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Summarizes agricultural development issues and constraints, based on annotated bibliographies of recent studies (1983-89) and on-going research projects. Includes a discussion of alternative agricultural development strategies for Senegal, areas of agreement and disagreement regarding constraints, and principal knowledge gaps facing planners. Prepared as Phase I of the Senegal Agricultural Sector Analysis.

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**SUMMARY OF ISSUES AND CONSTRAINTS
BASED ON TWO ANNOTATED BIBLIOGRAPHIES:
PHASE I, SENEGAL AGRICULTURAL SECTOR ANALYSIS**

By Eric W. Crawford and R. James Bingen

January 18, 1990

Department of Agricultural Economics
and
Institute of International Agriculture
Michigan State University

Report prepared under USDA Cooperative Agreement No. 58-319R-0-001 funded by USAID/Senegal under Contract No. AFR-0970-P-AG-9025-AFR and PIO/T No. 685-0294-3-90015. Opinions expressed in this report are the authors' and do not necessarily reflect the official views of USDA or USAID.

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Preface

Terms of Reference

The PIO/T calls for three documents:

- 1) an annotated/analytical bibliography of "all recent and relevant documents covering the agricultural sector in Senegal";
- 2) a bibliography of "ongoing and planned development relevant research": and,
- 3) a listing of "development constraints and issues as identified in (1)."

This report represents document (3). It draws largely on the material included in the first bibliography, while also taking into account the much smaller list of on-going studies described in the second bibliography.

Focus of This Report

This report is a resource document for the Agricultural Sector Analysis (ASA) team. The scope of work suggests that the report should be a rather limited summary of constraints and issues, based on the documents annotated. It is not expected to include a recommended strategy for the Mission's program or for agricultural development in Senegal. Formulating the strategy is the task of the (ASA) team. Nonetheless, we have decided to present several alternative strategies as a way of organizing the issues and of summarizing the various schools of thought.

This report does not enumerate every issue or constraint mentioned in the documents annotated, or the number of times each was mentioned.¹ It seems more important to identify the views of the major actors in the policy debate, especially those expressed in recent documents, and to highlight any unrecognized constraints suggested by the documents.

¹This seemed undesirable for several reasons: (a) it could not be done with accuracy before the final set of annotations was prepared; (b) such a tally would give every "mention" equal weight regardless of source; and (c) economics-oriented studies are no doubt overrepresented in the annotations, which probably results both from donor preoccupation with economic issues and from the preponderance of economists doing the document selection and annotation. In any case, the vast majority of constraints and issues revealed by such a tally are likely to be well-known.

The report therefore begins with a presentation of the general types of constraints which the ASA team should examine, followed by a brief discussion of the constraints which received the most attention in the documents annotated. We then summarize the constraints and issues brought out in major sector review or policy documents, including those by the Government of Senegal (GOS), Abt Associates (Magnuson et al., 1985), the World Bank, and key French researchers. Certain topics which we were specifically requested to include are then addressed (assessment of development potential, privatization, livestock, and availability of analytical models).

Next, we discuss a short list of alternative development strategies which might be considered in designing USAID assistance programs, together with issues or assumptions which are central to each strategy. Lastly, we identify some areas of agreement and disagreement, and the principal knowledge gaps which emerge from the documents annotated.

General Types of Constraints

The major constraints are as follows (order not significant):

1. Technology (production, processing).
2. Human resources (literacy, skills).
3. Agroclimatic conditions and natural resources.
4. Institutions (public and private sector organizational capacity and performance).
5. Policies.
6. Economic potential (production potential, world market and price prospects).
7. Government budget (internal and external (donor) sources of funds).
8. Demographic factors (population, health).
9. Sociocultural factors (social organization of production and consumption, consumer food preferences).
10. Political factors.
11. Infrastructure (transport, communications)

A very similar grouping of constraints is cited in the Abt report (Magnuson, et al., 1985, p. 67) and attributed to Timmer.

