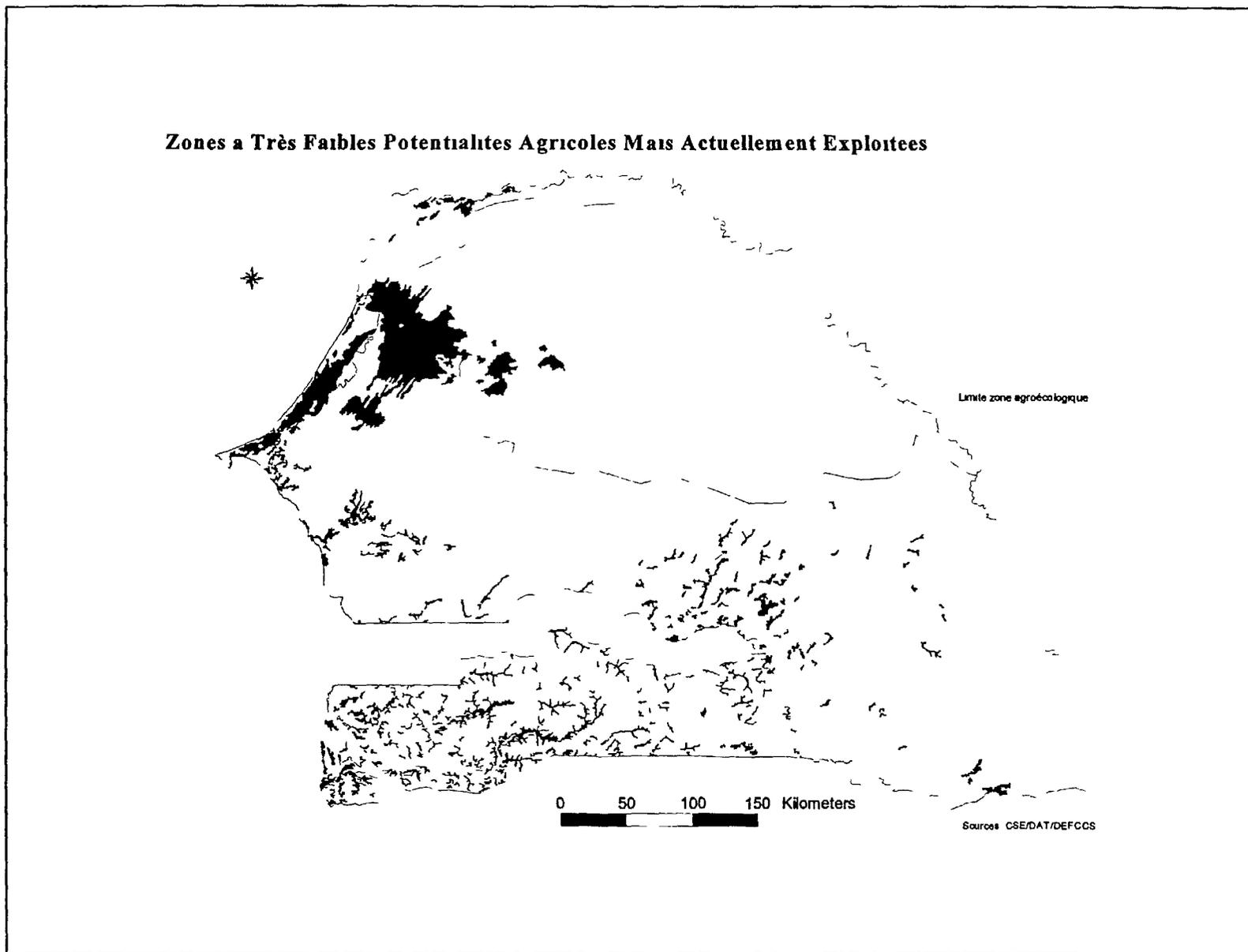


Figure 2 5 Agricultural Production Located in Areas Classified as Unsuitable for Agriculture

2.2 WATER RESOURCES

2.2.1 Rainfall

The SASA [USAID, 1991 p 53] concludes that "rainfall and its distribution during the growing season remains the primary determining factor in Senegalese agriculture." Nothing has changed in the past five years to alter this conclusion. The map series in Figure 2.6 shows that there is a historical trend of decreasing rainfall since the 1960s. The 500 mm isohyet, which in the SASA is defined as the outer limit for reliable rainfall [p 94] can clearly be seen in the map to be steadily retreating southward. The unavoidable conclusion derived from these data is that the land area receiving adequate reliable rainfall continues to decrease.

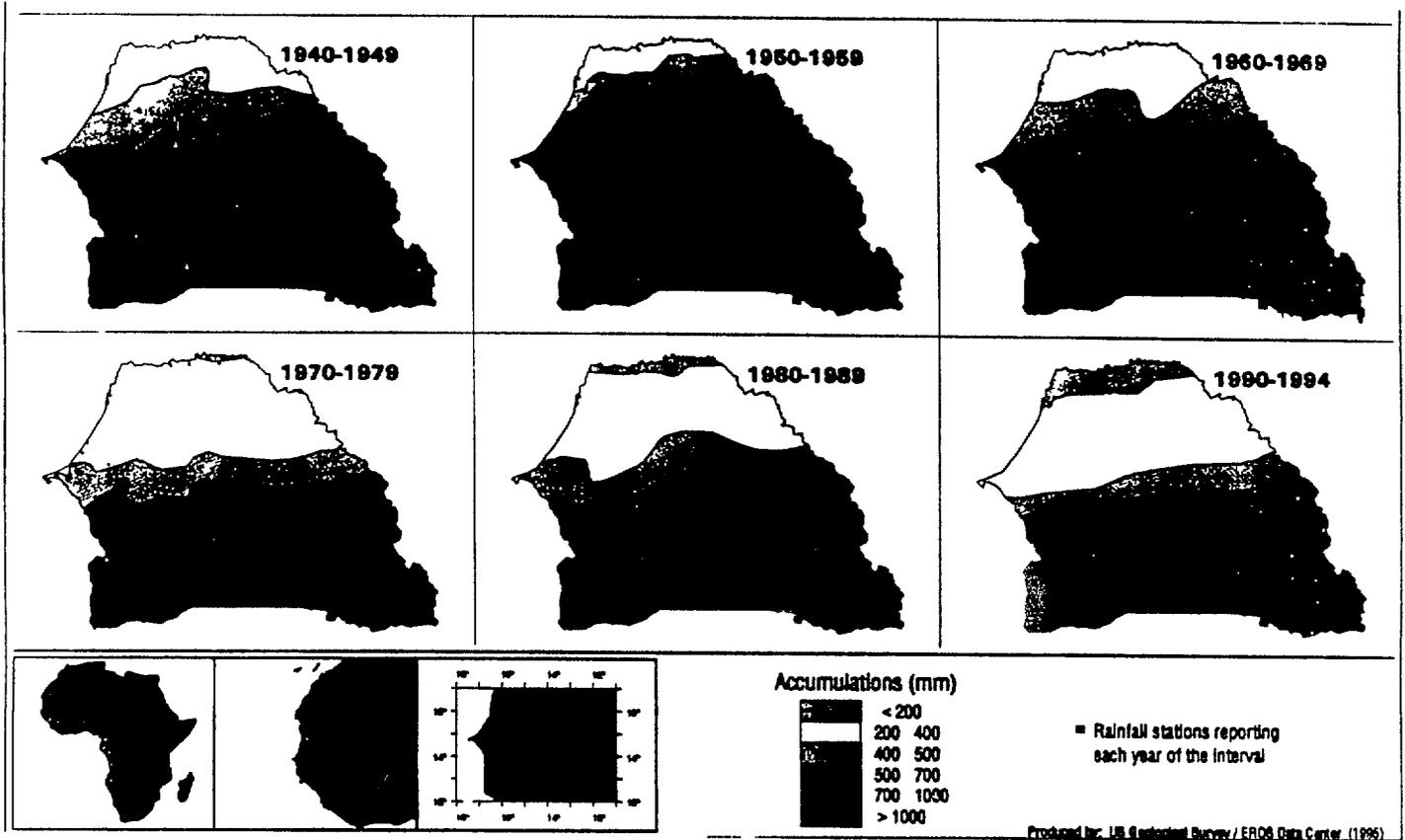


Figure 2.6 Historical Rainfall, 1940 - 1994

The second problem with the rainfall is illustrated by the graph shown in Figure 2.7 which gives the annual rainfall for three representative stations: Saint Louis in the north, Ziguinchor in the south, and Kaolack in the central part of the country. Not only is there a downward trend in the annual rainfall, but there is tremendous variability of total rainfall from year to year. This huge variability poses a tremendous risk to farmers.

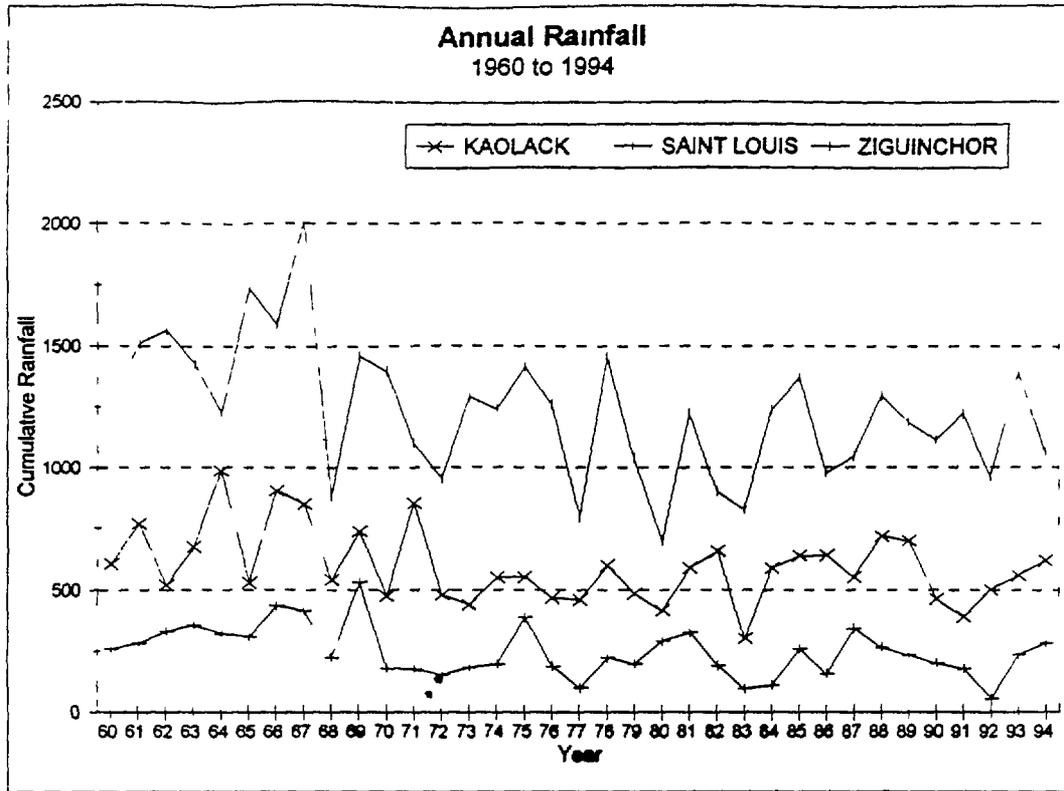


Figure 2 7 Annual Rainfall Graph For Three Selected Stations, 1960 to 1994

The Senegalese climate has two seasons

- The dry season, lasting an average of eight months from November to May, with rare, low intensity rainfalls between December and February, and
- The rainy season, which starts in May in the south with the arrival of the monsoons and moves progressively north Sixty percent of the rainfall is received in August and September [CONSERE, 1995, p 80]

Potential evapotranspiration is estimated at 2000 mm/year throughout the country [World Bank, 1994, p 4], and there is nowhere that rainfall exceeds this figure On average, Senegal receives 100 billion cubic meters of water from rainfall Only 0.6 percent of this quantity goes to recharge the various aquifers The majority is drained into the sea or returned to the air through evapotranspiration [CONSERE, 1995 p 80]

2 2 2 Surface Water

Three large rivers (the Senegal, the Gambia and the Casamance), the Lac de Guiers, water accumulations in the "dead" valleys (Sine, Saloum and Ferlo), and a variety of seasonal streams and lowlands constitute the surface water resources of Senegal

The largest surface water resource is the Senegal River, 1,800 kilometers long, that flows from Mali and forms part of the border between Mali and Senegal and divides Senegal from Mauritania. This river has an average annual flow of 23 billion cubic meters. Two dams have been built on this waterway, an anti-salt dam at Diama completed in 1987 and a flow control/hydro-electric dam at Manantali completed in 1988. Approximately 4 to 5 billion cubic meters of this resource are currently being used, leaving a large quantity to flow out to the sea.

In the south the Casamance River offers relatively low flows of 3 to 4 cubic meters per second at Kolda. Furthermore, during a large part of the year its middle and lower channels suffer from sea water incursions.

The mean annual flow of the Gambia River at Goulombo is 10 billion cubic meters. Only about 300 to 400 kilometers of its 750 kilometers length are located in Senegal.

Lac de Guiers is the principal source of potable water for the Cap Vert region. The control structures on the Senegal River have created a supply potential of from 400-600,000 to 1.2 million cubic meters per day from this body of fresh water [CONSERE, 1995, p. 27]. Dakar's demand in 1990 was 150,000 cubic meters per day [World Bank, 1994, p. 5] but the Societe National d'Exploitation des Eaux du Senegal (SONEES), the parastatal in charge of supplying water to urban areas, falls short of demand by 15 to 30 percent [World Bank, 1994, p. 24]. This organization was privatized in 1996 and is now known as Societe des Eaux (SDE).

The Peanut Basin contains the Sine Saloum complex of valleys and ponds which provide seasonal availability of water of marginal importance and suffers from incursions of sea water deep into the land at low flow stage.

The Anambe Basin in the south (only a part of which lies in Senegal) contains water which could be used for irrigation and aquaculture.

The principal factors in the degradation of surface waters and the constraints to their optimal use are

- Large seasonal and annual variations,
- Very low gradient of water channels limits the possibility of diversion,
- Chemical pollution from agricultural runoff (pesticides, fungicides, fertilizers), and
- Sea water incursions in the lower valleys (Sine Saloum, Casamance)

These constraints often require large investments (retention dams, anti-salt dams or dikes, levees) to improve the water resource or protect the soils against flooding, salinization, and acidification [CONSERE, 1995, p 28]

The Organisation Pour La Mise en Valeur du Fleuve Senegal (OMVS) is a regional international organization put in place to manage the Senegal River with the view of providing food self-sufficiency, restore ecologic equilibrium, and reduce the vulnerability of the economies of the member states (Senegal, Mali, and Mauritania) and to accelerate their economic development through an increase in regional cooperation. The major result of this cooperation has been the construction of the Diama anti-salt dam in 1986 and the Manantali retention dam in 1989. The aim was to provide 375,000 hectares of irrigated land, improve river navigation, and produce hydroelectric power [CONSERE, 1995, p 96]

There are three large surface water management projects underway

- Programme de Developpement de la Rive Gauche (PDRG) — In the framework of the OMVS, land management is the responsibility of the authorities of each separate country. In Senegal, the Cellule Nationale de l'Apres-Barrage coordinated the formulation of the Plan Directeur de la Rive Gauche. Two extreme scenarios were considered (1) the "maximalist scenario" with the use of all water resources for irrigation of 154,000 hectares and (2) the "fallback scenario" where an artificial flood with recessional agriculture is maintained on 67,000 hectares and 61,000 hectares were to be left in forest and pasture. The final plan decided upon envisages:
 - (1) Irrigation of 88,000 hectares cultivated at 160 percent (1.6 crops per season)
 - (2) Recessional agriculture with a 15 day submersion of the fields
 - (3) 63,000 hectares left in forest and pasture

Execution of this plan is programmed for twenty five years in three phases [CONSERE, 1995, p 97]

- Mission d'Etudes et d'Amenagement des Vallees Fossiles — Initially conceived as a project to use some of the 9 to 13 billion cubic meters of water that annually flows into the sea to restore water to 150 kilometers of the lower Ferlo valley, the project has since grown to national scope. The original objective was accomplished in 1995, and the plan has expanded to include a network of over 3000 kilometers of dry river beds and canals [MEAVF, 1995]. The expanded network is still in the pre-feasibility stage. CONSERE notes that the results of the activities already undertaken have not yet been evaluated, even though the larger scheme has already moved into the planning stage [1995, p 96]
- Mission d'Etudes et d'Amenagement du Canal du Cayor — The Canal du Cayor, 240 kilometers long from the Lac du Guiers to the Thies Region, was first proposed in 1984

to meet the ever increasing demand for water in the Dakar urban area for the next thirty years, and to provide irrigation for 10,000 hectares along its route

CONSERE notes that it is important that the construction of large hydraulic works be undertaken with prudence. In addition to technical studies, environmental impact studies should be made before their construction to evaluate the predictable negative effects on the sustainable management of the resources and the ecosystem, and define the necessary corrective measures. Despite its incontestable value, the Diama dam has introduced important modifications in the fisheries, the surface aquifers, and the natural habitats (Djoudj) which remain to be evaluated [1995, p. 29]

2.2.3 Ground Water

On a national scale, ground water resources are very abundant, except in the Tambacounda region. The potential for exploiting this resource is highly variable by region depending on the capacity, the depth and the degree of mineralization of the aquifers. The exploitation and management of ground water resources are constrained by the following problems:

- Planning is hindered by insufficient knowledge of the dynamics, actual capacities, recharge, and suitability for different uses of the aquifers,
- The depth of some aquifers such as the Maestrichtien (150-400 meters) make them very costly to exploit,
- High mineral content of some aquifers, notably the Oligio-Miocene sands in the Casamance, the Quaternary aquifers of the Senegal river valley and the deep aquifers of the Peanut Basin make them unsuitable for agriculture,
- Poor recharge capacity and periodic exhaustion of the Grand Coast sand aquifers, and
- Overexploitation of the Quaternary aquifers of Cap Vert and the Palaeocene aquifers of Sebikotane due to the high demand from Dakar poses a risk of exhausting or contaminating these aquifers with salt intrusions [CONSERE, 1995, p. 30]

Table 2.5 shows the capacities and usage rates of the various aquifers of the country. These data show that only about 16 percent of the available ground water capacity is being used. The global figure masks regional variation, however. This is especially evident in the Dakar region where the daily production of drinking water in 1990 was over 150,000 cubic meters per day [World Bank, 1994, p. 5]. The data in Table 2.5 show that the groundwater resources in these two aquifers are already overexploited.

Table 2 5 Aquifer Capacities

Aquifer	Capacity (cu m/day)	Usage (cu m/day)	Available
Major Aquifers			
Alluvial Sands			
Senegal River	140 000	small	100 000 ²
Cayar at St Louis	115 000	70 000	45 000
Cayar at Dakar	45 000	45 000	0
Infrabasaltic	15 000	18 000	0
Saloum lens	4 000	small	4 000 ²
Casamance lens	5 000	small	5 000 ¹
Miocene in Casamance	105 000	5 000	100 000
Eocene Louga Bambgey	14 000	small	14 000 ²
Palaeocene Pout Sebi Mboao	58 000	59 000	0
Maestrichtien			
Deep aquifers	700 000	70 000	630 000
Recharge zone	420 000	small	400 000 ²
Minor Aquifers			
Socle	50 000	small	50 000
Eocene east Louga Bambeay	50 000 ²	small	small
Palaeocene east Cayar	20 000 ²	small	small
Various other formations	very small	very small	very small

Source CONSERE 1995 p 29

2 3 BIOLOGICAL RESOURCES

2 3 1 Plants

2 3 1 1 Forestry

The data on Senegal's forests are very old, the most recent available coming from the 1981 Plan Directeur de Developpement Forestier (PDDF) and cited both in CONSERE [1995, p 83] and the Plan d'Action Forester du Senegal [1993, p 43] These figures are given in Tables 2 6 and 2 7 below Climate is the determining factor of forest type, which ranges from Guinean type forest in the far south to Sahelian type forest in the north All varieties of Soudanaiian type forests are found between these two extremes The Senegal River contains particularly dense dry type Sahelien formations due to its periodic cycles of flooding Another exceptional formation of note is the mangroves in the estuaries of the Casamance's principal rivers

The following tables show the distribution of forest types by region and projected decrease through 1990 as calculated in the PDDF

Table 2 6 Area Covered by Wooded Formations in 1980, By Species (x1000 ha)

Region	Brush Steppe	Wooded Steppe	Brushy Savanna	Wooded Savanna	Open Forest	Gallery and Dense Forests	Total
Cap-Vert	11 1						11 1
Diourbel	112 0	40 8	24 6	13 1			190 5
Sine Saloum	116 4	72 2	114 0	437 4	29 3		769 3
Louga	803 1	1,183 8		1 7			1,988 6
Fleuve	1,080 6	1,808 9	72 7	299 5			3,261 7
Senégale Oriental		5 4	183 5	3,456 6	897 0	2 9	4,545 4
Thiès	37 2	92 8	51 3				181 3
Casamance			6 5	416 1	1,315 4	36 6	1,774 6
Total	2,160 4	3,203 9	425 6	4,624 4	2,241 7	39 5	12,722 5

The classified domain, national parks and special reserves combined covered, in 1970, 31.71 percent of the nation contained in 213 classified forests with a surface area of about 6,240,000 hectares and eight zones *d'intérêt cynégétique* (hunting zones) with approximately 2 million hectares

The map in Figure 2.8 was extracted from the CSE Environmental database and shows the areas that were classified as having at least limited or better potential for improvement or reforestation for production. 9,878.2 thousand hectares fall in this class. Figure 2.9 shows the areas that were identified as covered by forests of all types, and cover a surface area of 7,239 thousand hectares

Table 2 7 Projected Evolution of Wooded Formations 1980 - 1990 outside National Parks

Region	Rate of Decline 1980-1990	Area (x 1,000 hectares)		
		1980	1985	1990
Cap-Vert	15 0	11	11	10
Diourbel	15 0	11	182	172
Sine Saloum	15 0	769	736	695
Louga	10 0	1,989	1,930	1,860
Fleuve	10 0	3,262	3,165	3,050
Senegal Oriental	7 5	4,545	4 447	4,325
Thies	15 0	181	173	163
Casamance	7 5	1,775	1,736	1,689
Total	9 2	12,723	12,380	11,964

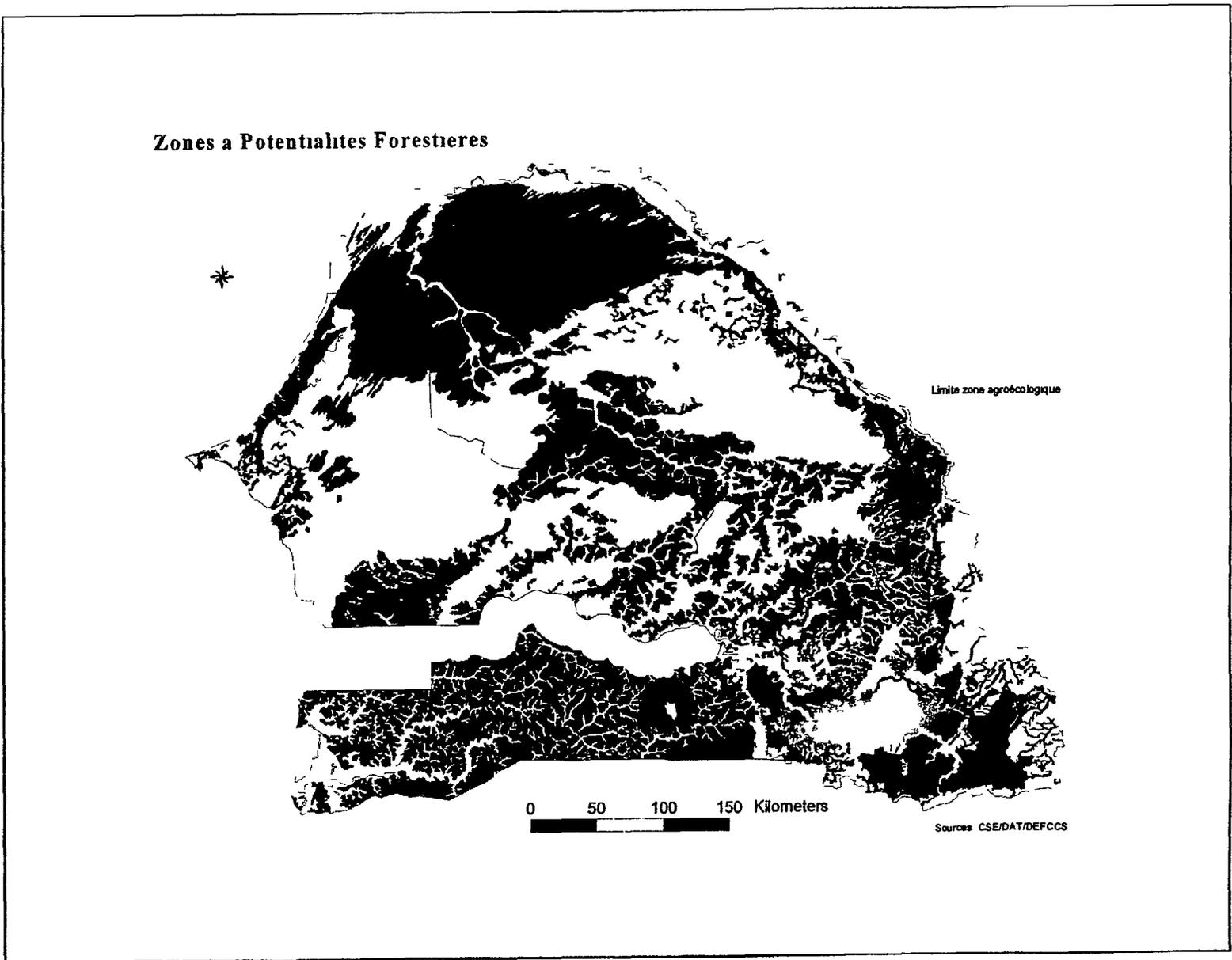


Figure 2 8 Areas with Forestry Potential

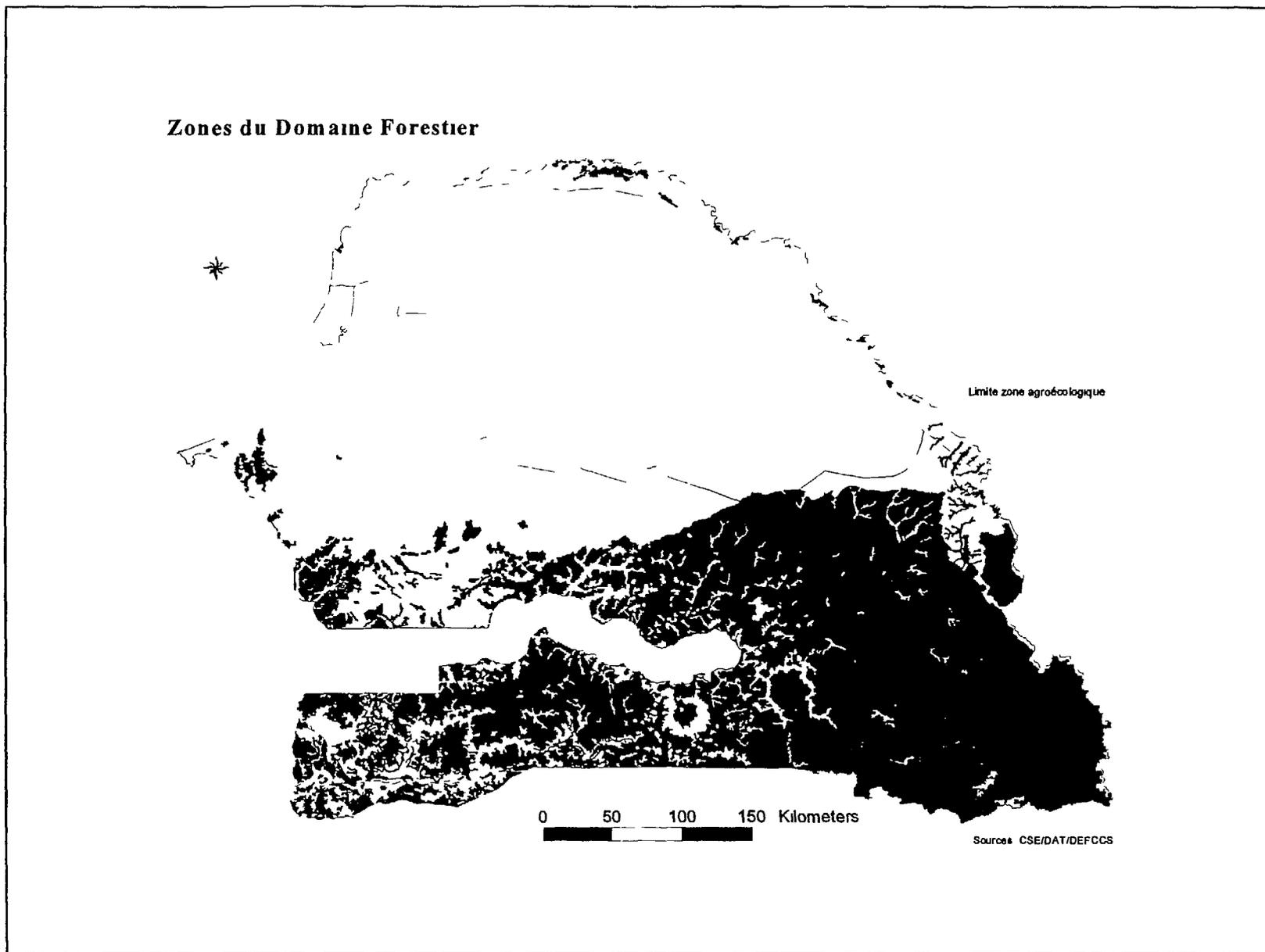


Figure 2.9 Areas Classified as Forest Covered

2 3 1 2 Pasture Lands

As with the forests, there is little information available. CONSERE [1995, p. 84] reports that 80 percent of the cattle feed is provided by natural pastures by means of extensive grazing. These pasture areas are essentially composed of classified forests, sylvo-pastoral reserves, and fallow lands covering an area of 12,500,000 hectares. With the decrease in rainfall, there has been an unquantified degradation of the pasturage that is characterized by a decrease of the floristic diversity and a reduction in the vegetation, both in height and lateral development.

Figure 2.10 contains a map derived from the CSE environmental database showing the location of lands classified as either of good or average quality for use as pasture. A total of 11,634 thousand hectares was so classified. The map in Figure 2.11, from the same source, shows the land areas that were found to be in use as pasture of all types. The area found to be used for this purpose is 7,357.8 thousand hectares.

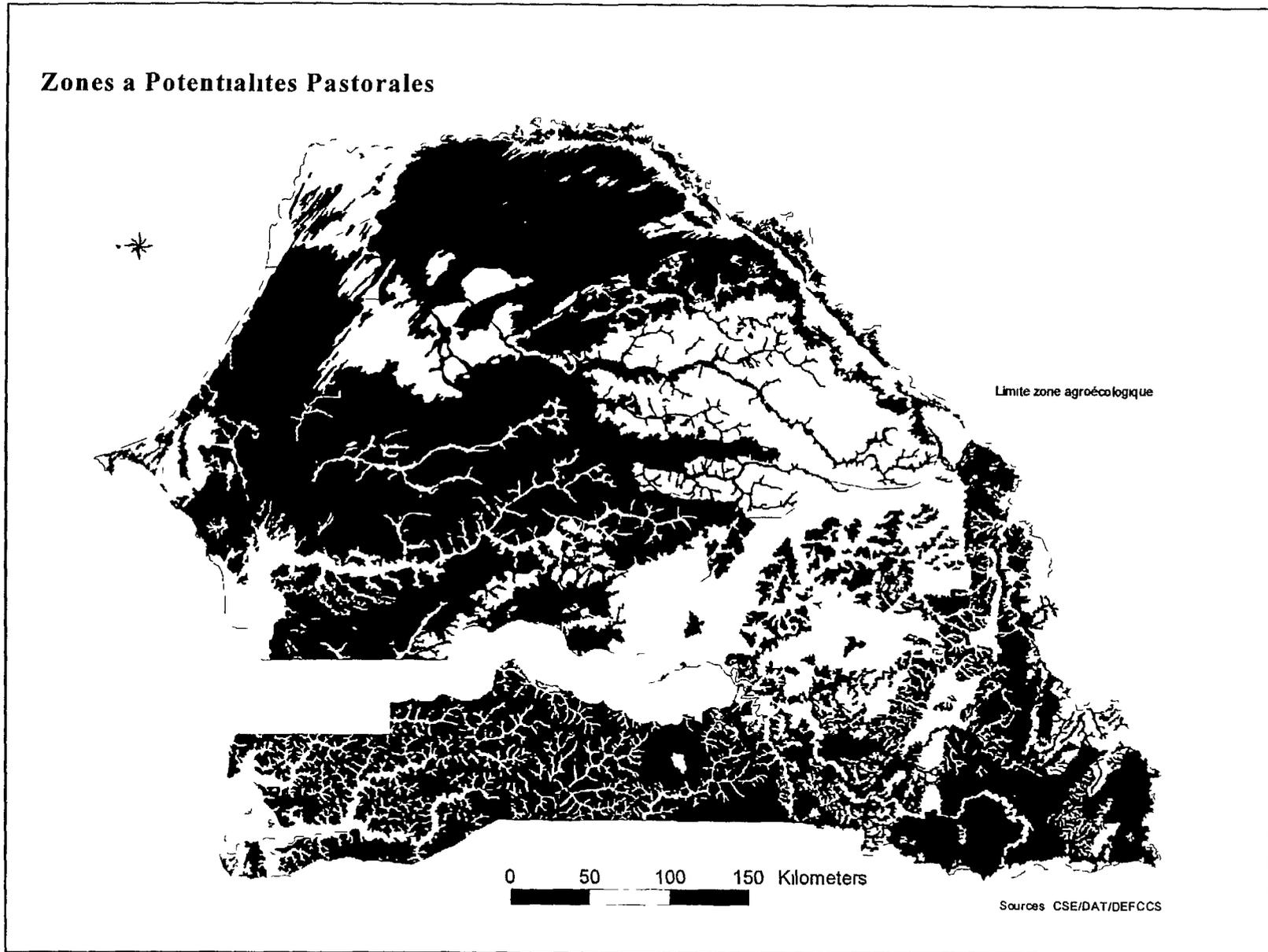


Figure 2 10 Areas with Pasture Potential

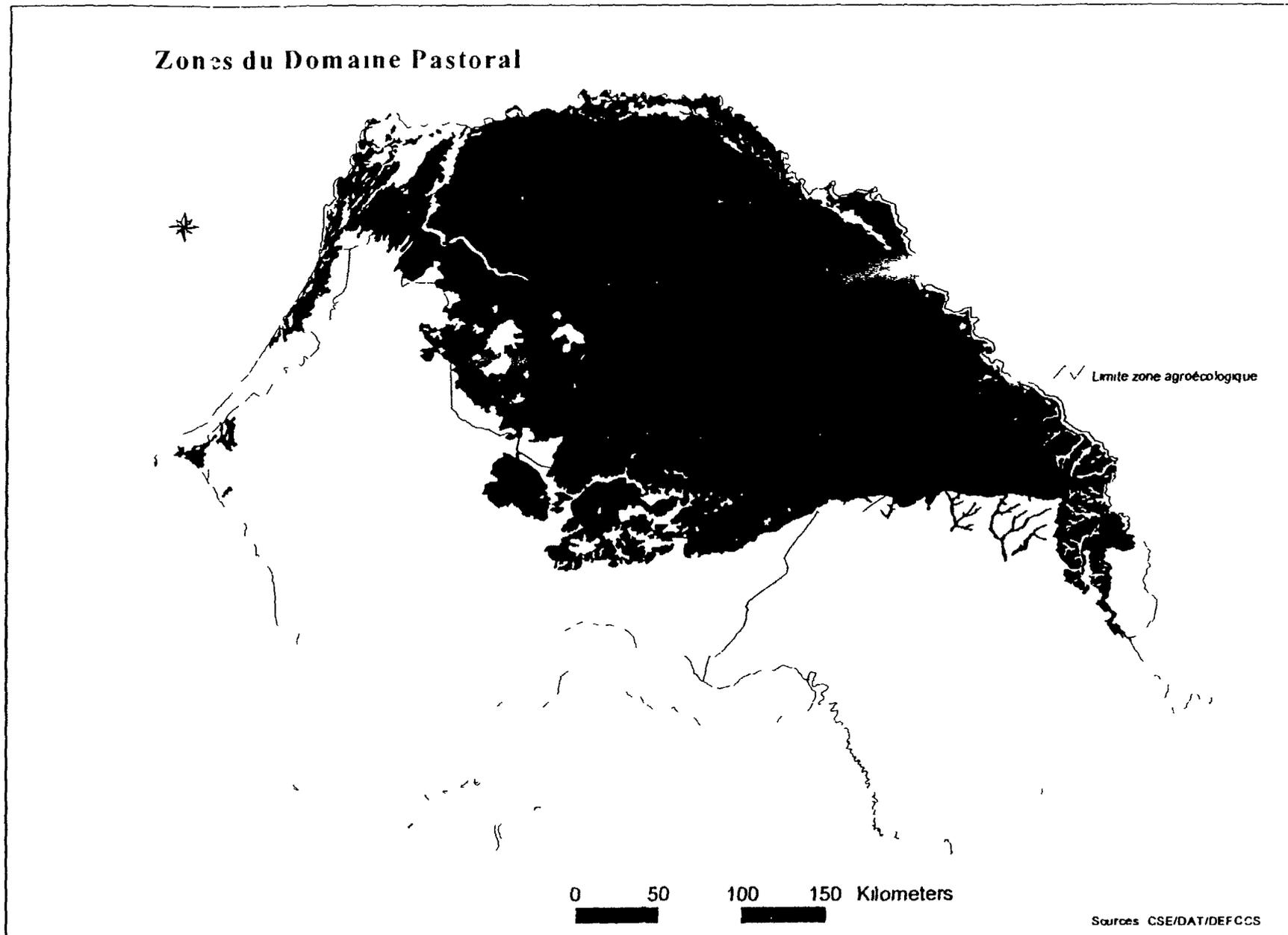


Figure 2.11 Arcs Classified As In Pasture Use

2 3 2 Wildlife and Bio-diversity

Senegal's native fauna and flora are typical of the Sahel. Habitat destruction brought on by human encroachment has eliminated most of the original wildlife. Some remaining natural habitats are valuable in that they represent the extreme limits of the range of several species. There are also marine and coastal habitats that provide breeding areas for birds and marine turtles, and important staging grounds for migratory water birds on their way to and from Europe. Mangroves are also important to marine mammals such as the African manatee and certain dolphins.

Senegal has made a large effort to create a national park and nature reserve system and use it as a basis for environmental tourism. Some wildlife diversity has been preserved through these efforts, but the overall picture is not encouraging. There remains little left to conserve outside the national parks and many of the remaining large animal species, such as the ostrich, chimpanzee, wild dog, cheetah, African manatee, African elephant, giant eland and red-fronted gazelle are close to extinction [World Bank, 1994, p 18]. Table 2.8 contains a list of the protected areas of the country with the surface area they cover.

Table 2.8 Protected Areas of Senegal

Name	Area (hectares)
Parc National de Niokolo Koba	913,000
Parc National de Basse Casamance	5,000
Parc National des Oiseaux du Djoudj	16,000
Parc National de la Langue de Barbarie	2,000
Parc National des Isle de la Madeleine	450
Parc National du Delta du Saloum	73,000
Reserve Ornithologique de Ndiael	46,550
Reserve de Faune du Ferlo Nord	487,000
Reserve de Faune du Ferlo Sud	663,700
Reserve de Popenguine	1,009
Reserve de Gueumbeul	720
Reserve de Kalissaye	200
Reserve de Kassel	90
Reserve de Djovol	3
Total	2,208,022

Source: World Bank, 1994

2 4 POPULATION

2 4 1 Size and Distribution

The 1988 census reported the Senegalese population at 6,896,808 inhabitants. Given a surface area of 196,720 square kilometers, the overall population density averages 35 persons per square kilometer. Table 2.9 demonstrates, however, that this overall density figure conceals a wide disparity in population distributions. One fifth of the population (21.6 percent) lives in Dakar region, which contains only 0.3 percent of the surface area, resulting in an average density of 2,707 people per square kilometer. The one fifth (18 percent) of the national territory covered by Dakar and the Peanut Basin (Thies, Diourbel, Kaolack and Fatick Regions) contain almost two thirds (63 percent) of the nation's population, with densities of 50 to 2,700 people per square kilometer. This contrasts with densities of 6 to 28 persons per square kilometer in the other four fifths of the country. Women predominate over men in the population at 51.4 percent to 48.6 percent ratio. Close to three fifths (57.7 percent) of the population is under the age of twenty, while only 5 percent is over the age of fifty, leaving a balance of 37.3 percent in between. Sixty one percent of the population is classified as rural.

Table 2.9 Regional Population Totals and Densities, 1988

Region	Total Population	Surface Area (kilometers sq)	Density (pop/kilometers sq)
Dakar	1,488,941	550	2,707
Thies	941,151	6,600	143
Diourbel	619,245	4,359	142
Kaolack	811,258	16,010	51
Fatick	509,702	7,935	64
Louga	490,077	29,188	17
St Louis	660,282	44,127	15
Ziguinchor	398,337	7,339	54
Kolda	591,833	21	28
Tambacounda	385,982	59,602	6
Senegal	6,896,808	196,720	35

Source: CTSPAF, 1995, p. 38

2 4 2 Population Dynamics

Examination of the historical population data shown in Table 2.10 and Figure 2.12 reveal the following characteristics:

- High rate of population growth: the average rate of increase of nearly 3 percent nationally, with rates of 3.9 percent and 3.4 percent in the regions of Dakar and Diourbel, respectively.

Total population has grown from 3 million at Independence to a little less than 5 million in 1976 and to just under 7 million in 1988. Rapid population increase is the result of a combination of a falling death rate and a birth rate that remains at a very high 6.6 children/woman today.

- Inequality of the distribution of population increase, while all regions are increasing, the regions in the west around Dakar are increasing at a higher rate than the average. This reflects a migratory trend towards the opportunities of the urban areas.

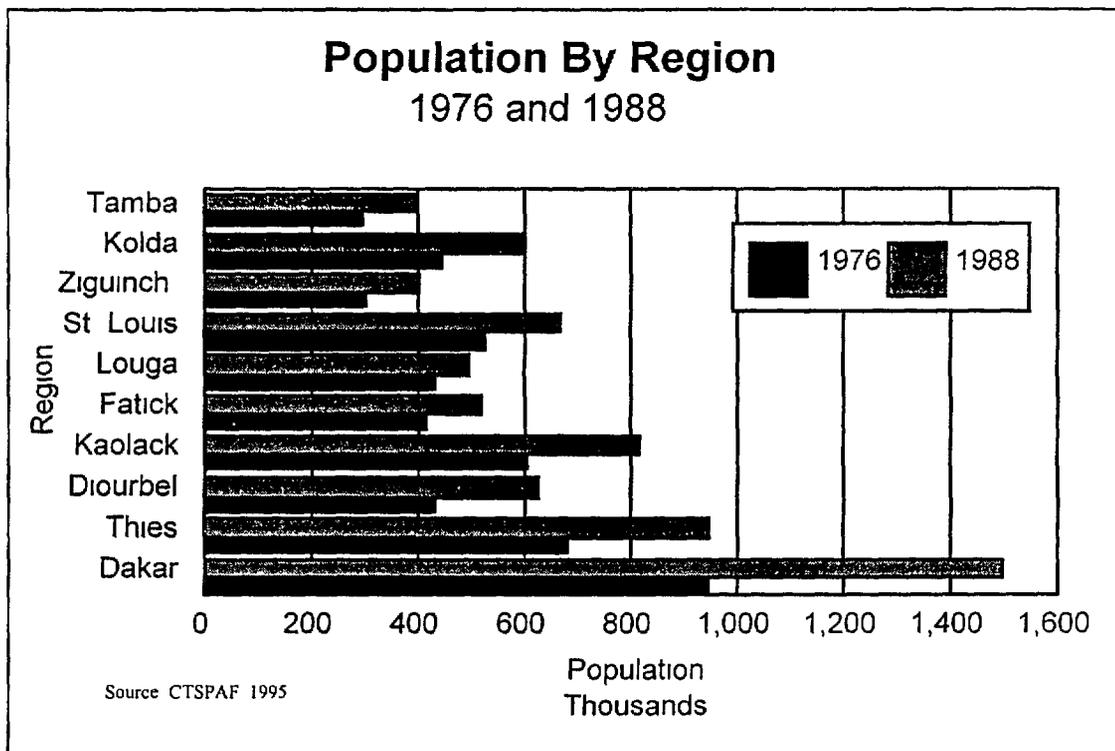


Figure 2.12 Population By Region, 1976 and 1988

Table 2 10 Regional Population Totals 1976 and 1988

Region	1976	1988	% Change
Dakar	940,920	1,488,941	3 9
Thies	674,440	941,151	2 5
Diourbel	423,038	619,245	3 2
Kaolack	597,501	811,258	2 6
Fatick	408,657	509,702	1 8
Louga	419,599	490,077	1 3
St Louis	514,735	660,282	2 1
Ziguinchor	291,632	398,337	2 6
Kolda	439,050	591,833	2 5
Tambacounda	287,313	385,982	2 5
Senegal	4,997,885	6,896,808	2 7

Source CTSPAF, 1995, p 44

The population projections shown in Table 2 11 and Figure 2 13 were made in 1989 by the Direction de la Statistique. The figures represent a scenario with intermediate (i e neither high nor low) assumptions for birth rate, death rate, migration, etc. The following points can be drawn from these data:

- Population is expected to nearly double in 25 years, from 6 9 million in 1988 to 13 8 million in 2015,
- Urban population will increase by 2 5 times from 2 7 to 6 7 million. Close to one half of the population (49 4 percent) will live in cities as opposed to 23 percent in 1960 and 39 percent in 1988, and
- Population will continue to concentrate in the Dakar and Peanut Basin regions. Dakar alone will contain more than one fourth of the population (27 percent) with a population of over four million. The four regions of Dakar, Thies, Kaolack and Diourbel will contain almost two thirds of the total population (63 percent) and more than three fourths of the country's urban population on 14 percent of the national territory.

Table 2 11 Projected Regional Population Totals 1994 to 2015 (x 1,000)

Region	1994	2000	2005	2015
Dakar	1,869 3	2,326 9	2 774 8	3 822 8
-urban	1804 7	2 248 2	2,682 5	3 699 6
-rural	64 6	78 7	92 3	123 2
Thies	1,114 0	1 310 9	1,494 3	1 889 3
-urban	406 3	510 2	611 8	849 1
-rural	707 7	800 7	882 5	1 040 2
Diourbel	749 9	902 3	1,047 3	1 371 0
-urban	163 3	198 4	232 0	307 5
-rural	586 6	703 9	815 3	1 063 5
Kaolack	947 8	1 100 9	1241 3	1 535 5
-urban	229 2	279 5	327 8	437 7
rural	718 6	821 4	913 5	1 097 8
Fatick	568 6	628 9	679 2	764 8
-urban	65 7	79 3	92 3	121 4
-rural	502 9	549 6	586 9	643 4
Louga	525 4	555 0	573 5	578 1
urban	89 7	109 6	128 9	173 1
-rural	435 7	445 4	444 5	405 0
St Louis	748 5	842 4	924 2	1 078 8
urban	216 9	261 3	303 8	400 1
-rural	531 6	581 1	620 4	678 7
Ziguinchor	466 8	543 9	614 0	764 5
-urban	194 7	249 1	302 7	429 6
-rural	272 1	294 8	311 3	334 9
Kolda	688 9	797 1	895 9	1 101 0
-urban	78 8	99 6	120 0	167 9
rural	610 1	697 5	775 9	933 1
Tambacounda	448 5	518 0	581 3	712 1
-urban	74 8	91 5	107 4	143 9
-rural	373 7	426 5	473 9	568 2
Senegal	8,127 7	9,526 3	9,725 8	13 617 9
-urban	3,324 3	4,126 8	4,909 4	6 730 1
-rural	4,803 8	5,399 8	5,916 8	6 888 3

Source CTSPAF, 1995, p 45

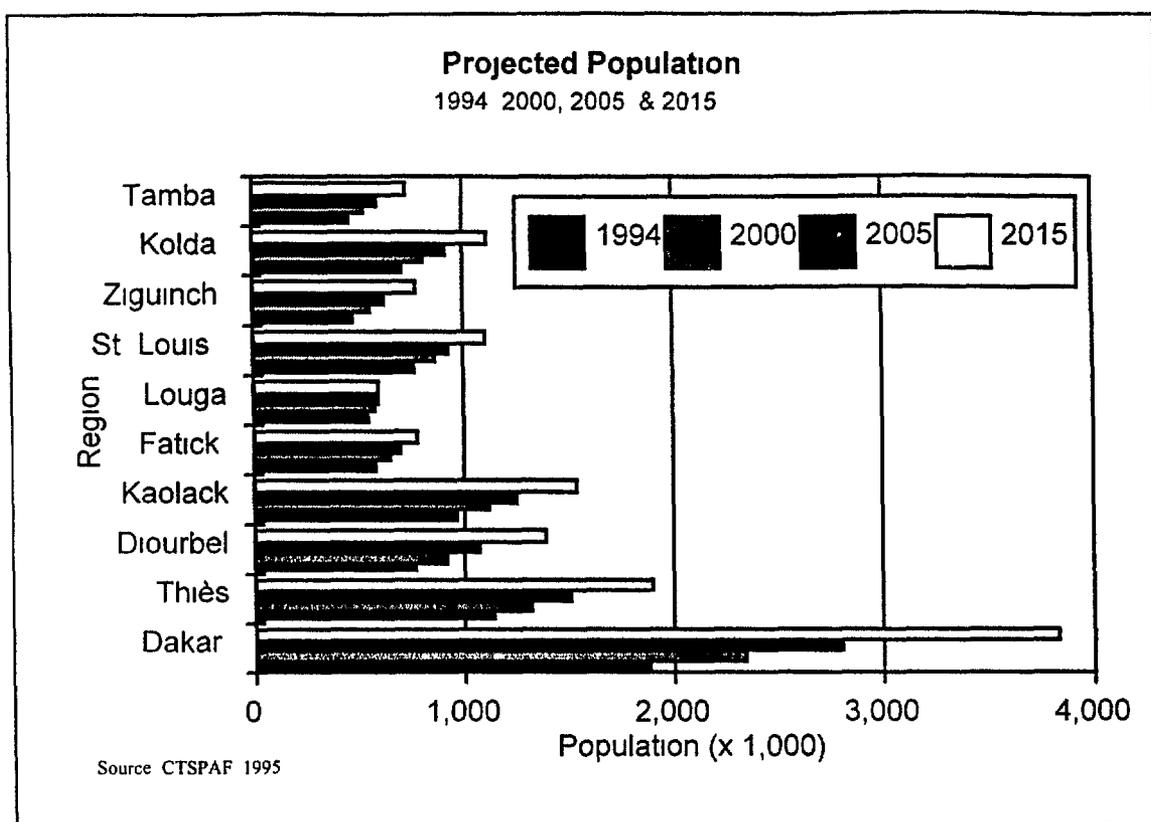


Figure 2 13 Projected Population By Region, 1994 to 2015

2 4 3 Human Carrying Capacity

In 1991, the SASA calculated the human carrying capacity for Senegalese rainfed agriculture to be adequate to support 57 percent of the population. This figure was arrived at by two different methods. The first calculated it from a 1990 population level of approximately 7.25 million. The second from a 1988 population level of 6.9 million. Both calculations result in the conclusion that approximately 3 million people needed to find their nourishment elsewhere.

There is no indication that more land has come into production since then (see Figure 2 2). There is no indication that crop productivity has increased in any significant way. There is some debate about shifts in the cash crop/food crop ratio. Some researchers say that the cash crops percentage of the mix has increased, and others argue the reverse. Nobody, however, says that there has been a significant shift.