Commonly Cited Constraints

The most frequent emphasis is on constraints associated with technology, institutions (including organizations and policies), natural resources, and the world economy. Debates about the priority to assign to research and technology development, to policy reform and "getting prices right," or to protection against the negative effects of the world economy, have been particularly prominent in recent years. Constraints associated with human resources, and demographic, sociocultural, or political factors have received less attention. (Notable exceptions include the World Bank Country Strategy Paper (1989b), which discusses all four factors, and Waterbury (1989), which contains an analysis of political factors especially related to development of the Peanut Basin.) There has been considerable interest in literacy and agricultural education, but most studies were conducted from the late 1970s to early 1980s. Interest in farmer and village organizations has been growing recently, but most studies we found were not Senegal-specific.

Which constraints need to be addressed during an ASA exercise? Previously identified constraints may no longer be relevant. The significance of any constraint may vary over time and according to the particular development strategy selected. For example, a strategy of abandoning agriculture in favor of services and light manufacturing would face a different set of constraints than a strategy of pursuing food self-sufficiency. Thus, it is useful to include a discussion of alternative development strategies.

Constraints and Issues Cited in Key Documents

The 1985 Abt report (Magnuson, et al.) identifies several "broad economic questions which underlie Senegalese agricultural policy": macroeconomic problems, agricultural production and marketing, rural institutions, environmental and water issues, and regional agricultural development potential. The report recommends a food security rather than food self-sufficiency objective. Important policy issues are:

- appropriate crop mix: what cropping pattern would improve food security? How would changes in cropping pattern affect prices, trade, government revenue, and other policy objectives? What should be the long-term role of peanuts and maize?
- policies and services to support agricultural intensification
- how to arrest environmental deterioration?
- roles of public and private sectors in agricultural development

The following are cited as major constraints on agricultural development in Senegal:

- fiscal constraints (public finance, balance of payments, mobilizing private capital)
- physical constraints (land, labor)

- environmental limitations (soil, pasture, and forest degradation due to persistent drought, population pressure, and resource-depleting land use practices)
- water resource constraints
- technology and research system constraints (historical concentration of research at Bambey and on peanuts, current weaknesses of national research program)
- input supply constraints (related to fiscal, organizational, and policy factors)
- marketing channel constraints (politicization of peanut marketing system, high cost of government marketing interventions, disincentives to private sector participation, inadequate secondary road network)
- policies and regulations to encourage private sector involvement

Major objectives set forth in the 1989 GOS **Déclaration de politique de développement agricole** include:

- agricultural sector growth to achieve higher productivity, better rural income distribution, slower rate of rural outmigration, equitable treatment of different regions, food security, and improved natural resource management;
- agricultural diversification;
- improvement in balance of payments, and achievement of financial soundness in the individual crop subsectors;
- greater responsibility assumed by producers and other rural economic agents, permitting a progressive withdrawal of government agencies from production and marketing;

Major issues areas associated with achieving these objectives include:

- farmer organizations, including GIEs and cooperatives
- the cereal, cotton and peanut subsectors
- diversification, with emphasis on horticulture
- livestock
- credit
- agricultural inputs policy

- agricultural research
- extension and other field services
- land tenure and natural resource management
- strengthening of the Ministry of Rural Development.

The 1989 World Bank **Senegal country strategy paper** attributes the poor performance of the Senegalese economy since 1960 to poor policies (promotion of a large public sector, excessive regulation of the private sector), a poor natural resource base, adverse climatic conditions, the energy price shocks of the 1970s, a high population growth rate, and falling terms of trade. The impact of reforms instituted since 1985 has been limited by historical, institutional and sociopolitical factors (including tenuous allegiance to Western institutions and rules, and political polarization and discontent). The overvalued CFA franc is a constraint on agricultural growth, but unilateral devaluation by Senegal is not feasible. The World Bank's perception of major constraints can be inferred from the reforms recommended:

- improving private sector incentives
- public sector revenue mobilization and expenditure reduction
- rehabilitation of the banking system and deregulation of the financial sector
- sound environmental management, health and education sector reforms, and population growth and distribution policies.