The one factor that has changed is the size of the population. Projections vary, but extrapolating from the exponential best fit of the data derived from Tables 2 10 and 2 11, Senegal's current population is approximately 8.4 million (see Figure 2 14). If, as is argued in the previous paragraph, Senegal's capacity to produce food has not significantly increased, 4.3 to 4.5 million people (51 to 53 percent of the population) must now depend on sources of food outside the country. In the six

years since the SASA was published nothing has happened to alter their conclusion that "the long run is not just bleak - it is dismal "

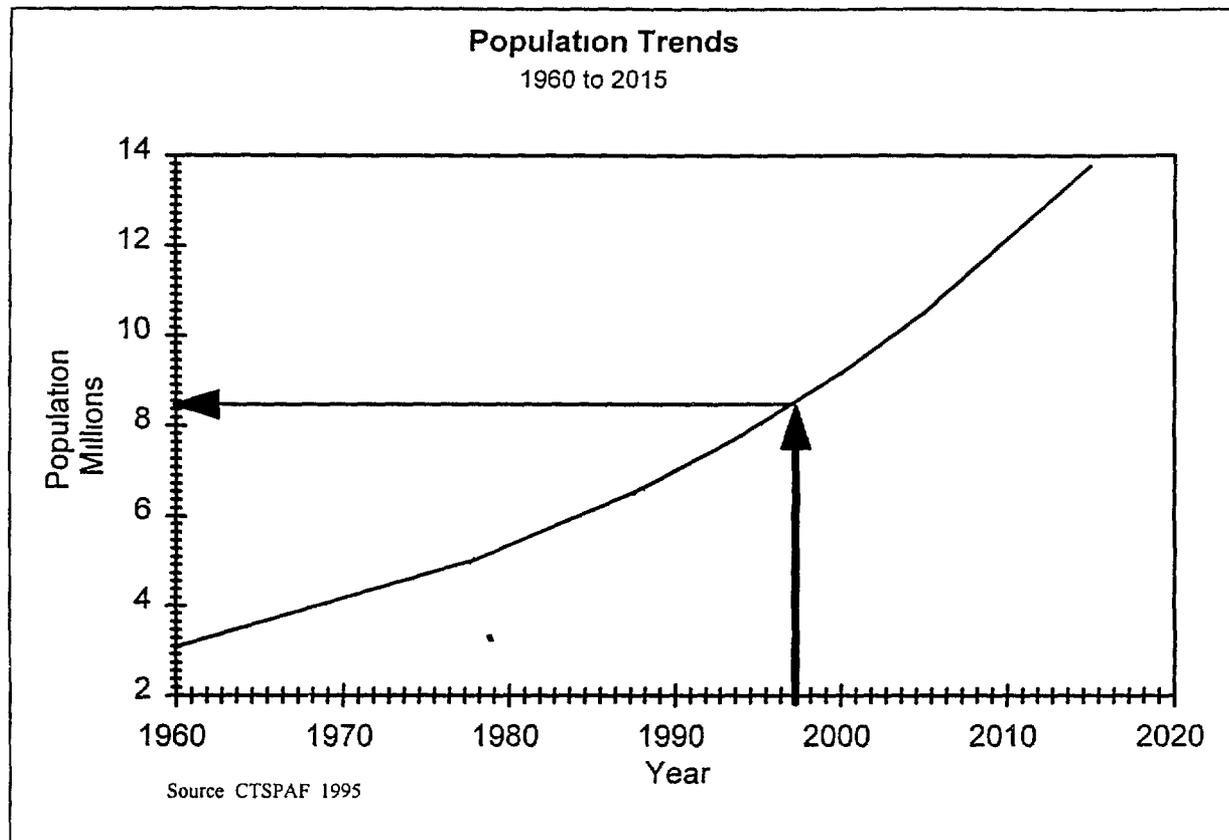


Figure 2 14 Population Trends, 1960 to 2015

2 5 NATIONAL ENVIRONMENTAL ACTION PLAN (NEAP)

The National Environmental Action Plan (NEAP) is meant to be the Senegalese Government's principal management tool designed to provide a strategic, unified framework for environmental planning and management. The process of developing this plan was launched in February, 1995 at a national seminar held in Dakar. The NEAP was to have seven principal components covering all aspects of Senegal's institutional, legal, economic social and cultural life.

- The rationalization of natural resource laws and the institutions needed to enforce them,
- The development of exchanges between regions on urban management, territorial planning and economic decentralization through the creation of centers that can contribute to solutions to the urban crisis,
- Providing research and education on the environment to improve management of natural resources, their value and accessibility to the people,

- Formulating a definition of a unified communication strategy and reliable information network,
- Resolving the problem of territorial management by decentralizing administration,
- Developing an official account of the biological diversity of Senegal, and
- Commencing a national strategy to fight against desertification in order to preserve other natural resources

Since the initiation of the planning process at the national seminar, the Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE), the government agency charged with developing the NEAP, has gone through a decentralized process of regional and local seminars designed to solicit the widest possible participation of the Senegalese people. The process started with thirty workshops at the *Département* level. This was followed by a survey of thirty-eight communes and one hundred thirty-seven rural communities, the results of which were evaluated in "study days" (*Journées des études*) where the data from the surveys were discussed to determine the elements to be covered by the Regional Environmental Action Plans in each of the ten regions. This information was used as the basis for regional workshops where the pre-implementation documents to the Regional Environmental Action Plans were created. These documents have now been sent to the Conseils Régionaux for approval before submission to the validation seminar for the NEAP, currently scheduled for June, 1997.

Concurrently, nine multidisciplinary "Groupes de Réflexion Thématique" have evaluated and issued reports on the following themes:

- The institutional, legislative, land management and development planning framework,
- Land management and decentralization policy in the framework of an integrated approach to the environment,
- The problem of urban decay,
- Environmental research, education and communication,
- Especially vulnerable ecosystems,
- Biodiversity,
- Desertification,
- Environment and sub-regional cooperation, and
- Financial mechanisms for natural resource management and environmental activity

The third source of input to the NEAP is a series of sectorial workshops with various groups of special interest:

- The private sector,
- Women's groups,
- Youth groups,
- NGOs,
- Civil society associations,

- Religious and customary chiefs,
- Research and training institutions, and
- Rural producers

The documents and plans, that are the result of this process, will form the basis of the NEAP. The principals and strategic orientations of the NEAP will be used to create an Environmental Charter that will serve as the frame of reference for the definition and the enactment of sectorial policies of management of natural resources and the protection of the environment. In conformity with the strategic orientations of the plan, the enactment of the programs identified will take place in three phases

Three year horizon-Phase 1 (1997-2000) should allow the reinforcement of the institutional and legal framework of the plan's enactment, to test the new partnership approaches in the context of decentralization and to put in place the sustainable finance mechanisms of the natural resource and environmental management activities. The principal actions include

- Creation of an Environmental Charter,
- Evaluation of the cost of investment programs,
- Evaluation of the cost of degradation of the environment and its impact on the national economy,
- Creation and enactment of pilot demonstration projects,
- Creation of a sustainable NEAP program,
- Establishment of a National Foundation for the Environment,
- Reinforcement of the functional blueprint of the NEAP (officials and partnership mechanisms),
- Execution of studies concerning perspectives on the formulation of plans in the context of regionalization, and
- Initiation of priority projects

Five year horizon-The activities envisioned during Phase 2 (2001-2006) should contribute to the consolidation of the improvements achieved in natural resource and environmental management. There are two areas of intervention

- Establishment of priority projects, and
- Impact evaluation of the changes made by the programs enacted under the NEAP framework

Fifteen year horizon-Phase 3 (2007-2022) will integrate the environmental dimension into the daily management of development policy. The actions envisioned will concern

- Establishment of a global programmatic framework,
- Articulation of NEAP, sectoral plans, and an economic development strategy, and
- Mechanisms for undertaking the plan

2 6 INSTITUTIONS

2 6 1 Ministry of the Environment and Protection of Nature (MEPN)

The MEPN was created in 1993 by regrouping the agencies concerned with natural resource management and the environment and the creation of a new agency named the Conseil Supérieur des Ressources Naturelles et de l'Environnement (CONSERE), which is discussed at length in the next section. In addition to various administrative bureaux, the MEPN has three *Directions*

- Direction de l'Environnement — responsible for monitoring and coordinating environmental activities, writing legislation and regulations concerning the environment, and combating pollution and nuisances,
- Direction des Eaux et Forêts — responsible for implementing the national forestry policy and exercising the prerogatives of the state in the forest domain, soil conservation, wildlife management and continental fisheries, and
- Direction des Parcs Nationaux — responsible for the organization and management of the national parks, protecting the fauna and flora in the national parks and reserves, managing biodiversity in the parks and reserves, creating new parks and reserves, and contributing to tourist development

The major change that is underway is a devolution of the functions that have traditionally been centralized at the national level to the Regions, Communes, and rural communities under the decentralization law.

Functions devolving to the Regions include

- Creation, management, protection and maintenance of forests, protected areas and natural sites,
- Management of continental waters,
- Measures to combat brush fires,
- Wildlife protection,
- Partitioning the exploitation of forest resources between Communes and Rural Communities,
- Regulation of hunting,
- Regional planning,
- Creation of volunteer brigades for environmental protection, and
- Authorizing forest clearance

Powers devolved to the Communes include

- Authorizing wood cutting inside the Commune boundaries,
- Reforestation and communal reforestation,
- Enforcement of the forestry code,
- Managing waste, health, pollution and nuisances,
- Protection of surface and ground waters, and
- Creation of communal environmental action plans

Powers devolved to the rural communities include

- Forest management within its borders, based on plans approved by the competent state authorities,
- Authorizing wood cutting,
- Enforcement of relevant sections the forestry code,
- Operation of vigilance committees against brush fires,
- Advising the Regional Councils on forest clearing,
- Managing sites of local natural interest,
- Creating woods and protected areas,
- Creation and management of artificial ponds and retaining dikes for agricultural and other purposes,
- Waste management
- Combating unsanitary conditions, and
- Creating and executing of the local environmental action plans

The other recent change that has taken place is the revision of the forestry code to give increased rights to local inhabitants to use forest resources. This code is currently going through a further revision to bring it in line with the decentralization law.

2.6.2 Conseil Supérieur Des Ressources Naturelles et de L'Environnement (CONSERE)

CONSERE is an agency of the MEPN that was created in 1993 to act as a central body to coordinate the activities of the various government agencies concerned with environmental and natural resource management. Structurally, it consists of three bodies:

- An interministerial council — the decision making body, presided over by the prime minister and charged with the supervision and coordination of the action plans for managing the environment and natural resources,
- The permanent committee — the monitoring body, under the presidency of the Minister of the Environment and Protection of Nature monitors the execution of the directives and decisions of the Interministerial Council, and

- The permanent secretariat — with the role of analyzing the coherence of current or proposed policies concerning the management of natural resources and the protection of the environment and analyze the pertinence of the various institutions and legislation relative to natural resources

The first major task of CONSERE was the formulation of the NEAP, as discussed above. The principals and orientations of the NEAP compose an Environmental Charter, that CONSERE proposes to have ratified by the National Assembly, and which will serve as a frame of reference for defining and enacting natural resource and environmental protection management policies. With the first version of the NEAP scheduled for publication in May, 1997, the agency foresees its future mission within the framework of the plan as

- Better defining the environmental responsibilities to guarantee that environmental concerns are harmoniously integrated in the sectoral policies and programs from their conception, planning and execution at all levels, from the central to the decentralized,
- Monitoring the conformity of development programs with the Environmental Charter. It will ensure compatibility of socio-economic activities with the maintenance of ecologic equilibrium,
- Ensuring the coordination of environmental sector policies and development. From the frameworks and mechanisms already in place, this coordination will take into account the new regionalization context in regard to the different roles devolving to the state and to the local collectives respectively,
- Contributing to the creation and the management of a National Foundation for the Environment in view of mobilizing sustainable resources to aid natural resource and environmental management initiatives,
- Aiding in the identification of partnership structures and mechanisms in the natural resource and environmental management domain (environmental management execution networks, articulation of mechanisms located at the public and private levels, integration of the execution structures that intervene at local, regional and national scales, etc)
- Setting up a responsive environmental information system capable of permanently serving the various actors and clarifying the environmental decision making process, CONSERE should establish an information interchange system between the institutions concerned with executing the plan
- Conceiving the planning and decision making tools for natural resource and environmental management,
- Contributing to environmental impact studies (establishing procedures, directives, measurement instruments and monitoring indicators, and measures for public participation in the decision making process), and
- Establishing a system of annual reports on the state of the environment permitting the evaluation of the results obtained by the plan's execution

2 6 3 Centre de Suivi Ecologique (CSE)

CONSERE has identified the CSE as the center of excellence and the focal point of environmental information [CONSERE, 1995, p 145) CSE defines itself as a public interest association under the MEPN Its purpose is to collect, enter, treat, analyze and disseminate data and information about the country, the natural resources and the infrastructure for the purpose of improving the management of natural resources and the environment To achieve this purpose the CSE has established the following objectives

- To offer services and the most advanced geographic products to all its members and interested organizations and people,
- Transfer technology,
- Assist the processes of
 - (1) planning resource management,
 - (2) reinforcing development structures,
 - (3) formulating projects and mobilizing resources, and
- Assist the development of the private sector [CSE, 1994]

The World Bank [1994, p 29] comments that CSE has developed a staff and technical capacity which are "exceptional for Sahelian Africa" CSE has certainly proved itself responsive to the needs of this report, having provided the data on which all of the maps have been based Continued development of the CSE's capabilities, as recommended by CONSERE, will be a major step in the solution of the information management problems identified at the beginning of this chapter

2 7 CONSTRAINTS, OPTIONS AND ALTERNATIVES

2 7 1 Constraints

There are many constraints to efficient natural resource and environmental management A number of them are listed below, organized into three categories physical, institutional and human

2 7 1 1 Physical constraints

Rainfall

- Rainfall has been decreasing since the 1960s and the trend shows no indication of reversing This has led to a lowering of aquifers, decrease in river flows, degradation of the natural vegetation, salt water incursions into river drainage basins, and acidification of soils
- Rainfall is exceedingly variable, both from year to year and within the rainy season of any given year This variability makes planning at all levels extremely problematic

- The rain that does fall is concentrated in a relatively few large rainfall events, that mostly runs off the land rather than soaking in to become available for plant growth. The runoff causes soil erosion, especially at the beginning of the rainy season, before the ground is protected by vegetation.

Surface Water

- There is a strong seasonal and annual variation in flows of rivers
- Surface water is subject to chemical pollution from agricultural runoff
- The lower basins of many rivers are subject to salinization from sea water

Ground Water

- There is insufficient knowledge of aquifer capacities
- There is a problem of over exploitation of certain aquifers
- Aquifers suffer from weak recharge capacities
- There is excessive mineral content of some aquifers which makes them unusable

Soils

- No soils have been identified as having "high potential for agriculture"
- Only 19 percent of the country has soils considered suitable for agriculture
- Many soils are suffering degradation from erosion and overuse
- Unsuitable soils are being used for agriculture, leading to their degradation

2.7.1.2 Institutional Constraints

Natural resource information, while relatively abundant, is too poorly organized and managed to give an adequate picture of the natural resource situation.

Land tenure

- The current system favors agriculture over forestry & grazing
- Agriculture and tree planting justify exclusive use, pastoralism and natural forest management have non-exclusive use status, favoring agriculture in agriculture vs non-agriculture conflict situations
- Lands left fallow for prolonged periods lose exclusive rights of use, reverting to protected status

The economic incentive structure favors agriculture over fuelwood production, including

- Forestry permits and fees,
- Price controls on charcoal,
- Free access to agricultural lands, and
- Subsidies on imported bottled gas

Institutional structures and research are sector oriented, concentrating on particular aspects of the puzzle, neglecting the trade-offs in the overall scheme

Sectoral policies, plans, programs and projects often conflict with overall orientation of the state and its ability to sustain them

2 7 1 3 Human constraints

Population is increasing rapidly with no possibility of reversing the trend in the short-term

There is a tradition of "command and control" mentality that permeates all levels of the government

There is a lack of involvement by "stake holders" that limits the collection and use of indigenous knowledge and the cooperation of the people most closely involved and affected by the natural resource

There is a lack of an "environmental ethic" in the decision making process at all levels

There is a lack of management skills at all levels

2 7 2 Options and Alternatives

The physical resources of Senegal are a given. Not much can be done to provide more water or increase the capacity of the soil, which are the major constraints to the land's ability to produce vegetation. Nor is it likely that any major deposits of minerals or fossil fuels remain to be discovered to provide the basis for new processing industries. Senegal's population, on the other hand, is increasing rapidly, and will continue to do so for the foreseeable future. The question is "How can a fixed quantity of resources be managed to provide for the needs of an ever increasing number of people, while, at the same time, increasing their quality of life, without destroying the productive capacity of the resource base?" The answer is not in the resources themselves, but in the use that the people make of the resources. That is to say in economics and sociology.

There is a general consensus that the top down, command and control system of social organization which until very recently has characterized Senegal's approach to natural resource management has had very limited success, not just in Senegal, but world wide. Large technical infrastructure projects

have seldom achieved their promised results and have often led to unintended negative consequences. Centrally mandated projects and programs have met with suspicion and resistance on the part of the people they are meant to help, undermining their effectiveness. Thirty-five years of experience since the first wave of Independence in Africa have proven that centralized natural resource management is not the answer.

The alternative is to decentralize. Turn control over the land and natural resources and return it to the local populations who are most closely concerned. Under this alternative free market forces will allow local populations to decide on the tradeoffs that determine land and natural resource use and production.

This is not to say that government has no role. On the contrary, government has a very important part to play in at least three areas. First, the government must establish the framework of policies, institutions, physical infrastructure and services that will facilitate the activities of the free market. Second, the government needs to protect the common interest by determining the limits to which resources can be sustainably exploited and regulate their use within these limits. Finally, government has a responsibility to ensure that disenfranchised, disadvantaged, and powerless social groups are not excluded from receiving a share of the benefits derived from the exploitation of the nation's natural resources.

The GOS is currently in the midst of a restructuring process which is intended to conform to this alternative strategy. The process revolves around two major themes. The first of these is the Decentralization Law which went into effect on December 31, 1996 and is intended to devolve responsibility in most aspects of government, natural resource and environmental management included from the center to the local and regional levels. The second theme is the National Environmental Action Plan which is currently being finalized and is scheduled for adoption at a National Validation Seminar to be held at the end of June, 1997. The NEAP is intended to provide an overall, unified framework upon which the necessary institutions, regulations and policies for rationally managing natural resources and the environment can be constructed.

This restructuring process is a very fundamental change in paradigm. Such changes take time and are likely to have false starts, blind alleys and unforeseen difficulties that need to be encountered and overcome as the process unfolds. Although it is important to move forward as quickly as possible, caution and balance are also required. Humans and their institutions require time to adapt to new circumstances, and rushing the process can be very destructive to the outcomes. Developing options and alternatives for activities in natural resource management in advance of the finalization of the NEAP is therefore somewhat problematic as they may be contrary to the priorities that eventually emerge. Some areas of activity are, however, fairly straightforward, including

- Strengthening the capacities of Regional, Rural and Commune Councils to carry out the new responsibilities that now fall within their purview through training and structuring

activities in a manner that aligns them with these administrative bodies rather than creating distinct project management arrangements for administrative convenience,

- Improving the government's ability to provide technical support to the local bodies by improving the capacities of the extension services,
- Ensuring that all rural development projects take an holistic, integrated natural resource management approach, and do not simply focus on one single production factor or constraint,
- Directing research programs towards systematic aspects of the environment rather than concentrating on specific, individual resources,
- Continuing to improve the environmental database and the institutional capacities to collect, store, disseminate and use natural resource information by strengthening the agencies most directly concerned (eg the Centre de Suivi Ecologique (CSE) the Division des Statistiques Agricoles and the Direction de Travaux Geographiques et Cartographiques)
- Continuing to support the overall effort to rationalize and coordinate natural resource and environmental management activities across administrative department boundaries through further development of the role of the Conseil Supérieur Des Ressources Naturelles et de l'Environnement (CONSERE) or a similar, cross-cutting agency

CHAPTER 3 MARKETING, PRICES AND POLICIES

The following chapter will examine the impact of structural adjustment and devaluation on the production, marketing and pricing of Senegal's principal commodities. Emphasis is placed on changes in production choices, marketing decisions and consumption patterns for rice, groundnuts horticultural products and cereals, in response to the new policy environment. While the chapter does not pretend to offer a comprehensive analysis of sub-sectoral changes, it does provide an overview of the effect of the government's redefined role on major production systems.

3.1 THE LIBERALIZATION OF THE RICE TRADE

The rice sector has historically been at the center of the food policy debate in Senegal for four inter-related reasons: its importance in the balance of payments equation, the size of the Government of Senegal's investments to promote local rice production in the Senegal River Valley, its central place in the Senegalese diet, and the consequent potential social and political volatility surrounding questions of policy and prices.

Since the publication of the USAID Agricultural Sector Assessment in 1991, the rice sector has undergone a complete transformation. The January 1994 devaluation and the implementation of the GOS Rice Sector Adjustment Program has had profound (but not yet fully appreciated) impacts on consumers and rice producers. This section will provide an historical overview of policy changes and their effects on market organization, consumers and producers. [RSAP/APAP/UPA 1997]

3.1.1 Historical Overview

From Independence until 1987, the rice sector was essentially under complete management by the GOS. The government had a monopoly on rice imports and established authorized wholesale and retail margins. The GOS insulated the consumer from world market price fluctuations but also generated substantial profits by selling the imported rice to wholesalers at healthy profit margins.

With the creation of the Societe d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Senegal (SAED) in 1965, the GOS began a massive investment program along the Senegal River aimed at ensuring food self-sufficiency through the production of irrigated rice. SAED acted as a 'total service' regional development agency, providing heavily subsidized inputs, machinery, mechanical farming services and extension. They purchased paddy from the farmers at a mandated price, processed the paddy and marketed the product. Enormous inefficiencies throughout the production and marketing process resulted in very high production costs, among the most expensive in the world. Production was sold at the same price as imported rice, the GOS subsidizing the difference between consumer and producer prices.

The steady deterioration of the country's economy obliged the government to radically revise the policy of heavy government involvement in the agricultural sector. The Nouvelle Politique Agricole, promulgated in 1984, signaled a determination by the GOS to dramatically reduce its involvement.

(and non-productive investment) in agriculture, opening the door to a progressively greater role for the private sector

In terms of the rice sector, the new policy began to manifest itself in 1987 with the reorganization and down-sizing of SAED's mandate and corresponding personnel requirements and operating budget. Major changes involved

- Transferring perimeter management authority to farmers,
- Discontinuing the provision of credit and the sale of inputs to farmers, and
- Suspending the provision of mechanical tilling and harvesting services

In 1990, two additional initiatives were implemented which further decreased GOS financial investment in locally produced rice

- Stopping construction and maintenance of irrigation earthworks, and
- Withdrawing from the production and marketing of rice seed

By the end of 1990, GOS involvement in local rice production was restricted to the purchase of paddy at a fixed price, product transformation and marketing

The year of 1994 saw the promulgation of the GOS Declaration de Politique de Developpement Agricole (DPDA) and the signing of agreements with donors pertaining to the financing of the new liberalized sectoral policy. In conformance with the schedule outlined in the DPDA, the GOS continued its disengagement from local rice production, and in June, eliminated fixed producer paddy prices, sold off SAED rice mills to former employees and ended the Caisse de Perequation et de Stabilisation des Prix (CPSP) collection and processing of paddy and the distribution of local rice. On January 11 of the same year, the FCFA was devalued by 50 percent, overnight doubling the Cost Insurance Freight (CIF) local currency costs for imports with a view to promoting local production, import substitution and export marketing

The majority of rice sector reforms were implemented in 1995. On March 3, the GOS eliminated all fixed wholesale and retail price margins, although the CPSP still maintained its monopoly on broken rice imports. This measure, in conjunction with an increase in the CPSP wholesale price to reflect world market levels, saw the retail price of rice jump at least 60 FCFA/kilo over the next four months.

From March until the end of 1995, the national rice market became very unstable, with steep price rises in the regions reflecting scarcity. Much of this instability can be imputed to the disorderly and precipitous manner in which the CPSP retreated from regional distribution. In June, the CPSP, with almost no warning to private rice traders, closed their regional warehouse facilities, selling off their stocks and ending transport subsidies to the regions. Henceforth, wholesale supplies could be obtained only from CPSP's Dakar warehouses.

Due to the massive liquidation of CPSP's regional stocks, the impact of the changed distribution system was not felt at the regional level for the first six weeks. By August, bottlenecks in the CPSP wholesale distribution system began to create shortages in certain regions and consequent dramatic price increases. This situation prompted the GOS to permit private firms to begin importing broken rice, five months ahead of their scheduled market entry.

The arrival of the private sector did not immediately result in price decreases. On the contrary, the chaotic situation in the Dakar wholesale market, coupled with the speculative behavior of traders, high world market prices and opportunities to realize substantial profits, spiked prices during the month of September. Prices, however, rapidly fell in the following month, as substantial quantities of inexpensive Indian rice came on the market. Over the past year, prices have continued to decrease slightly as the market has matured, world prices have dropped and importers have shifted supply sources from the more expensive but better quality Thai A-1 Special to cheaper, lower quality sources, dominated by India.

In February of 1996, the CPSP ceased importing broken rice, ending 30 years of GOS involvement in rice marketing.

3.1.2 Impact on Market Organization

Prior to the enactment of the liberalization measures, there was substantial concern by both the GOS and certain donors regarding the ability of the market to function in an economically efficient manner. Major unanswered questions concerned: Would private sector importers have the financial resources and organization to ensure adequate supplies of rice on a sustained basis? Would market share concentration, either among importers, exporters or both result in oligopolistic market behavior? Would collusion among regional wholesale and retail distributors result in price fixing and "inflated" margins?

The private sector soon laid to rest concerns about their ability to replace the CPSP. During the brief period in early 1996, when both the CPSP, prior to its withdrawal, and the private sector were importing broken rice, private sector imports accounted for 77 percent of broken rice imports. According to the previously referenced RSAP report, post-liberalization rice stocks have ensured, at a minimum, 1.8 months of coverage, based on an average monthly consumption of 30,000 tons. In fact, there has been criticism that stocks are too high, limiting marketing opportunities for locally produced rice.

There is no evidence of dangerous levels of market concentration, either among exporters or importers. Between October 1995 and May of 1996, rice was purchased from 15 different exporters, with the top four providing approximately 60 percent of the market. Similarly, during this time, 20 importers purchased rice, with a four firm concentration ratio of a relatively modest 53 percent. If continued, these trends bode well for structural concerns of the market.

3 1 3 Impact on Consumers

The impact on consumers of the rice liberalization program obviously varies according to income level and consumption habits. According to a 1994/95 household consumption survey, there is little variability in the quantity of rice consumed across urban income groups. The poorest 25 percent of the urban population consumed 66 kilograms per capita per year, compared to 71 kilograms for the wealthiest 25 percent of the urban population.

The liberalization policy and the consequent 23 percent average nominal price increase since the elimination of mandated retail prices has had a severe impact on the nation's poorest income group. Prior to liberalization, expenditures on rice represented a very substantial 29 percent of income. This figure has increased to an estimated 37 percent, or 10,032 FCFA per month for the poorest 25 percent of the population [RSAP/APAP/UPA, 1997].

Price increases have had no discernable effect on consumption patterns for rice. Preliminary data indicate that there has been virtually no substitution of millet for rice, as had been hoped. According to Diagne [1996], increases in millet consumption in certain rural areas have not occurred at the expense of rice purchases, it is, rather, attributable to increased income from groundnuts, as a result of devaluation and the consequent higher local currency equivalent of world market prices.

In fact, consumption data bring into question whether other cereals can be considered as viable substitutes, particularly for the mid-day meal. This is due to two main reasons. Rice consumption has steadily increased during the last thirty years, both in urban and rural areas, obtaining a nearly unshakable position in the Senegalese noontime diet [RSAP, 1997]. Its ease of preparation contrasts sharply with requirements for cooking millet. Moreover, when comparing the price of rice with commercially pre-prepared millet, rice is 50 percent less expensive.

3 1 4 Impact of Devaluation and Liberalization on Producers

For the last 30 years, irrigated rice production along the Senegal River has been a center piece of the GOS's policy of attaining food self-sufficiency. It has absorbed a large share of the investment budget in agriculture, considering that rice production in the valley represents only 3 percent to 5 percent of the country's total cereal consumption. This section deals with the impact of devaluation and liberalization on irrigated production along the Senegal River as rainfed production in the southern part of the country is destined almost exclusively for auto-consumption.

Despite devaluation, which has doubled local currency import costs, local rice at current yields and quality level has remained uncompetitive. Recent changes in the rice import tariff system, aimed at increasing protection (and obviously increasing the burden on the Senegalese consumer) were implemented at the end of January 1997. It is still too early to determine the impact on the marketing of local rice. This issue will be explored in greater detail in a following section.

3 1 5 Production Trends

Between 1989 and 1993, production along the Senegal River rose steadily from 70 600 tons to 120,200 tons but has since declined to 87,615 tons during the 1996/97 season. Increased production during the 89-93 period was largely due to the entry of new private investors into production activities, the completion of the Manatali Dam which improved water access and the easy availability of credit from the Caisse Nationale de Credit Agricole du Senegal (CNCAS)

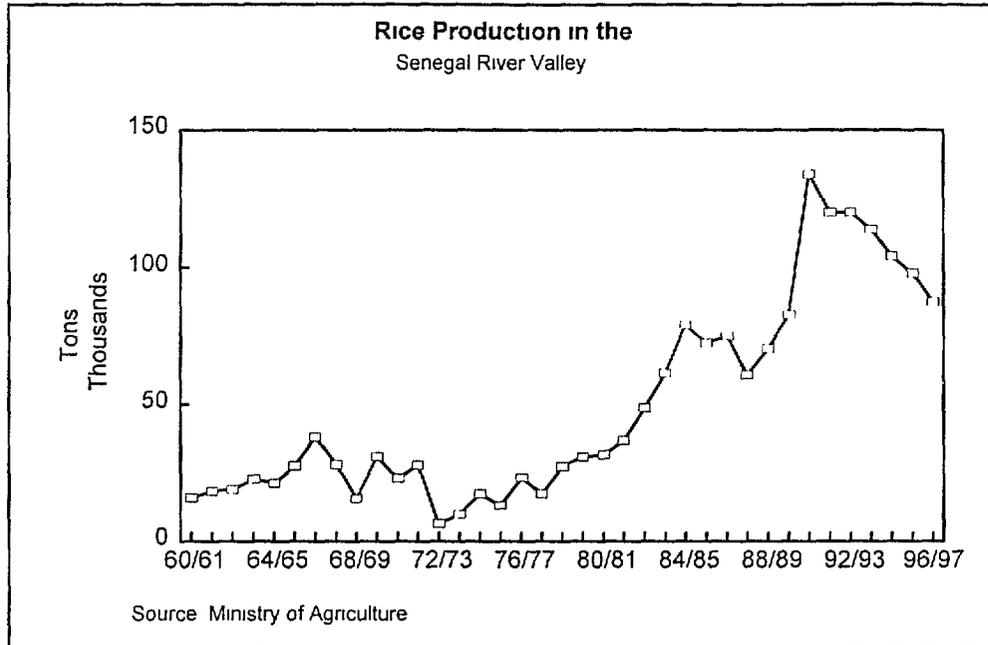


Figure 3 1 Rice Production in the Senegal River Valley

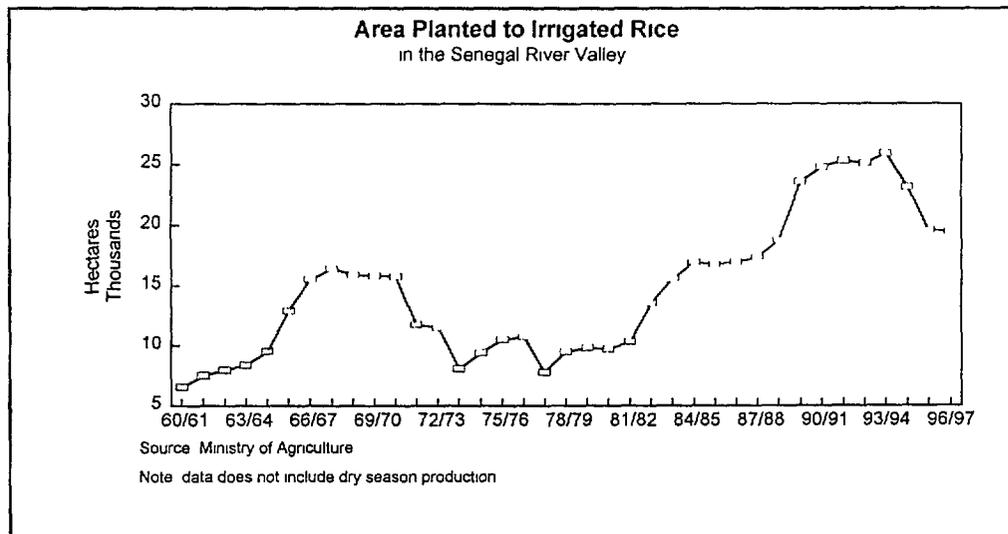


Figure 3 2 Area Planted to Irrigated Rice

Figure 3 2 shows that rainy season cropped area reached a high point of 25,900 hectares in 1991/92 but fell to 19,470 hectares during the 1996/1997 season. The decline in hot season planting was even more pronounced, descending from a peak of 7,300 hectares in 1992/1993 to 2,700 hectares in 1995/96.

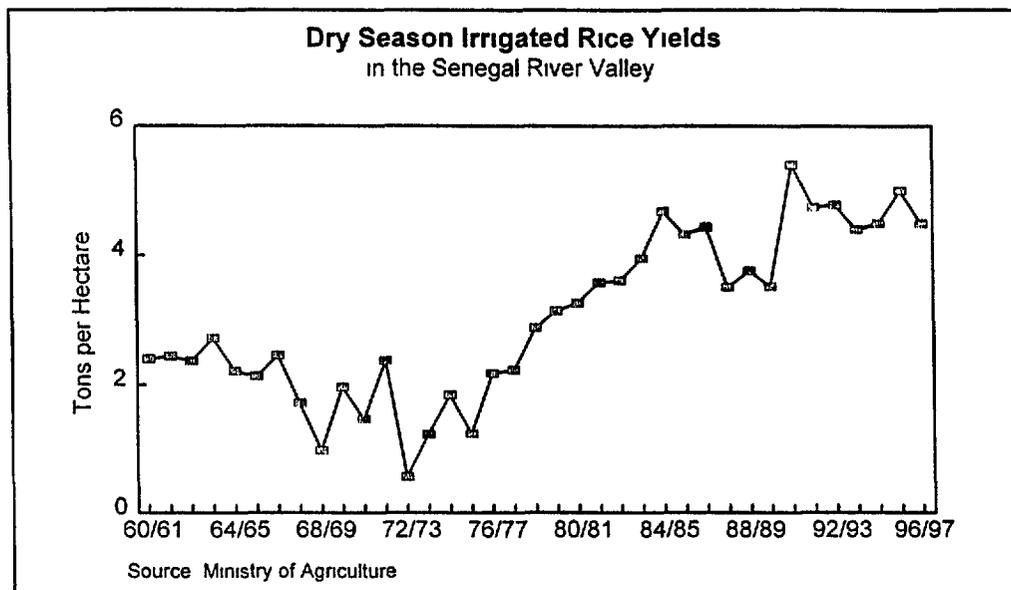


Figure 3 3 Dry Season Irrigated Rice Yields

According to GOS statistics, rice yields reached their historic high during the 1990/91 cropping season, attaining an average of 5.4 tons per hectare under dry season conditions in the valley. This figure, however, is not universally accepted. The recent World Bank-funded report [Durufle, 1996] cites an average yield of 4.9 tons for the same year. In essence, yields have remained stable since 1991. Average farmer productivity continues to be far below results obtained in research trials in the area.

3 1 6 Reasons for the Decline in Production

The above graphs clearly illustrate that the concurrent devaluation and liberalization of the rice market has had a very negative impact on rice production in the Senegal River Valley. The reasons for this decline span the entire spectrum of the production and marketing streams.

3 1 6 1 Changes in the Relative Costs of Inputs and Paddy

Between 1989 and 1995, per hectare costs of purchased inputs (excluding machine services) at recommended levels increased by 79 percent whereas the average producer price for paddy increased only 26 percent. The following table [Wane 1996] exposes the price changes.

Table 3 1 Changes in Purchased Inputs Costs for Rice After Devaluation

	Quantity/hectares	1989	1995	% Change
Seed (kg)	120	21,600	31,200	44
DAP (kg)	150	13,050	24,000	83
Urea (kg)	250	17,500	45,000	157
Propanil (litre)	10	16,500	32,750	98
2-4-D (litre)	2	5,000	10,400	108
Furadan (kg)	10	15,000	24,000	60
Diesel fuel (litre)	120	25,200	36,000	43
Total cost		113,850	203,350	79
Paddy price		85	107	26

Source Structure des Prix et des Coûts de Production et de Transformation du Riz dans la Vallée du Fleuve Senegal, 1996

In concrete terms, a producer in 1995 needed to sell 1 92 tons of paddy to cover his consumable input costs, versus 1 36 tons in 1989. Machine services have increased only by 2 percent as of the 1996/97 cropping season, [Wane, 1997] but these costs will certainly rise as most equipment currently in use was purchased prior to devaluation. As equipment is renewed at post-devaluation prices, its repercussions on production costs will be felt immediately and these will be substantial, given that farming services and amortized motor pump costs are among the highest in the production process.

Anecdotal information suggests that, due to increased competition among input retailers, prices have decreased slightly during the last year. Nevertheless, the impact of devaluation on input costs has been great. Although no detailed studies are yet available, one can safely assume that farmers have substantially decreased application of inputs in the face of increased costs and have experienced a 500 kg /hectares decrease in average yields during the 1996/97 cropping season.

3 1 6 2 Credit

The Caisse Nationale de Credit Agricole du Senegal (CNCAS) is the major credit provider in the valley. As can be seen from the following graph, the amount of credit extended to producers and millers rose rapidly at the start of the decade to over 6 billion FCFA. As the amount of money loaned increased, so did the default rate which averaged only 73 percent between 1990 and 1993.

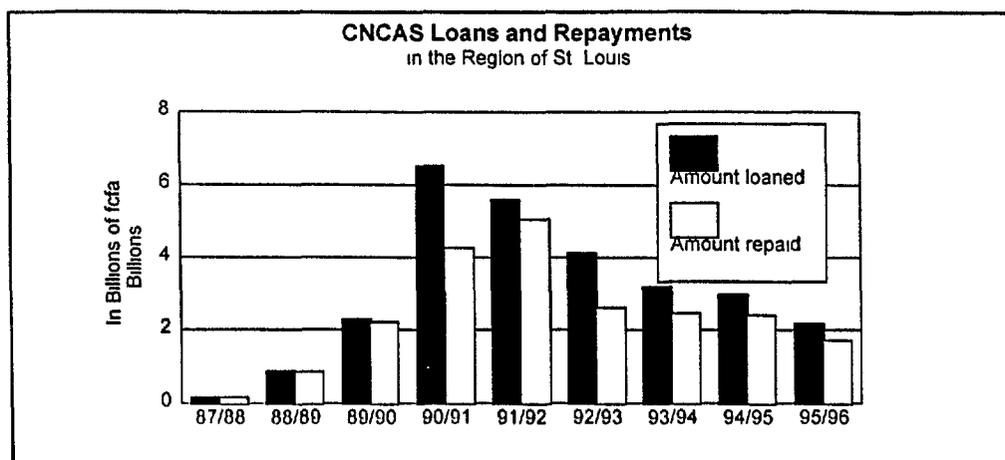


Figure 3 4 CNCAS Loans and Repayments in the Region of St Louis

The rise in the default rate was essentially due to a lack of vigilance and rigor on the part of the loan administrators. Loans were given in function of need rather than in relation to the ability of the borrower to repay. Frequently, producer groups who were in default would simply reconstitute another group with the same members to secure an additional loan. One recent study noted that the village of Ronkh, with an active population of 1000 was home to 140 producer associations [Wane, 1996]

During the last three years the CNCAS has radically tightened its loan requirements and has consequently reduced its loan portfolio and default rate. It has recently changed certain lending provisions to better adapt to production requirements: repayment periods for certain loans have been expanded from 3 to 7 years, loans are now available to purchase previously owned agricultural equipment. At the present time, however, loans cannot be obtained to finance second crops as farmers do not have sufficient time to pay off the outstanding loan prior to the beginning of the second production cycle. This is probably a major reason why there is not much double cropping in the irrigated perimeters.

3 1 6 3 Product Quality

With the use of proper milling techniques, the Senegal River Valley can produce high quality rice but it never has, and, until recently, it has never had to. Previously, the CPSP, the GOS parastatal, bought SAED milled rice and obliged wholesalers to purchase it, as a condition for obtaining the more desired Thai A-1 broken rice. According to a recent consumer survey [Baudouin and Simantov, 1996], commercially milled local rice has a very good flavor but non-uniformity of grain size (and the presence of impurities) makes it exceedingly difficult to cook. Non-homogeneous grain size means that a portion of the rice is either overcooked or undercooked. Satisfactory preparation of local rice requires time-consuming sorting by the preparer, who, generally is also the purchaser.

Despite its appreciated flavor, housewives prefer to purchase imported rice of more homogeneous size. Improved milling and sorting is critical to the viability of local rice production in Senegal.

3.1.6.4 Distribution Networks for Locally Produced Rice

The distribution networks for local rice are not well developed. In large measure, this is due to quality problems which make locally produced rice less attractive to the consumer and, by extension, to the distributor. Additional factors play an important role. The traditional wholesale distribution network is located in Dakar, the entry port for imported rice, making commercial communications far easier. Moreover, wholesaling rice requires substantial capital, most of which is concentrated in Dakar.

3.1.6.5 Ineffective Tariff Protection

The tariff protection system adopted by the GOS to "assist" local producers in making the transformation to a liberalized economic environment used a reference price which was based on prevailing prices for Thai A-1 broken grains. This was the historical (and practically sole) source of broken rice imports. Thai A-1 is the only broken rice quoted on international markets and because of its high quality, is also the most expensive. The liberalization of rice imports in mid-1995 coincided with an accelerated marketing effort by the Indian government to clear out stocks accumulated during eight bumper crop years. These were sold to exporters at below prevailing market prices. Inexpensive Indian rice flooded into Senegal. The tariff system, which was based on the more expensive Thai rice, did not provide the anticipated level of protection for local rice. Poor quality Indian rice was sold in major markets in northern Senegal for less than the production and processing costs for the local commodity. Demand for local rice dried up, bringing many of the recently created milling firms to the brink of bankruptcy and eliminating marketing outlets for producers. The inability to move product resulted in rising loan default rates and a subsequent decision by producers to decrease hectareage by 25 percent. Local rice stocks have continued to accumulate, awaiting price increases engendered by the implementation of the revised tariff system.

On December 31, 1996, the National Assembly approved Law 96-35, for a period of two years which established import duties on 100 percent broken rice, varying from 15 percent to 45 percent, in function of the CIF per ton cost of imported rice. The system will guarantee an import price of around 181,000 FCFA per ton which should make it competitive with local rice whose production processing and local marketing costs are estimated to be 188,590/ton. [GOS 1996]

The law was implemented four months prior to the drafting of this report so it is too early to judge its effectiveness. Anecdotal evidence suggests, however, that its impact will be delayed, as importers, anticipating the increase in taxes, purchased large quantities just before the law was enacted.

3.1.7 The Future of Local Rice Production

The GOS has given the local rice sub-sector two years to “adapt” to the changed market conditions. One can expect that local production will continue to decline steeply as producers switch to other less input-intensive crops or cease farming on irrigated perimeters. The most productive rice farmers will probably have improved access to credit as demand decreases with crop diversification.

Financial analyses conducted by West African Rice Development Agency (WARDA) and the RSAP have concluded that under plausible price scenarios, Senegal cannot compete with low cost broken rice producers without substantial tariff protection. Both studies, however, conclude that the country can be very competitive in the quality, whole grain market. Although this market at around 20,000 tons per year is, for the time being, only a fraction of the size of that for broken rice, there exists significant demand in neighboring countries. A handful of rice mills in the valley have begun producing high quality whole rice. One miller, Delta 2000, recently sold 500 tons of rice to Mali. Quality improvement and export initiatives need to be encouraged as competing on the broken rice market will cease to be an alternative with the expiration of the two year tariff protection measures.

3.2 THE GROUNDNUT SUB-SECTOR

If one can characterize rice as being at the center of the food policy debate, one can speak of groundnut production as being at the center of both the rural income and balance of payments debates. Approximately 50 percent of the country's population are groundnut producers and, historically, Senegal has been one of the largest exporters of unrefined groundnut oil in the world. Simply put, as groundnuts go, so goes rural incomes and the country's balance of payments.

Since 1989, the last production year analyzed in the USAID Agricultural Sector Analysis, production and yields have decreased substantially, never approaching 1989 levels. In fact, excepting area planted, production and yields have decreased at accelerated rates compared to the previous 20 year period.

Table 3.2 Average Annual Growth Rates for Groundnuts

	Area Planted	Production	Yields
1967-1988	(1.5%)	(0.6%)	0.9%
1988-1996	0.1%	(2.3%)	(2.4%)
1967-1996	(1.4%)	(0.7%)	0.6%

Source: Durufle, 1996

These calculations are particularly disquieting as they are based on official statistics which are widely believed by knowledgeable observers to have substantially overestimated groundnut production and yield data. [CIRAD, 1997]

It was anticipated that the higher local currency producer prices resulting from devaluation would provide a powerful incentive to farmers to increase their productivity and production. The official price paid by SONAGRAINES, the GOS parastatal responsible for sales of seed and fertilizer and the collection of the harvest, progressed steadily during this time: 70 FCFA in 1992/93, 100 FCFA in 1993/94, 120 FCFA in 1994/95, 130 FCFA in 1995/96. As the following graphs clearly demonstrate, the awaited supply stimulus has not occurred.

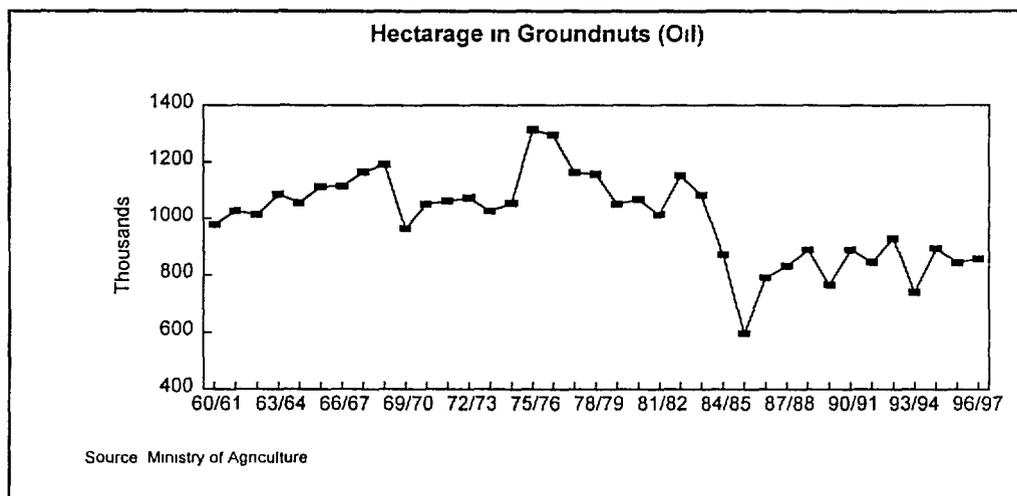


Figure 3 5 Hectarage in Groundnuts (Oil)

With the exception of 1992-93 cropping season which coincided with an election year and is discussed below, hectarage planted to groundnuts has not significantly increased after devaluation. The cropping season immediately following devaluation saw a slight increase in area planted to 892,000 hectares but the increase did not carry over to the next planting season.

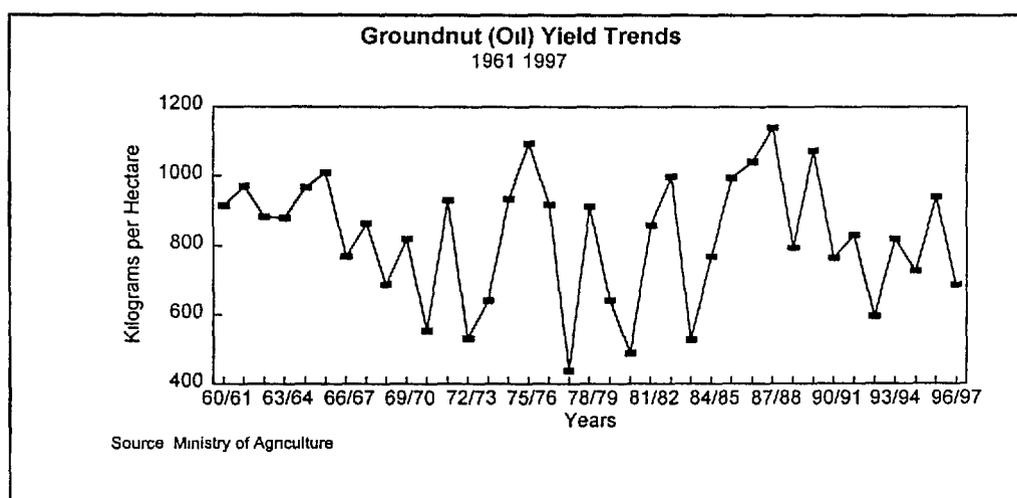


Figure 3 6 Groundnut (Oil) Yield Trends

During the period of 1989 to 1996, groundnut yields continued to exhibit their typical inter-seasonal variability. Only once, however, during this period, did yields surpass the level obtained during the 1989/90 cropping season.

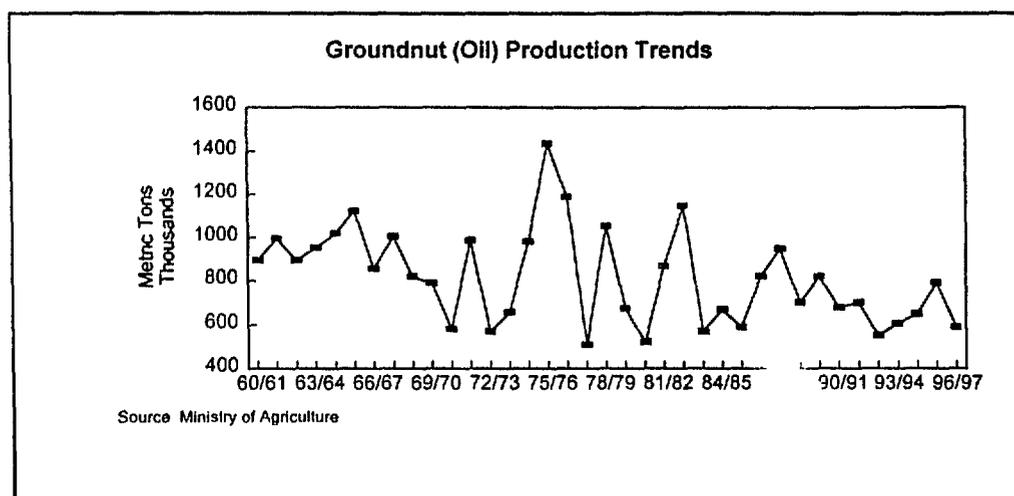


Figure 3 7 Groundnut for Oil Production Trends

Groundnut production has attained 1989 levels only once during the last seven years. As shown in Table 3 2, production has declined 2 3 percent per year during the period from 1988 to 1996.

3 2 1 Reasons for the Decline in Production

Reasons for the decline in production and yields are of course interrelated and may be categorized by factors related to lower input use and food security.

3 2 1 1 Input Use

The decreasing use of certified seed has been cited in numerous studies as the principal constraint to improved yields. ISRA, the National Agricultural Research Institute, recommends that 33 percent of farmers' seed stock be renewed annually but renewal rates are thought to be around 10-15 percent. Major reasons evoked for non-renewal are access to credit, poorly developed distribution networks and lack of year-round availability of seed.

The decrease in the use of commercial fertilizers is clearly due, in part, to credit constraints. SONAGRAINES requires that producers provide a 30 percent downpayment on purchases and charges seasonal interest rates of 25 percent. With the continued decrease in rural incomes and the variability of inter-seasonal harvests, the downpayment is beyond the reach of most farmers and the risk of a poor harvest resulting in non-payment of the loan is too great to chance. It is interesting to note that the increase in consumption in the 1992/93 crop year is directly attributable to the GOS's

election year initiative in which fertilizer was offered at no interest and no money down. The repayment rate was 35 percent.

The development of an energetic private sector fertilizer distribution network on which the GOS and donors had founded hope in the mid-1980s has not occurred as farmer demand has not been sufficient to warrant interest from commercial operators.

Farmers evaluate the cost of inputs by their price relative to outputs. According to Kelly, [Kelly et al 1996] farmers consider commercial fertilizer to be too expensive, relative to the producer price of groundnuts. The following table illustrates the price ratio of groundnuts to fertilizer.

Table 3.3 Groundnut/Fertilizer Price Ratio (in FCFA/kilogram)

Year	Groundnut Producer Price (FCFA)	Fertilizer Price in FCFA/kg	Percentage of Subsidy	Groundnut/Fertilizer Ratio
1983-84	50	50	63	1.00
1984-85	50	100	0	0.50
1985-86	90	52	32	1.73
1986-87	90	60	21	1.50
1987-88	90	78	20	1.15
1988-89	70	80	9	0.87
1989-90	70	89	0	0.79
1990-91	70	89	0	0.79
1991-92	80	89	0	0.90
1992-93	80	89	0	0.90
1993-94	70	90	0	0.78
1994-95	120	130	0	0.92
1995-96	125	138	0	0.92

Source: Adapted from Cash Crop and Foodgrain Productivity in Senegal, 1996. Direction de l'Horticulture.

The data indicate that since the GOS fertilizer subsidy has been abolished, the per kilo price of groundnuts has not equaled the price of fertilizer. The ratio is highly correlated with fertilizer use and would suggest that either raising the official price of groundnuts and/or decreasing the price for fertilizer would provide impetus for many farmers (who have available resources) to increase fertilizer use.

3.2.1.2 Food Security

Food security concerns play a large role in the allocation of resources to the production of cash crops. Historically, yields of groundnuts have varied more than yields of millet and sorghum. This has held true for the period since 1989. As groundnut yields have significantly trended downward, the relative risks involved in inter-seasonal variation have become more acute. Thus, despite detailed

farm-level studies which affirm that groundnut production is more profitable than millet/sorghum cultivation in the Peanut Basin, farmers are inclined to reduce risk by planting food crops which are subject to less yield variability. It should be noted that a recent in-depth study of the groundnut sub-sector CIRAD [1997] reached the exact opposite conclusion in terms of relative profitability while working in mostly the same geographic zone.

Food security concerns also have an effect on the quality of groundnut seed. With the adoption of the GOS's policy in the late 1980s to have individual farmers store 75 percent of their seeds, producers have not generally applied pesticides to their seed stocks as this precludes subsequent consumption. With the decrease in rural incomes, seed stock has become a principal source of liquidity (and also a reserve food source) after proceeds from the harvest have been exhausted.

3.2.2 Groundnut Oil Production

As would be expected, the significant decline in groundnut production has had an adverse impact on the amount of raw material entering the SONACOS oil crushing facilities. As one can see from the following graph, however, the decline in delivered raw material has outstripped the decrease in groundnut production.

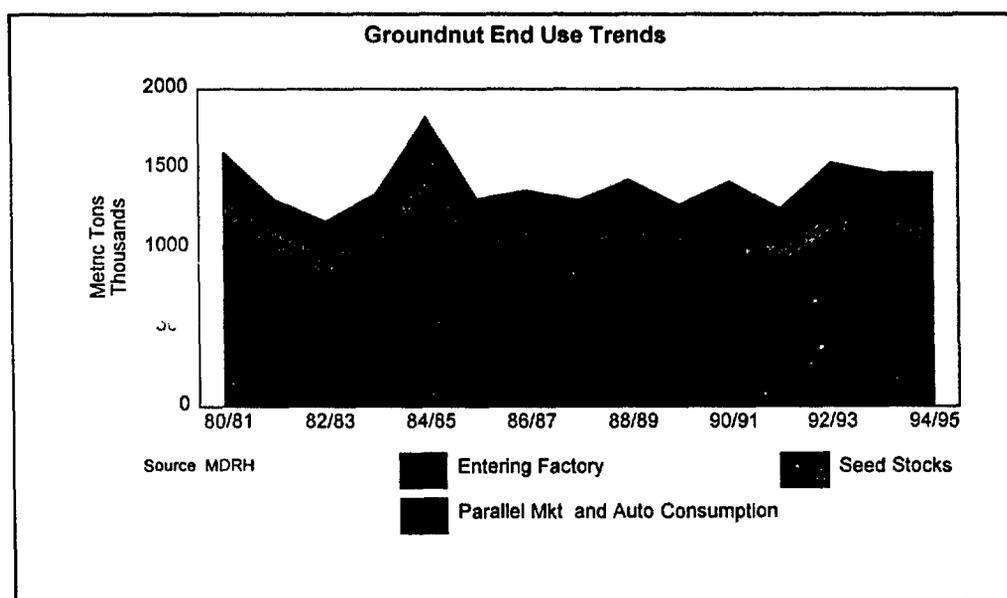


Figure 3.8 Groundnut End Use Trends

The decline in processed raw material is clearly attributable to the continued development of the parallel market. The sale of groundnuts through un-official channels was authorized in 1989. Prior to authorization, it was a thriving commerce, originally centered in Touba, the headquarters of the Mouride Brotherhood where it benefited from the protection of the Mouride leadership. The main

motivation for selling on the un-authorized market was to avoid reimbursing the GOS groundnut parastatal for seed and fertilizer loaned during the previous cropping season

The decline in the availability and use of credit to purchase inputs has not, as would be expected, had a dampening effect on the un-official market. On the contrary, the market has grown despite decreased motivation to avoid loan repayment. There are several reasons for this. The producer price on the parallel market is approximately 20 FCFA per kilo more than that offered by SONAGRAINES. The high fixed processing and administrative costs of the GOS' parastatal limits its ability to compete with the parallel market on price. The product assembly functions of the parallel market are much more "producer friendly". The parallel market has many more assembly points, often purchasing groundnuts in small rural markets and remote villages and does not require that sellers clean and bag their product. SONAGRAINES and its authorized agents have far fewer purchasing points, which in 1991 were reduced from 1750 to 750, and demands that farmers clean and bag their merchandise prior to the transaction. Perhaps most importantly of all, the parallel market pays cash on delivery whereas SONAGRAINES often delays payment for several months after reception. The reasons cited above amply illustrate why Senegal's 920,000 metric ton annual processing potential has been running over this decade at around 30 percent capacity.

Paradoxically, the decline in SONACOS' oil production has coincided with its return to financial health. The parastatal greatly reduced its costs. More significantly, it began to import increasing quantities of unrefined vegetable oil which were subsequently refined and bottled and then sold at a healthy profit while exporting an increasing percentage of raw groundnut oil to take advantage of rising world market prices.

During the 1990s, one has seen the State and SONACOS return to sub-sectoral financial profitability while groundnut producers have seen their revenues plunge in both real and nominal terms. The balance of payments which averaged, between 1981 to 1984, 20,512 million FCFA in constant francs tumbled to an average 4,148 million FCFA between 1991 and 1995 [CIRAD, 1997, pg. 87].

Although the future privatization of SONACOS and the closure of SONAGRAINES should help reduce production costs, thereby creating the opportunity to raise producer prices, the refineries will have to provide additional incentives to producers and/or private sector intermediaries if it to obtain sufficient raw material to profit from the post-devaluation environment and maintain a positive commercial balance.

3.3 THE HORTICULTURAL SUB-SECTOR

Since 1989, horticulture has been one of the more dynamic productive activities within the agriculture sector. Prior to devaluation, production trends were already on the rise. This was accentuated after the currency realignment. Devaluation did indeed have the anticipated consequence: import substitution. Exports, however, to both European and regional markets declined slightly. The following graphs illustrate the sub-sectoral trends.

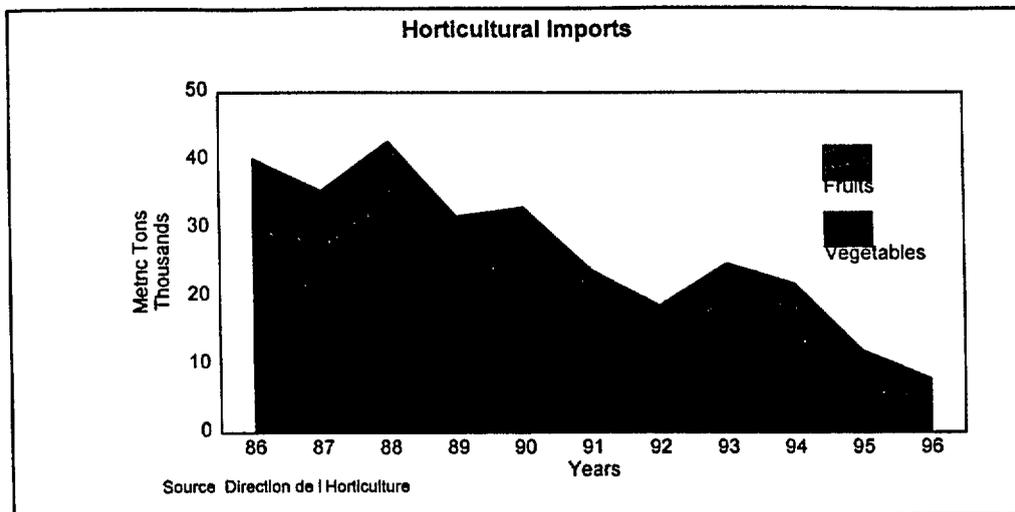


Figure 3 9 Horticultural Imports

Figure 3 9 shows that horticultural imports have been on a downward trend since 1988. During that year, 42,796 tons of fruits and vegetables were imported. Imports fell to 21,793 tons in 1994, the year that the FCFA was devalued. Imports dropped steeply during the following two years. The 7,825 tons represents a decrease of 82 percent from 1988 import levels. Table 3 4 shows the positive impact of devaluation on specific horticultural commodities.

Table 3 4 Change in Principal Horticultural Imports After Devaluation

	1993 (in metric tons)	1995 (in metric tons)	% Change
Potatoes	8596	3394	- 60
Onions	6897	5470	- 20
Apples	1764	890	- 49
Citrus	1265	412	- 67

Source: Etude de Diversification et de Modernisation de la Filière Horticole au Senegal. Direction de l'Horticulture

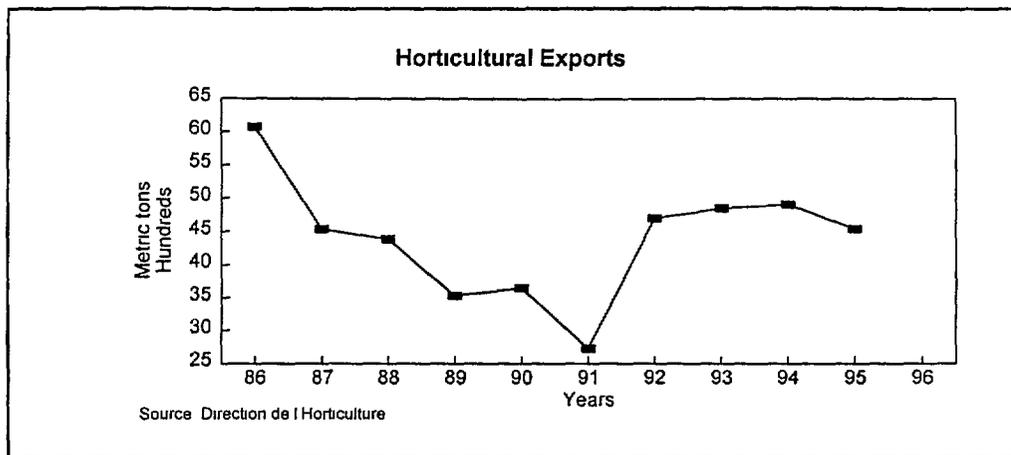


Figure 3 10 Horticultural Exports

Figure 3 10 shows that exports, based on official statistics, have not increased after devaluation. It is important to note, however, that the official statistics almost certainly underestimate the level of exports to Mauritania, as most of the horticultural exports are produced in proximity to the Senegal River and are transported by pirogue, thus not entering into the national statistics. The reasons for the apparent lack of response are examined in a following section.

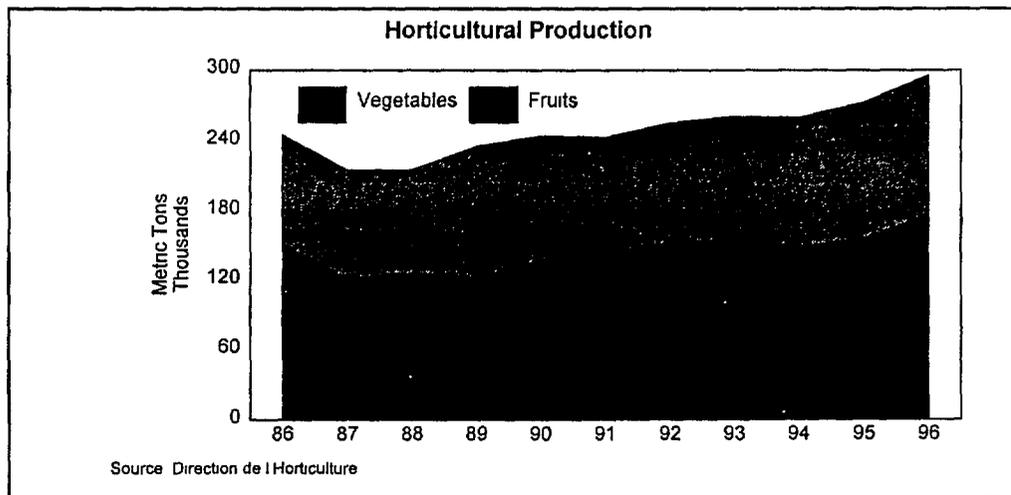


Figure 3 11 Horticulture Production

Fruit and vegetable production have risen steadily since 1991, going from a combined 242,834 tons to 295,205 tons in 1996. Increased production is clearly a response to the higher price of imported products following devaluation.

3 3 1 The Domestic Market

Domestic production, storage and marketing techniques are, almost exclusively, rudimentary in nature. With the exception of a handful of commercial sized growers, production is typically on plots of less than half a hectare. Yields and quality are generally low due to the use of inappropriate seed varieties, low fertilizer and insecticides, and frequent problems with saline irrigation water. Regrettably, producers and intermediaries are currently able to realize only a small part of the potential benefits from domestic demand. Lack of vehicular access to many production areas and the poor condition of roads and trucks provoke enormous post harvest losses. The lack of cold storage facilities in major urban centers means that production is marketed at the same time with predictable negative impacts on producer and wholesale prices.

Nevertheless, prospects for continued expansion of small-scale horticultural production are promising. With increasing population trends, decreasing imports and positive macroeconomic responses to recent GOS policies, local demand should continue to rise. The European Union has long provided assistance to the sub-sector, principally through technical and managerial training. In the near future they will fund the construction of additional cold storage facilities, an improved information system and a wholesale market in the environs of Dakar. This should result in substantially increased revenues for market participants.

Small-scale horticultural production merits encouragement. In addition to providing good returns on a per hectare basis, its potential impact is far larger. It provides farmers with an economic activity during the dry season, improves nutrition and is a source of revenue for rural women. Perhaps most importantly, it has the potential to slow the rural exodus and can provide capital to permit cereal and cash crop producers to finance inputs to increase their productivity.

3 3 2 The Regional Market

It is difficult to estimate, with any degree of certitude, the volume of horticultural products exported to neighboring countries. Anecdotal information suggests, however, the exports to Mauritania have increased substantially over the last three years. Statistics for 1994 from EUROSTAT, the statistical office of the European Union, indicate that Mauritania imports considerable quantities of horticultural products from the EU.

Table 3 5 Mauritanian Horticultural Imports (1994)

Potatoes (Holland)	5,576 tons
Onions (Holland)	3,548 tons
Cabbage (France)	786 tons
Tomatoes (Spain)	163 tons
Carrots & Turnips (France)	238 tons
Cucumbers (Spain)	163 tons

Source: Direction de l'Horticulture

The liberalization of the national rice market necessitates a diversification of crop production along the Senegal River Valley. The increased price competitiveness of Senegalese products relative to European imports should provide good opportunities to expand market share. Small quantities of vegetables and fruits are exported to Guinea Bissau and the Gambia but weak consumer purchasing power and the small size of the markets do not hold promise for expanding exports. Although the size of the market is small, Senegal has an opportunity to displace Portugal as the primary supplier to the Cape Verde Islands. Portuguese produce is expensive and of mediocre quality. At present however, no refrigerated maritime transport exists on a regular basis between Dakar and Cape Verde. Among West African coastal nations, Senegal's relatively mild and dry climate provides a great advantage for vegetable production. Its southern neighbors, particularly the Ivory Coast, import large quantities of vegetables from Europe. The total absence of refrigerated maritime transport in the sub-region, however, precludes expansion south.

3.3.3 European Market

Senegal is a marginal player in the European market. Green beans, melons and lantern peppers account for over 80 percent of the country's horticultural exports, primarily to France. An examination of Senegal's market share and its direct competitors is instructive.

Table 3.6 Volume and Market Share of Senegalese Horticultural Exports to the EU (1994)

Product	E U Imports 1994 (tons)	Exporter	Tonnage	Percentage of Market Share
Green Beans	44,077			
		Kenya	12,665	28.7
		Egypt	11,042	25.1
		Morocco	5,364	12.2
		Senegal	3,155	7.2
Melons	101,572			
		Brazil	49,634	48.9
		Israel	13,900	13.7
		Costa Rica	8,353	8.2
		Senegal	933	0.9
Tomatoes (incl cherry)	157,522			
		Morocco	148,297	94.1
		Israel	4,073	2.6

Source: Etude de Diversification et de Modernisation de la Filière Horticole au Senegal. Direction de l'Horticulture.

Senegal's market share is insignificant and its direct competitors during Senegal's growing season are mostly countries who have a long-standing and highly developed agricultural export sector.

Since the 1970s, the potential to export horticultural products to European and North American markets has been vaunted. Several unsuccessful attempts have been made to capitalize on Senegal's inherent advantages: proximity to major markets, adequate infrastructure and favorable climate. In the 1970s, a Dutch-American firm exported large quantities of fruits and vegetables to Europe and North America by boat. High costs of production, notably water, and inefficient customs services forced them out of business. More recently, green beans were exported to the USA but an inability to conform to USDA pesticide application norms resulted in the withdrawal of Senegalese exporters' import licenses. In the late 1980s, cashew nut exports held promise but shipments of poor quality product (unacceptable levels of foreign matter, unripe nuts which break during roasting) effectively closed off market opportunities in Great Britain and France.

The devaluation of the FCFA has once again brought discussions of exports to Europe to the fore. Successful export marketing requires a mastery of production techniques, adequate storage facilities near production areas and at embarkation points, good transport infrastructure (roads, refrigerated trucks), an experienced corps of exporters, an effective quality control agency and a bureaucracy which facilitates timely expedition of product, all of which are currently lacking in Senegal.

Even if some of the above mentioned constraints are overcome, the absence of large production volumes greatly increases maritime and air transport costs. Moreover, export marketing opportunities to Europe have significantly decreased, with the entry of Spain and Portugal into the E.U., the adoption of more stringent quality requirements and the recent increase in import duties for Lomé Convention members. Clearly, European export marketing is destined to remain a footnote in the country's agricultural development.

3.4 THE MILLET SUB-SECTOR

Although millet is the principal locally-produced cereal in Senegal, the sub-sector has been the object of very few recent in-depth studies and is far less well understood than other areas of Senegalese agriculture. This is mainly due to two reasons: millet marketing has been completely liberalized since 1989, only an estimated 10 percent of production enters the marketing stream.

3.4.1 Production Trends

Millet is the one crop which has seen sustained, although modest, increases in production and yields over the last two decades. Increases, however, have not kept pace with population growth. As can be seen in Figure 3.12, yields have varied little over the last eight years, in contrast to groundnut yields.

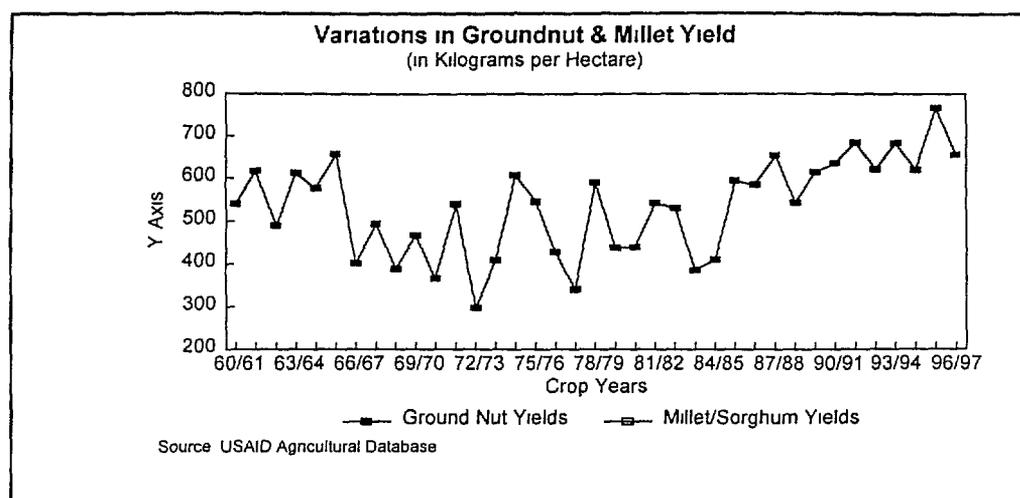


Figure 3.12 Variations in Groundnut and Millet Yields

Productivity, however, has historically been low because of the absence of improved varieties adapted to many of Senegal's agro-climatic zones and the non-application of productivity-enhancing inputs

It is estimated that after the 1994 devaluation, gross, per hectare profit margins for millet increased by 43 percent, much less than the 87 percent increase for groundnuts [Kelly, et al , 1996] The following table taken from Kelly and based on IFPRI/ISRA production data from the Peanut Basin illustrates the greater profitability of groundnuts in all zones except the Center-West

Table 3.7 Comparison of Net Returns to Groundnuts and Millet/Sorghum in Different Zones of the Peanut Basin (FCFA/hectare)

	Overall Sample	North	Center-West	Center	South-west	South-east
Groundnuts	54,666	40,501	34,841	60 847	70 915	59,737
Millet/Sorghum	33,472	14,730	43,356	34,827	37 800	22,946
Ratio Groundnuts/Cereal	1.63	2.75	0.80	1.75	1.88	2.6

During the two years immediately following devaluation, relative higher profitability of groundnuts translated into a 30 percent increase in area planted, accompanied by a 10 percent decrease in arable land used for millet production. During the 1996 cropping season, however, area planted to millet rose while overall production declined. Based on the calculations appearing in Table 3.8, one would

Expect a substantial shift from millet to groundnut cultivation. Figure 3.13 indicates that this has not been the case.

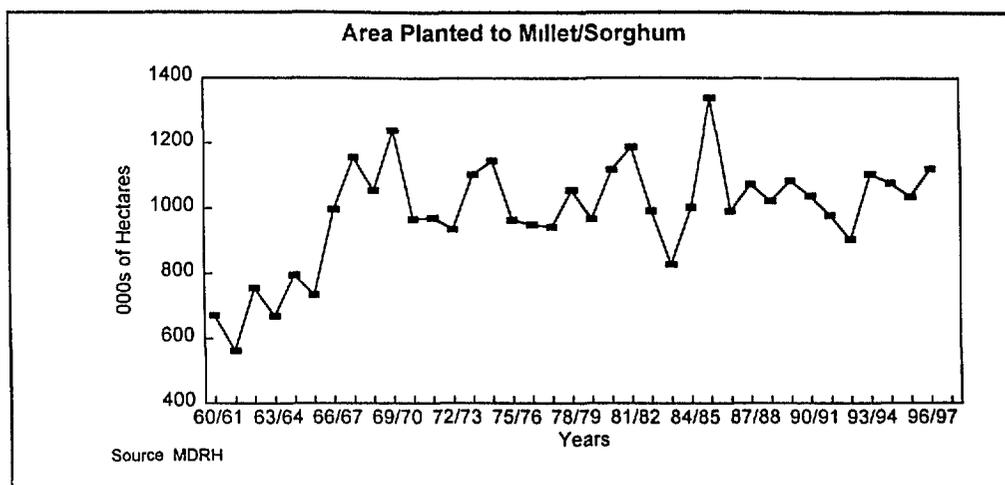


Figure 3.13 Area Planted to Millet and Sorghum

Assuming that official statistics reflect actual trends, it would appear that farmers' decisions regarding the appropriate mix of crops are not dictated solely by potential profitability. The lower inter-annual variability of millet yields compared to groundnuts, food security concerns and cultural considerations are key factors in decisions to allocate resources.

3.5 SUMMARY AND CONCLUSIONS

In the short-term, devaluation and the concurrent liberalization of the rice market has increased the retail price of rice by an average of 23 percent, placing an additional financial burden on Senegal's most financially vulnerable consumer groups. Despite the price increase, anticipated import substitution has not occurred, principally for two reasons: prices for millet meal have also risen, keeping it more expensive on a per kilo basis than the imported alternative, and consumption habits appear to be so deeply ingrained that the price elasticity for rice is extremely low. The withdrawal of the GOS from the purchase of locally produced rice, combined with the increase in input prices, decreased availability of credit, ineffective tariff protection and continuing mediocre product quality, has had a severe impact on production. Rice producers in the Senegal Valley are beginning to diversify into whole grain rice and alternative crops. This is to be promoted as there is little hope for developing a competitive broken rice sub-sector after the expiration of tariff protection.

Devaluation has not stimulated groundnut production, as anticipated, despite higher producer prices. Production and yields have trended downward while area planted during the last seven years has remained stable. Critical factors accounting for this trend are the continuing deterioration of seed stocks, both in terms of quality and quantity, and the decrease in use of fertilizers, pesticides and fungicides as a result of tightened credit restrictions. Farmers have tried to compensate by increasing

seeding rates. While this may present a short-term solution, it will have a severe medium-term impact on soil fertility. The development of the parallel market, while ensuring producers higher prices and greater convenience, has had a strong negative effect on the production of groundnut oil by the GOS parastatal. With plant capacity currently at 30 percent, SONACOS will need to align its producer prices more closely with those of alternative marketing outlets to avoid a continued decline in oil production.

Devaluation has had a beneficial effect on local horticultural production, stimulating substantial import substitution. However, exports have not increased to European markets. This is due to tighter European Union import requirements, stiff competition from countries possessing developed export markets and, with the inclusion of Spain and Portugal, an increased capacity among EU members to produce tropical and off-season products. Although European export prospects are limited, the potential for continued import substitution and increasing exports to neighboring countries is encouraging.

Production and yields of millet have risen slightly over the last seven years but not to levels anticipated by the expected import substitution following devaluation. This is because groundnut production in most regions of Senegal continues to be more profitable. In addition, the high relative cost of millet meal to imported rice has translated into slack consumer demand. In the absence of high yielding varieties and the continued increased profitability of groundnuts compared to millet, production may decrease in the coming years. If so, this will negatively affect soil fertility, as farmers forgo essential crop rotation.

A key to increasing agricultural productivity is to promote demand and facilitate access to inputs. In addition to the need for public awareness campaigns, more appropriate, affordable and sustainable credit schemes and improved input distribution networks, the possibility of using subsidies needs to be examined. The complexity of the subsidy issue and its far reaching policy implications cannot be adequately addressed within the confines of the present agricultural sector update. It must be done within the context of a targeted study which looks at the costs and benefits of different levels of subsidies to society as a whole.

The reform of the agricultural sector is still continuing. The establishment of a new extension agency, decentralization and the reform of the Ministry of Agriculture are now being implemented. Many major structural reforms have occurred recently and their impacts have not yet been fully appreciated. It would seem, however, that the changed sectoral environment has increased potential economic opportunities for Senegal's farmers. To take advantage of these opportunities, much must be done to increase farmer access to certified seed, fertilizer, extension services and stable markets, without recourse to the failed subsidy, pricing and credit policies employed in the past.

CHAPTER 4 AGRICULTURAL CROP PRODUCTION

4 1 INTRODUCTION

The purpose of this chapter is to describe (a) the farming systems in Senegal, (b) the principal agricultural and horticultural crops grown and trends in their production, (c) the main agricultural institutions that support agriculture in Senegal

4 2 OVERVIEW OF FARMING SYSTEMS

4 2 1 Historical Background

The traditional farming system in West Africa involved a shifting form of agriculture colloquially known as *slash and burn*. New fields were prepared by cutting down most of the trees and burning the remaining brush. The farmers then tilled the land and sowed their seeds in June/July at the beginning of the rainy season. When, after a number of years, the land became exhausted the farmers repeated the cycle on new land. Crop yields with this form of agriculture were not as high as with clear cutting because of the shading effect of the trees. However, there were compensating factors such as the fruits, nuts and leaves from the trees and animal foraging which increased the farmers' overall food security.

This form of agriculture was acceptable when the objective was subsistence farming. However, in more recent times, with increased population pressures and a shift to commercial agriculture, a number of changes have taken place in the farming systems. Land has been clear-cut to permit mechanized farming. Then, as population pressure increased, fallow periods were shortened or abandoned altogether in some areas. Furthermore, the decline in rainfall since the early 1960s has resulted in other changes in agricultural practices such as growing different crop varieties and introducing new cropping patterns.

There are three main bioclimatic regions in Senegal. From south to north these are Guinea, Sudan and Sahel. There are two main agricultural production systems in these three regions: rainfed and irrigated. A minor form of recessional farming known as *decrue* is also practised in the Senegal River Upper Valley. While most farmers practice rainfed agriculture due to lack of irrigation facilities, others, in the Bakel area for example, practice all three types of farming.

4 2 2 Rainfed Agriculture

Rainfed agriculture, known as *dieri* in Senegal, is the dominant form of agriculture in Senegal. With the exception of certain cash crops, it usually consists of several crops in a mixture often in association with livestock, particularly small ruminants such as sheep and goats, and chicken. This form of mixed agriculture has benefits that include improving soil structure, stability and fertility due to the incorporation of animal manure in cropped fields, thereby minimizing erosion, conserving natural resources, and improving water holding capacity. The main crops grown under rainfed



agriculture in Senegal are sorghum, millet, maize, rice, peanuts, cotton, cowpeas and cassava. Minor crops include fonio, pigeon peas and bissap.

Prior to the droughts which started in the 1960s, rice was a staple in only a few countries in West Africa: Liberia, Sierra Leone, Guinea and Guinea-Bissau. For many countries, including Senegal, the staple was sorghum and millet. Senegal started importing large quantities of rice to make up for the cereal deficit caused by the drought. Rice is now an important part of the Senegalese diet, especially in the urban centers.

Groundnut and cotton are the two main cash crops grown in Senegal. The introduction of mechanization for groundnut production required extensive land clearing. This clearing of trees is in sharp contrast to the mixed farming adopted by farmers in the production of traditional food crops. The removal of crop residues for animal feed and fuel from harvested fields is a common practice. However, adequate residue to share between groundnut fields and homestead garden plots is not available. Farmers know that this practice reduces the organic content of the soils and they try to maintain the soils by using organic manure when it is available, inorganic fertilizer when they can afford it, and appropriate crop rotations.

Cotton is grown mainly in the more favorable climate and soils in the Casamance and Southeastern Senegal. It is grown in rotation with maize and millet. The cereal crops benefit from the residual effect of the fertilizers applied on the cotton.

Sorghum and millet are the two major coarse grains grown under rainfed conditions. Cowpeas, maize, fonio, cassava, yams, pigeon peas and bissap are also grown. Mixed farming is a risk avoidance strategy to overcome the uncertainties of rainfall associated with rainfed agriculture. Table 4.1 shows certain physiological characteristics of three important cereals grown in Senegal.

Table 4.1 Physiological Characteristics of Maize, Sorghum and Millet

Characteristic	Maize	Sorghum	Millet
Rooting System	Superficial in upper 50 cm	Stronger and deeper than maize	Stronger and deeper than sorghum
Water Required in Growing Period	500-600 mm	400 mm	300-350 mm
Yields with low inputs	1,000 kg/ha	750-1,000 kg/ha	500-750 kg/ha
Yields with high inputs	4,000-5,000 kg/ha	3,000 kg/ha	1,000- 1,500 kg/ha

Source: FAO (1983) modified

The Casamance and Southeastern Senegal are the most suitable areas for growing a variety of rainfed crops in Senegal and also have the most unused arable land [USAID, 1991]. These areas have a better potential than the Peanut Basin for the use of improved technologies. They are also not as densely populated as the Groundnut Basin even though there has been some movement of people from the Groundnut Basin to the Casamance during the last few years.

4 2 3 Irrigated Agriculture

Irrigated crops are primarily grown in the Senegal River Valley. Rice is the single most important irrigated crop. Rice production was started by the GOS because of the large deficits in local cereals brought about by a combination of recurring droughts and population growth. Maize, sorghum, tomatoes, onions, potatoes, and cabbages are also grown in the irrigated perimeters. SODEFITEX, in collaboration with SAED, is exploring the possibility of growing cotton under irrigation in the Valley.

Vegetable gardens and horticultural crop production are quite common around large towns and certain villages close to large centers. There are essentially three different types of gardens:

- Those located around homesteads and watered from wells,
- Small gardens in low lying areas, and
- Those that are situated along the banks of rivers

Joint research efforts by the L'Institut Senegalais de Recherche Agricole (ISRA) and the Centre de l'Horticulture (CDH) have already identified periods by product and region when vegetable production is possible if water were not limiting. The main vegetable periods are between February and June, with some production starting in early January and continuing to August.

The Societe Nationale d'Amenagement et d'Exploitation des Terres du Delta du Fleuve Senegal et des Vallees du Fleuve Senegal et de la Faleme (SAED) was formed in 1965 to promote the organized development of the Valley. Its activities at that time included land and water management, credit provision, input supply, tractor hire services, paddy milling, marketing and technical training of farmers. SAED's current activities are covered later in this chapter.

Three types of perimeters were developed in the Valley with their corresponding management levels as follows:

- 1 Large Perimeters — Some 16,000 hectares of large perimeters were developed of which 11,500 hectares have recently been rehabilitated by SAED. Approximately 78 percent of this area is located in the Delta while the remaining 22 percent is in Podor. A total of 18,000 farm families are associated with large perimeters.
- 2 Private Perimeters — The private perimeters were developed between 1989-93 and are managed by private individuals. They total some 36,000 hectares and about 85 percent of the hectarage is located in the Delta. They were poorly developed in terms of land leveling and drainage which has resulted in high irrigation costs (SAED, 1996).
- 3 Perimetres Irrigue Villageois (PIV) — The PIVs, which total some 16,000 hectares, were developed by SAED between 1970-80 in the mid-valley primarily as a more

secure form of production than rainfed. They were quite heterogeneous in terms of land development and soil types. Many of them were later abandoned by the farmers because of the land development problems combined with the sandy loam soils which have poor water retention properties.

4.3 AGRICULTURAL PRODUCTION

4.3.1 Production of Major Crops

The principal crops grown in Senegal are millet, sorghum, maize, rice, cowpeas, groundnuts and cotton. Table 4.2 shows the total value of each of these crops grown and the percentage that each represents of the total grown. Millet, sorghum and groundnuts are the most important crops grown in Senegal when measured in terms of total value of production. They account for 82.3 percent of total value between them. Maize, rice, cowpeas and cotton account for the remaining 17.7 percent.

Table 4.2 Value of Crops Grown in Senegal, 1995/6 (Billion FCFA)

Crop	Value	Percentage
Millet & Sorghum	103.2	40.6
Maize	16.0	6.3
Rice	18.6	7.3
Cowpeas	4.2	1.7
Groundnuts	106.0	41.7
Cotton	6.2	2.4
Total	254.2	100.0

Source: USAID Statistical Database, Table 7

The following three tables show, for each of the principal crops grown in Senegal, the average area grown, yields per hectare and total production for the periods 1984/5-1989/90 and 1990/91-1995/96.

Table 4 3 Crop Area Under Production, 1984/5-1989/90 & 1990/1-1995/6, (000 ha)

Crop	Average 1984/5-1989/90	Average 1990/1-1995/96	Percentage Change
Millet & Sorghum	1,085	1,023	-5.7
Maize	99	104	5.0
Rice	74	74	0.0
Cowpeas	83	79	-4.8
Cassava	14	19	35.7
Groundnuts	802	869	8.4
Cotton	34	40	17.6
Total	2,191	2,208	3.3

Source: USAID Statistical Database, Table 1

Table 4 3 shows that millet, sorghum and groundnuts comprised 85.7 percent of the total hectareage devoted to agricultural crops in the period 1990/91 to 1995/96. The remaining 14.3 percent was devoted to rice, cowpeas, cassava and cotton. Comparing the two time periods shows that the hectareage devoted to millet, sorghum and cowpeas has declined, and that devoted to maize, cassava, groundnuts and cotton has increased. The average rice hectareage stayed the same in the two time periods. This is due to a rapid rise in rice hectareage in the first half of the second period followed by a rapid decline in rice hectareage in the second half of the second period.

Table 4 4 Crop Yields, 1984/5-1989/90 & 1990/1-1995/6, (kg/ha)

Crop	Average 1984/5-1989/90	Average 1990/1-1995/96	Percentage Change
Millet & Sorghum	641	669	4.4
Maize	1,261	1,122	-11.0
Rice	1,957	2,336	19.4
Cowpeas	408	323	-20.8
Cassava	3,520	2,766	-21.4
Groundnuts	1,047	870	-16.9
Cotton	1,137	960	-15.6

Source: USAID Statistical Database, Table 4

Table 4 4 shows that, for the period 1990/1-1995/6 as compared to the period 1984/5-1989/90, yields increased for millet, sorghum and rice but decreased for maize, cowpeas, cassava, groundnuts and cotton. It was reported that cotton yields may have declined in the SODEFITEX region because some farmers are selling their fertilizers to others who may not necessarily be applying it to the cotton crop.

Table 4 5 Crop Production, 1984/5-1989/90 & 1990/1-1995/6 (1,000 metric tons)

Crop	Average 1984/5-1989/90	Average 1990/1-1995/96	Percentage Change
Millet & Sorghum	702	686	-2.3
Maize	124	117	-5.6
Rice	146	173	18.5
Cowpeas	37	28	-24.3
Cassava	48	52	8.3
Groundnuts	778	697	-10.4
Cotton	39	39	0.0

Source: USAID Statistical Database, Table 2

Table 4 5 shows that average production for the period 1990/1-1995/6 when compared to the period 1984/5-1989/90 increased for rice and cassava but declined for millet, sorghum, maize, cowpeas and groundnuts. Again, the rice data are somewhat misleading in that production increased in the first part of the second period and then declined drastically in the second part of the second period.

4.3.2 Cultural Practices

RICE is grown in five different ways in Senegal:

- 1 Upland or plateau,
- 2 Shallow-flooded freshwater or bas-fonds,
- 3 Deep-flooded,
- 4 Mangrove swamp, and
- 5 Irrigated

- 1 Upland Rice — Upland rice is grown like any other cereal crop. It receives moisture entirely from rainfall and requires about 400-700 mm of rain during the growing season. Soils range from sandy loams to loams. The crop duration for the appropriate varieties range between 90-120 days with the improved varieties tending to be at the lower end of the spectrum. The Senegalese Institute for Agricultural Research (ISRA) station at Sefa in the Casamance, in

- collaboration with the West Africa Rice Development Association (WARDA) has identified higher yielding varieties than the local ones that are currently grown by farmers
- 2 Shallow-flooded Freshwater Rice — This type of rice cultivation is limited to shallow-flooded swamps or valley bottoms that derive their moisture from a combination of rainfall, streams and run-off from the upland areas. They are found mainly in the Casamance area. A FAO report (1981) stated that these areas are the most productive or suitable for rice and vegetable crop production. Their agricultural potential is derived from a combination of their
 - Native clay loam and hydromorphic soils,
 - Year-round inundation, thereby ensuring the crop of moisture and certain plant nutrients usually not available under upland conditions, and
 - Fertility brought in by flooding from streams and erosion from the uplands
 - 3 Deep-flooded Freshwater Rice — This rice is cultivated in bowl-shaped depressions along streams and is limited to the Ziguinchor area. The rice is sown by broadcasting the grains on moist ground or is transplanted when farmers are late in sowing the seed. Moisture is derived from streams and run-off from the higher uplands
 - 4 Mangrove Swamp Rice — This rice is grown mainly along coastal estuaries in the Casamance. Transplanting of approximately 30 day-old seedlings is the exclusive means of growing this type of rice. It is essential that (a) the soil be continuously flooded except for brief periods of low tide, and (b) the rice be able to withstand some degree of salinity and acidity. Farmers usually transplant a few seedlings randomly in different parts of the fields periodically to determine if it is safe to transplant the full crop
 - 5 Irrigated Rice — Despite the large investments in irrigated rice production, yields have increased but remain relatively low. This problem has been further aggravated by low cropping intensities which averaged 1.2 (SAED, 1996). The problems are both technical and managerial and include
 - The total number of perimeters developed per annum, rather than their quality, was the criteria for success for SAED which resulted in large, poorly developed, and unevenly leveled plots with inadequate water control in the large centrally-managed perimeters,
 - Many of the private perimeters were also poorly developed,
 - The direct seeding method adopted by farmers, rather than transplanting, combined with frequent irrigation pump breakdowns, results in dry, weed infested plots whose yields are, as a consequence, reduced by as much as 80 percent,
 - Irrigated rice production is a relatively new technology in Senegal for which neither the majority of SAED extension agents nor the farmers possess the know-how and strict discipline required by irrigated rice culture,

- Several donors intervened in the Valley without adequate coordination of activities or a sustained long-term program, and
- The different rice varieties grown are often all mixed after harvest and grain moisture content is often not at optimum levels prior to milling, resulting in less rice recovered and more broken grains which is then sold as a single grade

There are a number of techniques for increasing rainfed crop production, including rice. These are

- Increased use of improved varieties combined with a complete "package of improved practices",
- Soil and water conservation practices including contour bunding, and
- Increased use of animal traction for land preparation, seeding and weeding

The technologies for most of these activities are already available and have been adopted by some farmers. Table 4.6 shows that the adoption of these improved technologies can result in impressive increases in yields.

Table 4.6 Rainfed Rice Yields in SZWMP, 1992-94, (kg/ha)

Variety	1992	1993 UB	1993 B	1994 UB	1994 B
IRAT 10	2727	995	2633	2454	NA
DJ 12519	3125	789	3242	2908	3495
I Kong Pao	2909	537	2841		
DJ 684D	2250*	472	3211		
ROK 5	2297*	1751	3211	NA	3041

Source: Louis Berger International, 1996

Notes: NA Cultivation practice not adopted
 B Bunded
 UN Unbunded
 * Some plots had salinity problems

The three-year average yield of the upland improved variety IRAT 10 is 2,202 kg/ha as compared to 1,158 kg/ha for 1990-1995 for the Casamance as a whole. Using the 2,202 kg/ha IRAT 10 yields alone, the production would have been 103,000 metric tons. Assuming a 20 percent adjustment in yields, which is necessary to compensate for the fact that farmers produce more under supervision, the production would still be 83,000 metric tons of paddy rice. This clearly suggests that improvements in rainfed crop production can be obtained using an aggressive dissemination of improved production methods to small-scale farmers using the national extension service. However,

the Senegalese extension service is fragmented, constrained by lack of transport and its agents need training. Other constraints include lack of seed and credit.

The USAID-financed Southern Zone Water Management Project (SZWMP) has undertaken a number of activities upon which to build possible future programs. These include:

- Reclamation of 22 valleys covering 10,200 ha in 1995 and training farmers,
- Setting-up 88 contour demonstration plots for rice production in collaboration with ISRA, NGOs and farmers organizations (Organisations Paysannes),
- Preparation of 560 compost pits, and
- Constituting 176 water management committees in 183 villages

Rice is the main crop grown in the irrigated perimeters of the Valley. Maize, sorghum and millet are also grown under irrigation. The following three tables compare the average areas grown, yields and production of these crops for the period 1985-89 and 1990-1995.

Table 4.7 Average Area of Selected Crops Grown in the Valley, 1985-89 and 1990-95, (000 ha)

Crop	Average 1985-89	Average 1990-95	Percentage Change
Rice	15.5	22.7	46.5
Maize	2.9	0.8	-72.4
Sorghum & Millet	21.1	25.3	36.5

Source: USAID Statistical Database

Table 4.7 shows that the annual average area planted to rice, sorghum and millet increased significantly in the period 1990-95 over the period 1985-89. This increase was 46.5 percent in the case of rice and by 36.5 percent in the case of sorghum/millet. As noted earlier, the area planted to rice decreased drastically in the last few years (see Figure 3.2). The area planted to maize has decreased significantly in the second period when compared with the first period. The overall increase in cultivated area in the Valley may be attributed to the development of private irrigated perimeters between 1989 and 1993 in response to increased availability of credit. The decrease in cultivated areas, which started in 1994, was the farmers' response to reduced availability of credit (SAED, 1996).

Table 4 8 Average Yield of Selected Crops Grown in the Valley, 1985-89 and 1990-95, (kg/ha)

Crop	Average 1985-89	Average 1990-95	Percentage Change
Rice	4,622	4,687	1 4
Maize	2,158	1,843	-14 4
Sorghum & Millet	555	256	-53 9

Source USAID Statistical Database

Table 4 8 shows that for rice, the average yield in the period 1990/1-1995/6 was up 1 4 percent when compared to the average yield for the period 1985/6-1989/90. By contrast average yields for maize, sorghum and millet declined significantly. The decline in yields is large due to the reduction in available credit which makes buying inputs more difficult.

Table 4 9 Average Production of Selected Crops Grown in the Valley, 1985-89 and 1990-95, (000 metric tons)

Crop	Average 1985-89	Average 1990-95	Percentage Change
Rice	71 7	106 2	48 1
Maize	6 3	1 5	-76 2
Sorghum & Millet	11 7	6 8	-41 8

Source USAID Statistical Database

Table 4 9 shows that average annual rice production increased by 48 percent in the period 1990-1995 over the average annual rice production in the 1985-1989 period. Rice production increased enormously at the end of the 1980s and then has decreased significantly every year in the 1990s. Production of maize, sorghum and millet have all decreased in the first few years. The declining trend in rice production over the last five years can be attributed to lack of credit and the inability of farmers to sell what they are producing (SAED, 1996). Farmers need to grade their rice so that the better quality rice will command a premium price. The whole grain rice can be sold in the urban centers of Senegal and to Senegal's southern neighbors.

Rice, maize and sorghum are also grown in the SODAGRI zone but rice yields are quite low. With a credit from the West African Development Bank, 4,000 hectares in the SODAGRI zone will be rehabilitated for the production of two irrigated crops per year. Because of its location in the higher rainfall area, the cost of irrigation should be lower in the SODAGRI zone than in the Valley because less irrigated water will be required.

Table 4 10 Rice Yields by Types of Perimeter in Senegal Valley (mt/ha)

Type of Perimeter	Average Yields
Ancient, not rehabilitated	3 0
Extended large plots	3 5
Private Perimeters	3 7
Unrehabilitated perimeters	3 7
Rehabilitated and transferred	5 0

Source SAED, 1996

Table 4 10 shows that rice yields can be increased quite significantly if the perimeters are properly prepared and if the correct technology packages are used

Irrigated agriculture has the highest yield potential in Senegal because the crop is assured optimal moisture. However, irrigation culture is quite labor intensive particularly in the case of rice. It requires a number of essential prerequisites that must be in place and at the right time. They include:

- Proper land development,
- Proper construction of irrigation inlet and drainage canals,
- Proper land preparation, leveling and puddling to provide good water control,
- Adequate amount of standing water in the paddies,
- Well trained extensionists and self-disciplined farmers, and
- Reliable input/output marketing arrangements

The Green Revolution in Asia was based mainly on the development of the irrigated rice varieties IR8 and IR36 by the International Rice Research Institute (IRRI) in the Philippines. Currently, approximately 60 percent of the total area in rice in the U.S. are cropped in varieties with IRRI ancestry according to a recent study by the International Food Policy Research Institute (IFPRI) in Washington, D.C. In West Africa most of the rice varieties grown in irrigated perimeters are also of IRRI ancestry and have given comparable yields to those in the Philippines in WARDA trials in Senegal. This points to the fact that in principal, irrigation can be as productive in the Valley as it is elsewhere in the world.

Donors and SAED have probably not tried hard enough to test "packages of technologies" as was done by IRRI in Asia using pilot farmers. Crop diversification (rice, horticultural crops, etc.) and double cropping are necessary to optimize the productivity of irrigated agriculture. Developing an agricultural technology takes time. It requires testing and refining with participation of agronomists, economists, etc. Once the technology is demonstrated to work and be cost-effective, it could then be replicated throughout the Valley.

4 4 HORTICULTURE AND FRUIT PRODUCTION

Annual horticultural and fruit production for the period 1987-96 is shown in Table 4 11 This table shows that horticulture has been one of the more dynamic sectors in agriculture during the last decade Both horticultural and fruit production have increased year over year during this period Horticultural production increased from 120,000 metric tons in 1987 to 175,000 metric tons in 1996 and fruit production increased from 95,000 metric tons to 120,000 metric tons during the same period The rate of growth has accelerated somewhat since devaluation because imports declined and because exports increased

Table 4 11 Horticulture and Fruit Production in Senegal, 1987-96, (000 metric tons)

Year	Horticulture	Fruits	Total
1987	120	95	215
1988	125	90	215
1989	121	114	235
1990	136	108	242
1991	142	101	243
1992	152	103	255
1993	154	107	261
1994	148	112	260
1995	155	118	273
1996	175	120	295

Source CDH

Table 4 12 Production of Horticultural Crops in Senegal, 1996, (000 metric tons)

Crop	Total
Tomato	35
Green Bean	5
Okra	7
Potato	13
Peppers	2
Eggplant	4
Onion	65
Water Melon	20
Cabbage	13
Other	11
Total	175

Source CDH

Table 4 12 shows that onions, tomatoes and water melons are the three most important fruits grown in Senegal. Between them they made up 68.6 percent of total production by weight in 1996. The remaining 31.4 percent was made up of green beans, okra, potatoes, peppers, eggplant, cabbage and a small amount of other products. Yields of these products could be improved through a combination of good extension services and superior cultural practices.

Table 4 13 shows that fruit production is dominated by mangoes, citrus and bananas. The production of a larger quantity of "ordinary" mangoes than "grafted" mangoes suggests the need for CDH, ISRA and extensionists to assist Senegalese fruit producers in procuring more improved fruit trees which are generally more prolific and produce superior quality fruit.

Table 4 13 Fruit Production in Senegal, 1996, (000 metric tons)

Crop	Total
Ordinary Mango	46
Grafted Mango	28
Ordinary Citrus	12
Grafted Citrus	20
Banana	8
Other	6
Total	120

Source: CDH

Marketing arrangements for vegetables vary depending to a large extent on their destination. For example, the marketing arrangements of green beans for export are better organized than for those destined for the local market. The production of avocados, plantains, cashew and papayas can be expanded were CDH/ISRA to provide technical assistance to producers.

The Valley has a great potential for the production of a wide range of horticultural crops because of ideal temperatures during the cool season (November-March). Vegetables are a high value crop and do not require standing water or large areas. They can provide both food and cash for farmers. Climatic conditions in West African countries south of Senegal and along the coast do not favor the production of vegetables. These countries import most of the vegetables they consume. The possibility of exporting vegetables to these neighboring countries should be explored as the quality requirements of these countries are less exacting when compared to the western markets. Crops such as dried peppers, green beans and bissap can be targeted at the western markets. Bissap has an export potential, particularly with the interest in organically grown foods and drinks in the U.S. and Europe.

Bananas and plantains can be grown around the irrigated perimeters. They produce all-year-round and will also serve as wind breaks thereby reducing soil erosion and water loss through evapotranspiration. Moreover, the dead leaves can be incorporated in the irrigated plots to improve soil structure and fertility. Birds, often major pests in the Valley, do not nest in banana plantations. Crop diversification would help maximize the productivity of the irrigated perimeters in which large investments have already been made.

Increased vegetables production in the Niayes through irrigation from wells may also have increased potential but requires further study by the ISRA/CDH Farming Systems Research team in terms of environmental impact

4 5 AGRICULTURAL INPUTS

4 5 1 Agricultural Equipment

The Societe Industrielle Sahelienne de Mecaniques de Materiels Agricoles de Representations (SISMAR) is the primary producer of agricultural equipment in Senegal Table 4 14 shows the production capacity and sales of various agricultural equipment for the period 1991-1997 These data show that actual production is only a small percentage of capacity for all types of equipment The data also show that output has increased in the last three years This finding is counter intuitive because the deteriorating credit situation would argue for just the opposite

Table 4 14 Capacity and Sales of Agricultural Equipment by SISMAR, 1991-1997, (000 units)

Equipment	Capacity	1991	1992	1993	1994	1995	1996	1997
Seeder	10 0	1 0	1 5	1 5	3 0	3 2	3 5	3 5
Plow	5 0	0 1	0 1	0 1	0 2	0 2	0 5	1 0
Tiller	22 0	2 0	2 0	2 8	4 0	5 0	5 5	7 0
Cart	20 0	0 5	0 7	0 8	0 9	1 4	2 2	3 5
Sheller	1 3	0 1	0 2	0 8	0 2	0 2	0 3	0 3
Mills	0 5	N/A	0 1	0 1	0 1	0 1	0 1	0 1

Source SISMAR

4.5.2 Seed

Prior to the introduction of the recent structural adjustment programs in Senegal, the Service Semencier in the Ministry of Agriculture was the primary producer of seeds in the country. The provision of seeds is now the responsibility of the private sector under the auspices of the Union Nationale Interprofessionnelle des Semenciers (UNIS). UNIS comprises a mixture of private individuals and groups of farmers. ISRA supplies breeder and basic seed to UNIS.

Table 4.15 Quantity and Price of Available Seed in UNIS in 1997

Crop	Metric Tonnes	FCFA/kg
Groundnut	52,000	170
Rice	1,500	250
Maize	15	300
Millet	20	350
Sorghum	6	400

Source: UNIS

Good quality seed is basic in any "package of practices" designed to increase crop production. Good seed gives seedlings a vigorous start by providing food and some resistance to certain unfavorable soil and climatic conditions such as found in the Groundnut Basin. All improved seed are in short supply but the problem is especially acute with seeds for staple crops.

4.5.3 Fertilizer

Table 4.16 Fertilizer Use in Senegal, 1991-96, (Metric tons)

Cropping Season	USAID Estimate	SENCHEM Estimate
1991	26,762	33,086
1992	30,445	41,595
1993	47,020	51,595
1994	38,600	38,600
1995	NA	30,701
1996		32,437

Sources: USAID and SENCHEM, 1996

Table 4.16 shows that fertilizer use in Senegal has dropped since 1993. This decrease in use results from (a) the increase in the price of fertilizer as a result of the FCFA devaluation, and (b) the unavailability and high cost of credit.

4.6 AGRICULTURAL RESEARCH

4.6.1 Institut Senegalais de Recherche Agricole (ISRA)

ISRA was established in 1974 as a public research institution responsible for all agricultural research in Senegal. Its mandate covers crops, livestock, forestry and fisheries. ISRA's primary function is to conduct adaptive research on production, resource management and on-farm post-harvest problems. In addition, food processing technology research is done by the Institut de Technologie Alimentaire (ITA) of ISRA. ISRA also carries out some applied research and produces and supplies breeder seed, vaccines, and improved stock as well as technical bulletins and publications of its research findings (USAID, 1991).

ISRA has a total of 120 Senegalese researchers and 30 expatriates. The organization depends largely on external funding for the implementation of its programs. The research is implemented in strategic national commodity research centers with each having a multidisciplinary team of scientists. ISRA also collaborates with a number of regional and international research centers of which the main ones are

- 1 West Africa Rice Development Association (WARDA),
- 2 Semi-Arid Food Grains Research and Development (SAFGRAD),
- 3 Comite Inter-etat de Lutte Contre la Secheresse au Sahel (CILSS),
- 4 International Institute of Tropical Agriculture (IITA), and
- 5 International Research Center for the Semi-Arid Tropics (ICRISAT)

Such collaboration provides ISRA with (a) direct access to current state-of-the-art knowledge on how to structure breeding programs, and (b) materials for testing.

Even though ISRA has developed or identified a number of improved varieties, along with viable complementary agricultural technologies that are suitable for adoption by Senegalese farmers, several donors have expressed concerns with regards to

- ISRA's financial management of resources,
- Relevance of some of its research programs to farmers,
- Collaboration with extension agencies and farmers, and
- Ability to transfer relevant results to farmers

It is in light of the above that the USAID-financed Natural Resource Based Agricultural Research (NRBAR) Project was conceptualized and awarded to the Consortium for International Development

(CID) for the period 1991-98. The NRBAR addresses Senegal's need for (a) low-cost natural resource based agricultural (NRBA) technologies so as to improve the productivity of agricultural systems, and (b) for ISRA to have a viable institutional capacity to carry out NRBA research (ISRA, 1995).

The NRBAR's research focus is on cereals-based cropping systems in those areas with more than 400 mm of rainfall per annum. The project is managed by CID. ISRA prepares programs and submits them to CID for financing. Among the main accomplishments of the NRBAR are the following:

- Reinforcing the capacity of ISRA/ITA to evaluate programs jointly with extension agencies (PNVA), PVOs and farmers (Conseil National de Concertation et de Coopération des Ruraux (CNCR)),
- On farm research on compost preparation, agro-forestry and livestock,
- Ph.D training for researchers in agricultural economics, agricultural engineering, forestry management, livestock sciences, and water and soil sciences,
- Training 10 Senegalese at the M.S. level in soil and aquatic sciences, veterinary sciences, agronomy and meteorology, and
- Developing database to manage manpower resources at ISRA.

The Comité Régional de Prospection et de Planification Stratégique, comprising members from the research, extension, and farmer communities, is currently completing a strategic plan for the period 1997-2003 based on an in-depth analysis of the country's production constraints. The plan will be submitted to the Government of Senegal for consideration and financing. Another project at ISRA, financed by the World Bank, is the Agricultural Research II Project which is working on (a) prioritization of projects, (b) strengthening of research-extension linkages, (c) research planning, (d) financial management, and (e) testing at the farm level the various technologies that were developed by ISRA in Phase I of the project.

As a result of these interventions, ISRA is working more closely with the extension agencies and farmers than ever before. However, there are still a number of constraints that limit ISRA's effectiveness, including:

1. ISRA's heavy dependence on outside funding which sometimes leads to unsustainable programs,
2. ISRA's somewhat bureaucratic administration which provides no mechanism for attracting, rewarding or maintaining productive personnel,
3. The need for ISRA, the Universities and training schools in the country to work harmoniously in solving Senegalese problems as a whole, and
4. Insufficient funding from national sources.

4.6.2 Centre de Developpement de l'Horticulture

The Centre de Developpement de l'Horticulture (CDH) is in the Ministry of Agriculture and was created for the purpose of developing the production of fruits, vegetables and flowers in Senegal. The Horticulture Directorate within the Ministry of Agriculture coordinates these activities and works with the various growers, ISRA, and the PNVA in defining programs, and providing technical and extension assistance to the growers. A variety of training programs are conducted for both the extensionists and the farmers, horticulturalists and fruit growers with joint participation of ISRA/DA/CDH. For example, a training seminar, sponsored by private growers, was recently conducted on dealing with the problem of nematodes. Private growers have also sponsored similar training programs on subjects which they themselves have identified as problem areas. Both the CDH and ISRA hold weekly meetings with the growers to discuss and try to resolve problems. A master plan covering the period 1995-2015 was prepared with joint participation of the institutions mentioned above.

4.7 NATIONAL AGRICULTURAL EXTENSION

As in many other countries, agricultural extension in Senegal is at the center of agricultural technology and information transfer to the farmers. Agricultural extension in Senegal consists of two broad categories: (a) pure agricultural information transfer (production, farm management, marketing, processing, and community development) and (b) agricultural technology transfer (inputs to farm production, agricultural implements, marketing and processing equipment) (World Bank, 1994).

The agricultural extension service in Senegal is both fragmented and compartmentalized, thereby leaving a large number of farmers with little or no extension assistance. There are several suppliers of agricultural extension services, including the Directorate of Agriculture, Rural Development Agencies (RDA), the National Agricultural Extension Program and non-governmental organizations. They are discussed below.

The Directorate of Agriculture (DA), under the Ministry of Agriculture, is the main national agricultural extension service in Senegal. It consists of the following five divisions:

- Actions and Programming,
- Seed Control and Certification,
- Agricultural Statistics,
- Soils, and
- Administration and Finance

The Actions and Programming Division is in charge of extension in Senegal, and has the following sections: (a) project monitoring and evaluation, (b) training, and (c) equipment and infrastructure. It is this division that works closely with the World Bank-financed National Agricultural Extension

Program (PNVA) The Actions and Programming Division also provides early warning indications for possible food deficits based on crop assessments Training for both extensionists and farmers is conducted by the Training Division The Projects Monitoring Division follows-up on the execution of extension related projects

The Seed Control and Certification Division is responsible for the control and certification of all seeds in the country The Agricultural Statistics Division is in charge of collecting agricultural production statistics The Soils Division classifies soils according to types and usefulness The five administrative divisions set-up at head office is also found at the Regional level

The DA's relationship with the Senegalese Institute for Agricultural Research (ISRA) is said to have improved since the commencement of the PNVA project in 1990 Since then, both services jointly participate in the annual planning of programs Regional Committees with representatives from ISRA, DA, RDAs, forestry, livestock and farmer groups meet twice a year to evaluate the previous season's program and plan the program for the next season The DA is constrained by a number of factors that have limited its effectiveness in delivering agricultural information to the farmers They include

- Limited transportation at all levels making field visits difficult,
- DA depends essentially on the good-will of the PNVA for financing, and
- The Seed Control and Certification division is limited in manpower, infrastructure and mobility to fulfil its vital function of ensuring that farmers receive good quality seeds for both field and horticultural crops

4 8 REGIONAL DEVELOPMENT AGENCIES

These parastatal agencies were created to cater for specific regions and crops but with a wide range of activities that included land development, provision of credit, input supply, tractor hire services, marketing and technical training of farmers However, many of those functions have been passed on to the private sector since the introduction of the structural adjustment program

4 8 1 SAED

SAED was created in 1965 as a public enterprise to promote the organized development of the Valley Its activities at the time included land and water management, provision of credit, input supply, tractor hire services, paddy milling, and marketing and technical training of farmers Since 1981, the role of SAED and the commitment of the GOS to SAED have been defined in three year contracts by Mission Letter (Lettre de Mission) The GOS and donors provide financing to SAED to enable it to perform its integrated rural development activities in the Valley These functions include (a) monitoring of production, (b) providing advice and training sessions for farmers, (c) collecting agricultural statistics, and (d) carrying out surveys

SAED also assists farmers in the formation and strengthening of farmer groups for the purpose of carrying out agriculture related activities such as credit, provision of input, and output marketing. The objective is to bring selected members to a level of knowledge that will enable them to perform extension activities within their group.

The streamlining of SAED was completed in 1994 resulting in a significant reduction in personnel. Seventy percent of the remaining personnel are technicians in the following fields: agronomy, zootechnics, food nutrition, engineering and topography, economics and sociology, documentation and training.

SAED is headed by a Director and a Deputy Director in charge of technical coordination and operational activities. Next are three directorates as follows:

- Administration and Finance,
- Land Development and Water Management, and
- Planning and Rural Development

Field level operations are found in four departments: Dagana, Podor, Matam and Bakel. The actual implementation of extension services is done by Extension Agents who advise individual farmers and farmer groups involved in irrigated agriculture. SAED extension lacks extension specialists who link research and extension and who can deliver appropriate "packages of practices" that make irrigated agriculture along the Valley economically viable (USAID, 1991). Although SAED collaborates with other RDAs, the cooperative relationship is probably closest with WARDA, the regional organization that is the main source of improved irrigated rice varieties in West Africa. The withdrawal of SAED from the provision of credit has constrained increased irrigated crops production.

4.8.2 SODEFITEX

SODEFITEX was created in 1974 and charged with the production and marketing of cotton in the southern part of Tambacounda, all of Kolda and part of Kaolack. This RDA has about 200 extensionists and 100,000 farm families comprising 300 production associations that are relatively well organized. SODEFITEX enjoys French technical assistance and implements an integrated approach to production by combining cotton, cereal, livestock and vegetable production. The latter is grown mainly by women.

SODEFITEX extension agents (EAs) disseminate "technical packages" and train farmer groups, mainly in agricultural and rural literacy. Some EAs receive training from the *Ecole des Agents Techniques d'Agriculture* located in Ziguinchor, in addition to in-service training from highly trained section chiefs who upgrade their level of competence.

SODEFITEX plans to increase cotton production substantially through the institution of an intensive cultivation that will combine timely planting through the use of AT, use of organic manure and chemical fertilizers, and adequate planting density. The possibility of producing cotton under irrigation in the Valley is being explored through demonstration plots in collaboration with SAED. SODEFITEX officials have asserted that production will be raised from slightly over 46,000 metric tons in 1997 to a forecast 60,000 metric tons in 1998 and 100,000 metric tons by the year 2000.

Breeder seed for cotton is produced by ISRA with some financing from the Caisse Française pour le Développement. The structural adjustment programs have had less effect on SODEFITEX than on the other RDAs.

4.8.3 SODAGRI

SODAGRI is also a mixed rural development agency created for the development and management of the Anambe Basin in Kolda for irrigated rice production. The objective is to develop 5,000 hectares in total. During the phase I period (1982-92), 1,355 hectares were developed and another 2,500 hectares have been developed in phase II, following the construction of the Niandoula barrage. Four pumping stations and one rice mill have also been installed. Like SAED, SODAGRI's activities were reduced to only land development, extension, and training of farmers following the structural adjustment program.

ISRA and SODAGRI have recently signed a research & development protocol of understanding for activities on water management and agroforestry. Reduced accessibility to credit for inputs such as seeds, agricultural implements, and fertilizers is impeding increased crop production in the SODAGRI zone.

4.8.4 Societe de Developpement et de Vulgarisation Agricole

Societe de Developpement et de Vulgarisation Agricole (SODEVA) was created in 1968 for improving agricultural production in the Groundnut Basin. However, it currently has no operating budget and is undertaking no activities at present.

4.9 OTHER EXTENSION AGENCIES

4.9.1 Private Voluntary Organizations

There are approximately 181 PVOs or NGOs registered with the Ministry of Social Development. They comprise both foreign and local organizations with many of the former serving to strengthen the capacity of the latter to function (Wilcock, 1997). The Federation of Senegalese NGOs is the largest of the local NGOs. The foreign PVOs in turn are categorized into American and European. A certain number of these PVOs pursue agricultural development activities. However, the Ministry of Agriculture (MOA) has neither the capacity nor the means to coordinate these organizations'.

programs This sometimes leads to certain NGOs independently setting-up and operating unsustainable programs such as giving out free inputs without consulting the national extension service This gives the recipients a dependence on hand-outs Some may even recruit their own extension agents However, many of these PVOs are generally quite experienced and skillful in working with and developing community-based type of activities with farmers and villages at low-cost Some representative PVOs and a brief description of their activities follows

Africare Africare is a U S -based private, non-profit organization that seeks to improve the quality of life in Africa, mainly in the areas of agriculture, water resource development environmental management, health and emergency humanitarian aid (Africare, 1995)

The USAID-financed Kaolack Agricultural Enterprise Development Program (1992-97) is an \$8 million five-year activity for food production and revenue generation for rural groups in the Kaolack region of Senegal (Africare, 1997) The project incorporates elements of sustainable natural resource management through the setting-up of 4 hectare demonstration plots The project also does water management and soil erosion control activities The accomplishments to date include

- Planting 53 live hedges, 180 windbreaks, 260 field trees,
- Constructing 18 anti-erosion dikes, 74 compost pits, 22 nurseries, and 122 improved housing units, and
- Organizing 15 out of 56 anticipated microenterprise groups (80 percent women)

Environment and Development Action Environment and Development Action (ENDA) is an international NGO that was founded in 1972 in Stockholm at the first World Conference on the Environment The Senegal branch has now acquired a local independent status with its head office located in Dakar Major activities are in the areas of health, energy, education and agriculture The Systeme Prospective (SYSPRO) is the research department of ENDA and is headed by an agronomist graduate from the University of Minnesota ENDA targets young people as its farmers because of the large number of unemployed youth in Senegal and the fact that most of them can read That makes it easier for them to adopt new innovations such as intensive cultivation, alley cropping, and crop diversification It is estimated that approximately 80 percent of the vegetables exported from Senegal are produced from ENDA supervised farms The NGO has also published two books, one on health, population and development in Africa and the other on AIDS

The NGOs face the same kinds of problems that the national and regional extension services face inadequate financing, lack of credit, and difficulty in locating new markets for horticultural products

4.9.2 Programme National Vulgarisation Agricole

The Programme National Vulgarisation Agricole (PNVA) is a World Bank-financed project that commenced in 1990 with two broad objectives

- 1 Introducing the Training & Visit (T&V) method of extension in Senegal, and
- 2 Coordinating and strengthening the field operations and implementation of extension programs in Senegal

The PNVA has a total of 53 people, is headed by a director and has four divisions: Research & Development, Extension, Training and Monitoring and Evaluation.

The T&V approach to extension was developed in India and is based on the use of contact farmers within a group of farmers by the extension agent (EA). The EA is assigned a given number of groups of farmers (10-20 farmers per group). Each group has a contact farmer that the EA works with regularly. This farmer in turn passes on the information he receives to the rest of the group. The EAs receive training on selected agricultural themes such as line sowing, planting density, and fertilizer application every 15 days from Subject Matter Specialists (SMS). The EAs in turn carry out demonstrations to the farmers' groups. The rationale is that EAs cannot reach all farmers at the same time. Therefore, it is easier to work with groups. This method has not been as successful in Africa as it was in India. African countries, where it has been introduced by the World Bank, have tried to modify the approach to suit their needs.

In implementing its program, the PNVA and the various institutions signed a memorandum of understanding whereby the former basically provided the latter with the means to implement agricultural extension field programs (financial & logistics). The PNVA has a national coordinator plus 4 technicians, representing the 4 PNVA divisions in each of the cooperating institutions. At the field level are Regional Coordinators, Technical Specialists, Supervisors and Village Extension Agents. All receive a monthly allowance and coordinators are provided with a vehicle while the rest have motorcycles. There are also *Centre d'Expansion Rural* which carry out administrative and extension functions in agriculture, livestock and forestry but are placed under the Ministry of the Interior for administrative purposes. The target of the PNVA was to cover 50 percent of Senegalese villages. Thus far, 23 percent coverage has been achieved involving 33 percent of all farm families.

The major accomplishments of PNVA include (a) improved mobility and strengthening technical capability of RDAs extensionists, (b) improved research-extension linkage through training of extensionists by researchers on management of multilocational trials, (c) creation of an awareness among farmers on the availability of extension information by way of farmer field days, (d) rural training programs, (e) use of organic manure, and (f) introduction of improved varieties of groundnut and rice.

Despite the progress that has been made, a number of constraints still remain (a) PNVA has too many institutions to deal with and has insufficient control over their personnel, (b) PNVA has no field staff at the regional level so that head office staff have to make frequent field visits, (c) extensionists are often involved in too many activities which diminish their effectiveness, and (d) farmers adoption of introduced technologies is being impeded by lack of affordable credit

4 9 3 Farmer and Private Sector Organizations

There are a number of farmer groups and associations in Senegal Individual members are united by the different purposes determined by the group Some of them become well structured for community development activities such as agricultural, management of groundnut seed stores and village stores, and the production of charcoal These latter groups operate in the form of Groupement d'Interêt Economique (GIE)

4 9 3 1 Service Co-operatives

Service co-operatives are non-political associations comprising 50 or more individual farmers or members Their main function is to help their members in (a) the acquisition of credit for the purchase of inputs, and (b) the production and marketing of produce

4 9 3 2 Conseil National de Concertation et de Cooperation des Ruraux

The Conseil National de Concertation et de Cooperation des Ruraux (CNCR) is a federation of about nine farmer groups and village associations whose objective is to share problems and present their positions on development issues to the GOS The membership fee is 1,000 FCFA, one third of which is ear-marked for credit acquisition The CNCR has been active in a number of ways, including (a) the PNVA program, (b) elaboration of the ISRA strategic plan, (c) negotiations with the GOS aimed at lowering credit interest rates, and (d) development of project proposals for funding by international and PVO organizations Their ultimate objective is to attain a level of competence whereby certain members of the group will be able to perform extension services, including produce marketing for its members They are concerned about problems such as poor quality seeds and the inability of the Seed Control and Certification division of the DA to fulfil its vital role due to lack of manpower and financial resources

4 9 3 3 Comités Ruraux

Comites Ruraux (CR) are rural communities or organizations comprising groups of villages with an elected governing body known as Conseil Rural Their operating budget depends largely on local tax which is used for planning, natural resource management, health, education, social services, activities of the communities Although the *Sous Prefet* is not a member of the *Conseil Rural*, he has an influence on the governing body, in that he is authorized to sign their important decisions in order to make them legally binding

4 9 3 4 Other Farmer Groups

Other farmer groups involved in agricultural development include

- Senegal Exportation Produits Agricoles et de Semences (SEPAS),
- Federation des Producteurs Maraîchers des Niayes, and
- Federation des GIE de Thies

4 10 RESEARCH-EXTENSION LINKAGES

In Senegal the relationship between agricultural research and extension has historically been weak (USAID, 1991). This situation is usually the result of the competition for funds, manpower and physical facilities. In an endeavor to find a remedy to this situation and bring about closer collaboration between ISRA and the various extension and related institutions, the PNVA was initiated under World Bank financing in 1990. The PNVA has helped to improve the linkage between research and extension by (a) providing ISRA with financing, a major constraint, and (b) having an ISRA scientist as one of the heads of the four PNVA divisions, the research & development division.

Moreover, ISRA researchers and the various extension agencies jointly evaluate the performance of previous cropping season's programs and plan those of the incoming season. Additionally, ISRA researchers train the extensionists on conducting the multilocational trials in farmers' fields. ISRA scientists at the station in Djibelor were also involved in the planning and execution of 88 contour demonstration plots in the USAID-financed Southern Zone Water Management Project (SZWMP) for rice production in collaboration with NGOs and farmer organizations (Organisations Paysannes).

However, research and extension institutions are separated physically and the heads may have little contact except during meetings. This poor contact often moves down the line between the personnel of the two services.

The existence of many RDAs in the country also makes coordination difficult. Furthermore, there are development agencies, NGOs mainly, in the country that sometimes set-up and operate unsustainable programs like giving out free inputs (not even a package of production practices) without consulting the "national extension service".

4 11 TECHNOLOGIES AND CONSTRAINTS TO ADOPTION

There are a number of viable agricultural production technologies which ISRA researchers, in collaboration with regional and international research centers, have developed and which are suitable for adoption by Senegalese farmers. They include the following:

- Improved crop varieties for all major crops,
- Appropriate seed dressing and row seeding,

- Use of organic manure and chemical fertilizers,
- Animal traction (AT), and
- Soil and water management practices

Many of the technologies, however, remain on the shelves of the research station

The normal concept of information flow system is as follows

- Research <=====> Extension <=====> Farmers

But this flow breaks down in Senegal for a number of reasons such as

- Limited financial resources by ISRA, creating mobility problems, and lack of incentives
- Fragmentation of extension services creates more problems for ISRA in terms of coordination and setting of priorities,
- Inadequate supply of inputs such as quality seeds, and
- Availability of affordable credit to purchase inputs

The ideal flow of information within the system would be

- 1 The promising results of ISRA/CDH station research are confirmed in multilocal trials,
- 2 Results that are positive are passed on to the FSR/E team and extension service as a package,
- 3 FSR/E carries out surveys in order to identify any problems with the newly introduced technology, and
- 4 Technologies found acceptable are recommended for wider adoption while unacceptable ones are refined or abandoned

4 12 CONCLUSIONS AND RECOMMENDATIONS

Senegalese farmers long ago evolved a shifting form of farming which successfully used and conserved natural vegetation by protecting trees and soils. They also responded to climatic variances and uncertainty by growing a wide mixture of crops, often in association with raising livestock and chickens. Senegalese farmers found that the overall greater productivity of combining crops, fruit trees, nuts, greatly offset the higher yields of the treeless fields.

This increases farmers' food security and nutrition as well as linking agroforestry to livestock as a source of feed during the dry season. Also, during periods of celebrations like Tabaski, the sale of sheep by farmers represents a valuable source of income. This helps to stabilize farm income and productivity. The animals consume crop by-products while oxen and donkeys in turn provide transportation and animal traction. Incorporated animal manure in the soil adds to the soil organic

and mineral content as well as minimizing soil erosion which is a problem in the northern region and Groundnut Basin, where trees were removed for mechanized farming. This shows that Senegalese traditional farming system and natural resources management, including livestock raising, are intricately linked. Successfully intensifying land use to adapt to these conditions requires an adjustment of cropping practices to reflect the realities of persistent shortfalls in seasonal precipitation since the 1960s.

ISRA in collaboration with regional and international research centers, has identified and developed improved varieties, along with viable complementary agricultural techniques, that are suitable for adoption by Senegalese farmers and adaptable to the prevailing conditions. The introduction of "packages of technologies" to farmers such as in the USAID Southern Zone Water Management Project rather than "piece-meal" approach to technology transfer is essential in order to optimize the benefits from these packages.

However, there are a number of obstacles in the way of farmers' search to increase crop production. The main ones relate to the inability of the extension service to transfer technologies to farmers due partly to its fragmentation and need to upgrade the level of competence of extension agents through training. Other challenges include lack of access to affordable credit to purchase agricultural inputs and the limited size of the Senegalese market.

The structural adjustment programs which led to the disengagement of GOS parastatals from the provision of such services as credit, input supply, etc. and transferred to the private sector has partly resulted in

- Decreased fertilizer use by farmers,
- Decreased investment in agricultural equipment,
- Downward trends in cultivated areas in sorghum/millet and rice, and
- Downward trends in yields of oil peanuts and cotton.

Among the initial strategies that can be considered are the carrying out of targeted assessments on outstanding farmers and their practices with a view to using them as pilot or model farmers for such events as well organized Farmers Field Days. This initiative would also involve the GOS, the private sector, NGOs, researchers and farmers.

The structural adjustment programs have also resulted in greater participation of the private sector groups in agriculture-related activities such as in the development of private irrigated perimeters and in input and output marketing. Senegalese farmers will also likely increase their crop production if the local market organization is improved and the size expanded beyond the Senegal borders. However, border crossings, poor roads, rail and communication systems, and the unavailability of a reliable shipping line along the West African coast are impediments to allowing the private sector to flourish. While western markets can be explored for targeted crops such as bissap and dry hot

peppers, the local and regional markets hold a greater potential in the short to medium-term because of their lower quality requirements as compared to the western markets

The GOS, USAID, West African policy makers and various international donors can cooperate and develop joint partnerships in assisting the private sector to maximize the existing market potential in the region by facilitating the removal of the above obstacles. The region can be assisted in optimizing various countries comparative advantages in the production of given crops due to climatic differences between Sahelian and coastal countries. This assistance will not only be in line with national and regional food security but more importantly with global security. Environmental problems will not be solved on empty stomachs and human misery, such is now the case in Senegal

CHAPTER 5 CURRENT CONSTRAINTS AND FUTURE OPTIONS

5.1 INTRODUCTION

Over the past decade, and especially in the past three years, the GOS has demonstrated courage by liberalizing the economy. Since 1994, the macroeconomy has improved and many of the fundamental prerequisites are in place to permit sustained economic growth. However, the task of translating an improved macroeconomic environment into increased agricultural productivity has only just begun. Few farmers today would agree that their financial situation is better now than it was three years ago. They have seen few of the benefits of the improved economic picture. This is to be expected as services and industry are usually the first to profit from economic liberalization.

In this chapter we explore some of the factors that have contributed to the lack of success in agricultural development in Senegal over the last 20 years. Then, we identify the constraints that remain in developing the sector. Finally, we provide some thoughts on what USAID might do in the agricultural and natural resource sectors in the coming years.

5.2 PAST DONOR ATTEMPTS AT AGRICULTURAL DEVELOPMENT

There is widespread disappointment among donors with the performance of the agricultural sector in sub-Saharan Africa over the last two decades despite the enormous sums of money that have been invested. What is true for the sub-continent in general is true for Senegal in particular. The following paragraphs identify some of the contributing factors which have led to this disappointment.

The single most important reason for the poor performance of the agriculture sector is the inadequate resource base: soils are poor and deteriorating, water is scarce, and human capital at all levels in agriculture is wanting. This explains why agricultural productivity was low 20 years ago and partially explains why productivity is still low. It does not, however, explain why such little progress has been made in the last 20 years.

The next most important factor which has led to the poor performance of the agricultural sector has been the lack of a coherent long-term government policy for the sector. This lack of direction on the part of the government has meant that individual donors have had to develop projects in a policy vacuum. This lack of guidance, coupled with the sometimes conflicting ideologies of the different donors, has led to a public investment program in agriculture which is largely donor financed and driven as much by the internal policies of the individual donors as by the needs of Senegal.

Another factor that has limited the effectiveness of the donor support is that the donors, themselves, have not been consistent in their approach to agricultural development. There is enormous pressure within the donor community to show success from their interventions. This leads to sound development approaches being abandoned prematurely, often without benefit of sound analysis of the shortcomings and the lessons learned, in favor of a new approach.

The history of agricultural development is littered with examples of such approaches integrated rural development, farming systems, food self sufficiency, institution building, human resource development, agro-forestry, natural resource management, and private sector development to name a few. Many of these approaches have fallen out of favor largely because results were not shown quickly enough. It is rare to find donor-funded projects which have lasted long enough to reach the objectives of the project. Many projects are pre-ordained to failure because the objectives are not realistic and the projects are then discontinued because the objectives are not met. This "trendiness" in approach, coupled with unreasonably high expectations on the part of the donors, has severely hampered success in agricultural development.

A final factor that has hurt agricultural development is a simple lack of data and a misuse of that data which are available. The inherent complexity of policy analysis in Senegal requires viable and accurate statistics. However, a sustained commitment to develop this capacity has been notably lacking. Inaccurate statistics, once entered into the system, regardless of how unrealistic they might be, provide most of the raw information upon which repeated waves of analysis are performed and new programs are developed.

The history of interventions in the agricultural sector in Senegal shows many successes, but, in general, has been disappointing. But that is not sufficient reason for donors to pull out of supporting the sector altogether. Constraints still exist which, if not alleviated, will result in a further decline in rural incomes, a further migration out of the country into the cities and, if the cities are unable to absorb this flow, a further decline in quality of life in the cities.

5.3 CURRENT CONSTRAINTS TO AGRICULTURAL DEVELOPMENT

Factors that inhibit agricultural development in Senegal can be found at all levels: the natural resource base, macroeconomic policy, and production and marketing. The following paragraphs summarize some of these problems.

5.3.1 Resource Base and Natural Resource Management

Since the publication of the 1991 USAID Agricultural Sector Analysis little has changed in the physical resource base. The major physical constraint is the combination of poor **soils**, inadequate **water** availability, and a relatively large and rapidly growing **population**.

Soils that are suitable for agriculture are limited. It is estimated that (a) only 19 percent of the surface area of Senegal has soils that are deemed suitable for agriculture, and (b) these limited soils are suffering from degradation from overuse and erosion. The situation with water supply is equally bad. Rainfall has been decreasing since the 1960s. While the enormous seasonal and annual variations that are typical make trends difficult to detect, this decline shows no signs of reversing. Surface water suffers from (a) strong seasonal and annual variation in flows, (b) chemical pollution from agricultural runoff, and (c) salinization from sea water invasions in the lower basins. Finally,

the ground water situation suffers from (a) insufficient knowledge of aquifer capacities, (b) over exploitation of certain aquifers, (c) weak recharge capacities, and (d) excessive mineral content in some aquifers. Associated with this inadequate and deteriorating natural resource base is a population that is growing rapidly and will reach an estimated 9 million in 2000.

Two major shifts have, however, taken place in the natural resource management paradigm during this period. The first is the evolution of the concept of decentralization, making the people most closely concerned with the resource responsible for its management. The second is integration, coordinating all the functions relating to natural resource management that were previously widely scattered throughout the government through a newly-established Ministry of Environment and Protection of Nature under the umbrella of the forthcoming National Environmental Action Plan (NEAP).

Other problems associated with the natural resource base and its management include

- Deforestation is decreasing the availability of fuelwood,
- Natural resource information is poorly organized,
- The land tenure system favors agriculture over forestry,
- Lack of involvement of stakeholders,
- A "command and control" mentality from the center, and
- Lack of management skills at all levels

5.3.2 Macroeconomic and Agricultural Sector Policy

Starting in 1994, the GOS, with support from the World Bank and other donors, has undertaken a major restructuring of the economy, the agricultural sector and the natural resource sector. This restructuring includes

- 1 Devaluing the FCFA in January 1994 to, *inter alia*, promote primary sector exports and to encourage import substitution,
- 2 Liberalizing the agricultural sector international trade regime,
- 3 Liberalizing domestic marketing and pricing of all agricultural products,
- 4 Privatizing the production, processing and marketing of groundnuts and rice,
- 5 Undertaking a structural reform of the Ministry of Agriculture,
- 6 Developing a new policy on decentralization,
- 7 Developing the National Environment Action Plan, and
- 8 Creating the Ministry of the Environment and Protection of Nature

These policy adjustments are moving in the right direction. However, time will be required for their full implementation and for their effect to be fully felt by the Senegalese farmer. Sustained donor community support will be necessary during this transition period.

5.3.3 Agricultural Production and Marketing

There have been changes in recent years in (a) the affordability of agricultural inputs, (b) production techniques, and (c) the marketing of agricultural products. Some of these changes are described below. There are many agricultural production and input deficiencies that constrain agricultural production including (a) land quality, (b) credit, (c) seeds, (d) fertilizers & pesticides, and (e) equipment.

The quality of agricultural land in Senegal is deteriorating over time. Soil degradation and erosion results in a reduction in the land that is available for agricultural production and a further reduction in the amount of land in fallow. Increasing population puts further pressure on a diminishing resource space. Finally, the need to use or sell peanut hay, millet stalks and cereals for livestock use precludes its use in improving soil quality.

Short-term credit for cash crops was historically provided by parastatals. As these organizations move out of providing credit, the lack of credit has become an increasingly important constraint. The slack in providing credit has not been taken up by suppliers of inputs or purchasers of outputs, partly because of past poor repayment rates. The consequences of this lack of credit is a reduction in the purchase of other inputs such as improved seeds, fertilizers, pesticides and new agricultural equipment. In summary, the lack of credit causes a decline in the purchase of inputs which in turn results in a reduction of agricultural output.

Policy changes, changing rainfall patterns, and changes in relative prices of inputs and outputs have provoked some changes in production techniques. For example, unavailability of good quality seed and late seeding of groundnuts have had a substantial impact on yields. Some of the reasons invoked include (a) untimely distribution of groundnut seed, (b) absence of farmers' own good quality seed stocks, (c) reducing risk of late rains or early droughts by planting later, and (d) competition for use of seeders and tillers favors food crop production rather than cash crops. Furthermore, imported inputs such as fertilizer and equipment have increased in price more than producer prices causing a decline in the use of these imported inputs.

Marketing is also undergoing significant changes which have had an impact on production and the amount of surplus available for off-farm sales. For example, the decrease in outlets for fertilizer sales and collection points has had a substantial negative impact on groundnut production. At present, certified groundnut seed is available only at SONAGRAINES collection points two months prior to planting season. Moreover, it is sold only in 50 kilogram sacks. The limited number of commercial outlets and the size of minimum purchases hinder acquisition.

Another important constraint for improving agricultural performance is that the linkages between agricultural research and the development institutions are weak. There is evidence that new packages and practices developed by researchers do not always get transferred to farmers. The national agricultural extension service is itself fragmented.

5 4 POSSIBLE OPTIONS FOR USAID SUPPORT

Senegal is in the midst of a period of tremendous change. During the last four years the government has devalued its currency, liberalized both domestic and international trade, disbanded many parastatals, privatized others, and reduced the services and subsidies for yet others, embraced the concept of the market economy and an increased role for the private sector, embarked on a process for revamping policy and investment in agriculture, and started a major process of decentralizing the delivery of government services. These changes, in turn, have had an impact on the meso and micro economies of agriculture. Marketing channels for inputs and products have undergone significant transformation. The price and accessibility of inputs such as fertilizers, improved seeds and pesticides have been altered. Farmers have reacted to these changes by altering the combination of crops and varieties grown and the proportion of inputs used to grow them.

Structural adjustment was essential for macroeconomic and financial reasons. Most of the changes that have taken place at the meso and micro level were required, even though in the short to medium term they will be disruptive at times and will create winners and losers. An important role for the donors, USAID included, is to assist Senegal in making this essential transformation from a centralized, state dominated and *dirigiste* economy to a decentralized one where individual consumers, producers, free markets and the private sector make most of the day-to-day decisions in a liberalized economy.

The following options are proposed within USAID's philosophical framework of private sector promotion, fostering of beneficial competition, providing food security and results-oriented development activities. While all of the activities may not have a direct impact on enhancing productivity, they strive to promote the enabling environment necessary for its accomplishment.

5 4 1 Supporting Continued Liberalization

First, USAID should consider continuing to provide support for market liberalization, privatization and the development of the private sector both at the macroeconomic level and at the agricultural sector level. Structural adjustment will inevitably result in segments of the economy being hurt and pressure being brought to bear on the GOS to provide relief through such means as import restrictions and price controls. These restrictions and controls, while making short-term political sense, will be harmful to the economy in the longer term. The donors, especially the World Bank and USAID, should provide support to the GOS so that it can resist the pressures to the extent possible.

5 4 2 Decentralization and Natural Resource Management

Second, USAID should consider providing support for both decentralization and the National Environmental Action Plan. The GOS is currently in the process of re-engineering with an aim to fostering greater participation and responsibility by its citizens in governance and defining a cohesive

approach to the management of its natural resource base. The process revolves around two major policy changes. The first of these is the Decentralization Law which went into effect on December 31, 1996 and is intended to devolve responsibility for many aspects of governance and natural resource management from the state to regional and local levels. The second initiative is the NEAP which is now being finalized and is scheduled for adoption after validation in June of this year. It is intended to provide an overall, unified foundation upon which the necessary institutions, regulations and policies for rationally managing natural resources and the environment can be constructed.

The emerging decentralized framework and the adoption of the NEAP are bold and promising initiatives which can provide the means for improving the management of the productive resource base. These initiatives, however, will require the coordinated and sustained support of Senegal's partners. Areas for potential USAID attention include:

1. Strengthening the planning, programming and management capacities of regional, communal and local councils in NRM-related areas by providing appropriate training and technical assistance, and structuring interventions in a manner that reinforces these local institutions rather than bypassing them, as has so frequently happened in the past,
2. Improving the government's ability to provide technical support in agriculture and natural resource management by reinforcing the skills of the future national extension service, particularly in new areas included in their expanded mandate such as marketing and farm-level financial advisory services,
3. Continuing to support key natural resource management agencies involved in monitoring and coordination activities, and
4. Taking a broad, integrated approach that considers the interrelated nature of environmental factors when planning rural development and research interventions, avoiding a concentration on single, isolated production factors.

5.4.3 Support to Agriculture

Finally, USAID might consider continuing support for some of the more traditional interventions in the agricultural sector. Devaluation and the partial withdrawal of the state from supplying inputs and purchasing outputs has resulted in a further reduction in the affordability of agricultural inputs and credit. There is widespread consensus that the affordability of agricultural inputs and agricultural credit are the two most important constraints to increasing agricultural productivity.

USAID interventions in agriculture should be in the context of support for the GOS policy of food security. Current definitions of food security encompass three basic elements: availability, access and utilization. A country cannot achieve food security unless available food supplies are sufficient.

to provide every person in the country with an adequate diet. The food can be produced domestically or it can be imported commercially or through concessional aid programs. Achieving food security also requires that households have the financial ability to acquire sufficient food. Finally, people can also experience food insecurity when they fail to consume proper diets, even when food is available. Within the context of food security, there are a number of possible interventions in agriculture.

First, USAID might wish to consider developing partnerships with private sector seed, fertilizer and agricultural chemical producers whereby USAID would partially finance promotional efforts of these private sector firms. The private sector firms would reimburse USAID out of increased sales. This option would entail investment in updating improved seed, fertilizer and pesticide demonstration response trials but has the advantage of being (a) private sector oriented, (b) relatively easy to quantify and monitor, and (c) directly linked to the desired result of increased productivity.

Second, increasing farmers' demand for productivity-enhancing inputs is, of course, only half of the equation. Facilitating access to affordable credit is a prerequisite for purchasing more inputs. However, experience has shown that credit schemes where the state is the sole lender have not been successful. The recent evolution of rural credit unions merits close examination by USAID. There would appear to be significant needs in financial management training, program and policy development and liquidity.

Third, in addition to agricultural input demand constraints which need to be addressed, increasing the supply of quality seed is also critical. ISRA, in collaboration with international research centers, has identified improved varieties for most major crops grown in Senegal. The availability of good quality seed in adequate quantities from UNIS is a major constraint to increased crop production, particularly regarding food crops. During interviews conducted by the team, the Permanent Secretary of UNIS emphasized the need for technical assistance for training in food crop seed production, control and certification.

Another area which might warrant further investigation is in horticultural exports. Although the opportunities for developing significant horticultural export marketing activities are very limited and are, in any case, being supported by the European Union, the non-perishable dried fruit, pulp and herbal tea export market might be examined as demand has increased sharply for nutritional snack foods in health conscious Western markets. The possibility of exporting to the regional market should also be explored.

Finally, we believe that donor coordination in Senegal is less effective than in a number of other countries in which we have worked. We therefore suggest that USAID consider engaging a consultant for a four-week period to undertake two tasks. First, interview the donors, review their documents, analyze the information and prepare a report on what other donors are doing in agriculture, natural resource management and agribusiness. Second, develop a proposal for a donor coordination mechanism so that donors stay current on each other's activities.

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Statistical Appendix

Table SA1 | Primary Sector | TIP Financing by Donor and Region

Source	Dakar	Diguinchor	Dioubel	Saint-Louis	Tambacounda	Kaolack	Thies	Louga	Fatick	Kolda	Regional	National	Total
ALDI										400	400		800
BADEA		750		4,640	335					2,491	3,643		11,859
BANQUE MONDIALE												750	750
ICI FTAI		600	2	2,010	120	216	95	204		922	7,128	3,061	15,165
ICI ETAT (FDG GARANTIE)											290		290
BELGIQUE						3,071			4,23		1,738		9,046
BENEFICIAIRES		219		381	124	32	13		10		379	99	1,266
BID		1,134		7,629	1,467	1,001	1,833			4,281	4,500	4,068	25,913
BOAD		1,060		2,570						1,649			5,279
CFD		676		4,498	2,639					1,315	480	2,100	11,708
CNCAS				141								59	200
COMMUNI TIVAKSIANI							270						270
CRDI												77	77
CREDT MUTUEL SENEGAL					228						240		468
CSE												320	320
DANIDA/UNICN											77		77
DANIDA/UNSO/PNUD												827	827
ETAT (BUDGET FONCT)		306		374	240	83	160		115		340	2,580	4,198
ETAT (Fond DPV)												6	6
ETAT (autre)				70			174				108	1,898	2,259
ETAT (C I III A DI RHA I)		302											302
ETAT (IMPOTS ET TAXES)							15		3	1,961	243		4,279
FAC					457					40	288	1,470	2,264
FAD											7,700	1,283	8,983
FAO												800	800
FDS AFRICAIN DEV		1,396											1,396
FDS FEM					409								409
FDS OPFF DEV INTFRN										2,330			2,330
FDS CONTREP BELG-SEN											180		180
FDS CPTTE AIDE ALIMEN												330	330
FED	250	518		9,370							941	328	11,407
FED (DIAPER)												116	116
FED (PIN)				10,240								5,774	16,014
FED (PIB+PIN)												1,089	1,089
FED/FONDS REGIONAUX												1,513	1,513
FEM/PNUD												913	913
FIDA			1,125	5,012		1,023	649		974		4,142		14,124
FINLANDE						17	37		112				186
FKWT											2,264		2,264
FONDS CEDEAO		419											419
FONDS OPEP				2,000							2,783		4,783
FONDS SAUDIEN				3,330	370					2,679			6,379
IDA											2,525	5,872	8,397
ITALIE													0
JAPON	1,000			6,217			107			121	7,472	8,651	25,878
KFW				5,120									5,120
KFW (PRET)				9,301									9,301
ONUDI	131												131
PAYS BAS				1,481								1,029	2,610
PAYS BANEA0				571			1,340				490	1,543	3,946
PNUD												442	442
PRIVES											22		22
REP CHINE/TAIWAN											15,000		15,000
RFA(GTZ)		332		1,050						2,610	4,484		8,476
SAED(B FONCT)				2,050	75								2,125
UNIS(BENEFICIAIRES)											36		36
UNSO/PNUD												175	175
UNSO/SUEDE			58		104			144					306
USAID		570				594						7,097	8,261
Total	1,381	8,371	1,185	79,458	6,768	6,691	4,983	348	5,479	22,827	67,893	54,270	261,655

Table SA1 2 Primary Sector P1IP Financial Support by Sub Sector and Region

Sector	Dakar	Ziguinchor	Diourbel	Saint Louis	Tambacounda	Kaolack	Thies	Louga	Fatick	Kolda	Regional	National	Total
Agriculture		4 003		61 034	3 844	2 310	2 436		1 030	16 617	13 796	4 393	109 303
Élevage											339	5 813	6 152
Eaux et Forêts			1 183	1 927	1 140	57	2,326	148	112	2 610	10 003	8 734	28 421
Pêche	3 000	1 194		6 237								12 462	22 893
Hydraulique et Recherche		3 172			1 784	4 346						670	50 278
Études et Recherche	381							200	4 338	3 601	32 168	1 018	3 884
Appui Institutionnel				10 240								2 485	
Total	3 381	8 371	1 183	79 438	6 768	6 693	4 983	348	5 479	22 827	67 893	54 270	261 633

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Table SA1.3 Primary Sector PTIP Financing by Donor and Sub-Sector

SOURCE	Agriculture	Elevage	Eaux et Forets	Peche	Hydraulique et Recherche	Etudes et Recherche	Appui Institutionnel	Total
ACDI	400				400			800
BADEA	6 716				5 143			11 859
BANQUE MONDIALE							750	750
BCT ETAT	4 393	207	183	670	2 378	500	6 834	15 165
BCT ETAT(FD GARANTIE)	290				7 308		1 738	290
BELGIQUE							79	9 046
BENEFICIAIRES	1 088	99						1 266
BID	14 133		333	1 342	10 103			25 913
BOAD	4 279				1 000			5 279
CFD	8 432			2 776				480
CNCAS	141	39						200
COMMUNE TIVAOUANE	270							270
CRDI							77	77
CREDIT MUTUEL SENEGA	228							240
CSE							320	320
DANIDA/UN							77	77
DANIDA/UNSO/PNUD								827
ETAT (BUDGET FONCT)	798	319	1 743		159	639	338	4 198
ETAT (Fonct DPV)	6							6
ETAT (rnhure)		9		453				1 797
ETAT(CPTIE A DERBAC)	382							382
ETAT(IMPOTS& TAXES)	4 036							243
FAC	122	288	384	470				1 000
FAD	7 760	1 283						8 983
FAO	800							800
FDS AFRICAIN DEV	1 396							1 396
FDS FEM				409				409
FDS OPEF DEV INTERN	2 330							2 330
FDS CONTREP BELO-SEN							180	180
FDS CPTIE AIDE ALIMEN							330	330
FED	9 273		175	318		1 441		11 407
FED (DIAPER)								116
FED(PIN)				4 800				11 214
FED(PIR+PIN)								1 089
FED/FONDS REGIONAUX		1 313						1 313
FEM/PNUD								913
FIDA	11 688		1 135					1 311
FINLANDE			186					186
FKWT								2 264
FONDS CEDEAO	419							419
FONDS OPEF	2 000							2 783
FONDS SAOUDIEN	6 379							4 783
IDA	2 325	2 153				1 019		6 379
ITALIE	121							2 700
JAPON			5 369	12 987	2 300			8 397
KFW	5 129							4 901
KFW (PRET)	9 363							25 757
ONUDI								3 129
PAYS BAS	1 381							9 363
PAYS-BAS/FAO			2 400					131
PNUD		22						1 029
PRIVES								1 046
REP CHINE/TAIWAN					13 000			1 029
RFA(OTZ)	332		8 14					3 946
SAED(B FONCT)	2 173							442
UNIS(BENEFICIAIRES)								22
UNSO/PNUD								13 000
UNSO/SUEDE	594			306				8 476
USAID								2 123
Total	109 311	6 15	28 421	23 563	49 608	3 884	40 516	261 633

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Table SA4 1 Areas and Production of Major Crops in Senegal,(1990-1995)

Crop	St Louis	Louga	Thies	Diourbel	Sine Saloum			Casamance			Tamba- counda	Senegal
					Fatick	Kaolack	Total	Zigu- nchor	Kolda	Total		
Areas (000ha)												
Millet/Sorghum	25 3	97 2	124 8	121 4	139 0	332 5	471 5	18 7	94 7	113	67 3	1 020
Maize	0 8	-	0 6	-	2 2	35 1	37 3	2 0	35 9	37 9	27 1	104
Rice	22 7	-	-	-	0 5	0 4	0 9	19 4	27 3	46 7	3 7	74
Cowpeas	6 4	29 7	16 6	17 1	4 9	2 9	7 8	0 4	0 6	1 1	0 3	79
Cassava	-	-	17 1	0 2	0 6	0 9	1 5	0 3	0 5	0 8	-	19
Groundnuts	-	-	-	-	4 9	27 2	32 1	-	-	-	-	32
Oil Nut	8 3	95 4	91 8	85 0	113 9	298 3	412 2	16 3	76 1	92 4	68 5	854
Cotton	-	-	-	-	-	-	4 9	-	20 9	20 9	13 7	39
Total	63 5	222 3	250 9	223 7	266 0	697 3	968 2	57 1	256	313	181	2 220
Production (000mt)												
Millet/Sorghum	6 8	32 3	64 4	71 0	87 6	267 7	255 3	12 0	89 2	101	54 1	685 1
Maize	1 5	-	0 2	-	2 2	37 1	39 3	2 1	40 7	42 8	33 3	117 1
Rice	106 2	-	-	-	0 8	0 8	1 6	23 8	30 2	54 0	7 4	169 0
Cowpeas	0 8	9 9	4 8	7 8	2 1	1 3	3 4	0 2	0 3	0 5	0 2	27 3
Cassava	-	-	43 8	-	1 4	4 0	5 4	2 1	3 1	5 1	-	50 8
Groundnuts	-	-	-	-	4 7	25 9	30 7	-	-	-	-	30 7
Oil Nut	2 7	51 1	43 5	51 5	86 6	286 5	370 1	16 8	79 9	96 7	67 3	681 6
Cotton	-	-	-	-	-	-	3 6	-	20 9	20 9	13 7	38 4

Source Data abstracted from USAID Statistical Data Base

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Table SA4 2 Average Areas and Production of Major Crops Grown in Senegal, 1985-89

Crop	St Louis	Louga	Thies	Diourbel	Sine Saloum	Casamance	Tambacounda	Senegal
Area (1000 ha)								
Millet/Sorghum	21 1	153 3	131 3	146 2	450 6	98 9	100 3	1 102
Maize	2 9	-	-	-	30 0	40 2	28 4	102
Rice	15 5	-	-	-	0 5	56 5	3 8	76
Cowpeas	4 4	38 8	19 1	19 6	5 2	1 6	1 4	90
Cassava	-	-	11 8	0 4	1 6	1 8	-	16
Oil Nut	1 5	71 9	82 3	81 3	358 9	111 4	65 2	772
Groundnuts	-	-	-	-	14 9	2 4	0 8	16
Cotton	-	-	-	-	3 0	17 8	10 3	31
Total	45 5	264 0	244 5	247 4	864 6	330 6	210 2	2,205
Production (1000 mt)								
Millet/Sorghum	11 7	62 5	74 5	88 1	336 8	89 0	85 4	748 0
Maize	6 3	-	0 1	-	42 4	48 9	30 9	128 4
Rice	71 7	-	-	-	1 0	67 2	7 6	147 6
Cowpeas	1 0	18 5	8 0	9 7	2 4	0 9	0 6	41 0
Cassava	-	-	37 1	-	5 3	11 4	0 4	54 2
Oil nut	0 8	60 6	60 4	63 6	386 8	135 3	71 0	778 5
Groundnut	-	-	-	-	17 2	2 6	0 8	18 2
Cotton	-	-	-	-	2 8	20 7	10 8	34 4

Source USAID Data Base

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Table SA4 3 Average Yields, kg/ha, for Major Crops Grown in Senegal, 1990-89 and 1990-95

Crop	St Louis	Louga	Thies	Diourbel	Sine Saloum*	Casamance*	Tambacounda	Senegal
1960/61-1989/90								
Millet/Sorghum	401	312	458	496	661	853	674	544
Maize	970	-	-	-	1296	1165	844	907
Rice	2769	-	-	-	1778	1185	1220	
Cowpeas	291	305	299	327	398	537	342	312
Cassava	-	2854	3485	2473	4652	5781	2915	3698
Groundnut	-	-	-	-	1112	925	779	792
Oil nut	463	700	778	732	871	1046	908	836
Cotton	-	-	-	-	819	1218	971	1026
1990/91 1995/96								
Millet/Sorghum	256	330	522	582	753	892	804	670
Maize	1843	-	465	-	1054	1116	1226	1128
Rice	4687	-	-	-	1691	1158	2045	NA
Cowpeas	118	294	268	440	392	457	416	323
Cassava	-	-	2582	-	3665	5444		2748
Groundnut	-	-	-	-	954	-	-	954
Oil nut	377	531	490	603	902	1052	983	803
Cotton	-	-	-	-	716	1040	928	960

Source Data from USAID Statistical Data Base

* Data only available for 1985-89 cropping seasons

Table SA4 4 Average Areas (000ha), Production (000mt) and Yields (kg/ha)

Crop	1985-89			1990-95		
	Area	Product	Yield	Area	Product	Yield
Rice	15 5	71 7	4622	22 7	106 2	4687
Maize	2 9	6 3	2158	0 8	1 5	1843
Sorghum/Millet	21 1	11 7	555	25 3	6 8	256

Source Extracted from Tables 4 3 & 4 5

Table SA4 5 Annual Cultivated Areas (Ha) in the Senegal River Valley, 1990-96

Podor						
Period	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Rainy	5530	6337	5851	5680	6275	5896
Cold	2803	2538	2549	2429	1821	2307
Hot	1827	1501	2524	3151	557	576
Total	10160	10376	10924	11260	8653	8779
Rice (%)	71	71	70	72	65	61
Valley Left Side						
Rainy	26472	28211	27044	30444	26172	23052
Cold	5835	5687	4890	4923	3428	1389
Hot	7117	7238	7329	6297	4750	3184
Total	39424	41136	39263	41664	34350	30625
Rice (%)	83	82	83	83	82	76

Source SAED

Table SA4 6 Horticultural and Fruit Production (000mt) in Senegal, 1986-96

1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Horticultural										
150	120	125	121	136	142	152	154	148	155	175
Fruits										
95	95	90	114	108	101	103	107	112	118	120

Source CDH

Table SA4 7 Average Fruit Production (000mt) by Region in Senegal, 1996

Crop	Dakar	Thies	Fatick	Ziguinchor	Kolda	Tamba-counda	St Louis	Senegal
Ordinary Mango	1 8	14 2	1 7	19 3	9 5			46
Grafted Mango	1 6	10 0	2 2	12 7	0 7			27
Ordinary Citrus		14 1	0 7	6 8	2 9			12
Grafted Citrus	1 5	12 6	0 6	3 7	1 5			20
Banana	-	-		0 7	4 0	3 7		8
Others	0 3	1 8	0 3	2 4	0 8		0 1	6
Total	5 2	40 1	5 6	45 7	19 5	3 7	0 1	120

Source CDH

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Table SA4 8 Average Production and Yields of Horticultural Crops in Senegal, 1995

Crop	Dakar	Louga	Thies	Diourbel	Sine Saloum	Casamance	Tambacounda	St Louis	Senegal
Production (000mt)									
Tomato	16.3	0.7	10.7	0.2	1.6	1.4	0.1	0.3	31
Green Bean	3.6	-	1.4	-	-	-	-	-	5
Okra	5.4	-	1.3	-	-	0.3	-	-	7
I Pot	1.8	0.8	9.0	-	-	0.1	-	0.2	13
Peppers	0.5	-	8	-	0.3	0.6	-	-	2
Eggplant	1.3	-	2.9	-	0.1	0.1	-	-	4
Onion	10.3	21.3	10.6	-	0.6	1.6	0.1	19.2	64
Watermelon	6.9	0.6	-	0.2	8.9	1.0	-	2.0	20
Cabbage	5.9	0.4	3.8	0.2	0.4	0.6	0.6	2.0	13
B Tomato	0.7	-	1.5	-	-	0.7	-	-	3
Other	0.4	3.7	1.2	-	1.7	0.4	1.1	2.3	11
Total	53.8	28.3	44.7	0.6	13.5	6.9	1.5	25.9	175
				1	5	5	-	28	121
Yields (t/ha)									
Tomato	18.2	19.7	13.0	12.8	19.1	18.8	12.0	18.7	16
Green Bean	7.1	-	7.0	-	-	-	-	-	7
Okra	20.0	-	13.9	-	-	9.1	-	-	18
I Pot	11.9	15.0	17.0	-	-	14.2	-	20.0	16
Peppers	8.0	7.0	7.0	-	7.7	21.6	10.0	-	9
Eggplant	14.9	17.0	15.0	-	10.0	13.0	-	-	14
Onion	15.5	19.9	20.0	13.3	16.5	17.9	22.0	23.0	20
Watermelon	20.0	20.0	-	12.1	23.6	18.6	-	15.0	20
Cabbage	15.0	19.5	5.8	15.4	18.6	17.8	21.0	15.0	10
B Tomato	12.9	9.0	7.0	-	-	12.7	-	-	9
Other	5.6	17.3	7.2	-	8.4	2.6	13.4	13.0	10

Source CDH * 1988/89 totals

Table SA4 9 Field Extension Service Set-up in the Directorate of Agriculture, Senegal

	Region	Department	Arrondissement
Title	Regional Agric Inspector	Agric Sector	Agric Technical Agent
Qualification	MS	BS	Agric Certificate
Number	10	30	90
Transportation Means	4-wheel Vehicle	Motorcycle/Vehicle	Motorcycle

Source Directorate of Agriculture

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