The key environmental problems cited are soil degradation (including salinization), loss of forest cover, and urban water supply and sanitation.

The World Bank paper states that Senegal could have a comparative advantage in services and light manufacturing for export within West Africa, given its large, urbanized and trainable labor force and basically sound urban infrastructure. However, the document also notes Senegal's high labor costs and low labor productivity.

The 1989 World Bank paper entitled **The World Bank and Senegal, 1960-87** lists the following strategic issues for agriculture during this time period (pp. 87ff):

- diversification (promotion of export crops other than peanuts; cereals for import-substitution)
- technology (increased productivity of peanuts and millet; introduction of equipment and fertilizer as labor-substituting technologies in the 1970s; inappropriate and inadequately differentiated technical packages)

- producer prices and agricultural taxation (significant implicit taxation of peanut producers during the 1970s)
- institutions (parastatals favored over line Ministries despite inefficiency of some parastatals)

In the spirit of institutional self-criticism, the report takes the World Bank to task for failing to map out a long-term strategy for the agricultural sector during the 1960-87 period. The report also suggests that the existence of "grave data inadequacies," especially on micro-level production and distribution, contributed to development and extension of inappropriate technology and inappropriate priorities for World Bank lending.

The 1989 summary of the World Bank/MADIA Symposium (**Managing agricultural development in Africa**) makes similar points. In Senegal, as in other MADIA countries, the report finds that donors have frequently been part of the problem, not part of the solution. Problems cited include a lack of country-specific information, declining capacity for providing policy advice and investment analysis, instability in the level and focus of donor assistance, and lack of an overall agricultural sector strategy.

The report also states that while long-term food security planning is virtually impossible without a sound information system, governments and donors "have paid little attention to the systematic collection and analysis" of basic information. Existing USDA and FAO data are held to be "so inadequate and inconsistent as to be useless in planning."

Shapiro and Berg, in their 1988 paper entitled **The competitiveness of Sahelian agriculture**, discuss the issues raised by the drive to improve the competitiveness of Sahelian agriculture (with a significant focus on Senegal). These issues include:

- those labelled as "obvious": cost of production, exchange rates, fiscal and monetary policy, and structure of world markets;
- those labelled as "less obvious": research capabilities, and the efficiency and effectiveness of rural transport, marketing, credit, and inputs supply.

The paper discusses the roots of protectionist policy, and sets forth the case against protection of local cereals production, based on what Shapiro and Berg see as the constraints on increasing cereals production even with higher producer prices:

- production side constraints (lack of improved technology, land constraints and high cost of expanding rice production, consensus of studies showing limited aggregate supply response to higher prices)
- consumer demand constraints (importance of urbanization and other nonprice factors underlying preference for rice)

- negative macroeconomic effects (reduced foreign exchange earnings, likely negative effect on government revenues)
- negative food security effects (higher prices impose costs on those who are net buyers of cereals)

The competitive disadvantage of Sahelian cereals producers is exacerbated by both external and internal factors. The major world cereals producers (especially of rice) use efficient low-cost production technology, based on thorough water control. Their countries subsidize cereals production and exports. By contrast, exchange rate and other policies in the Sahelian countries act to discourage local production and encourage imports.

Documents by French authors reflect a diversity of views, but there are a few areas of emphasis which differ from those in the documents described above. Gentil and Ledoux (1988) have tended to stress the constraints imposed by the structure of world markets, including the subsidization of exports by major cereals producers, and the limited market prospects for traditional cash crops such as peanuts and cotton. This perception of constraints has motivated the proposals for supporting local cereals production by creating a protected regional space. Giri (1989), writing on the Sahel in general, emphasizes social and cultural factors as hindering adoption of more efficient techniques. In addition, Giri cites as constraints climatic difficulties, rapid population growth, worsening terms of trade, and the incapacity of governments to take charge of their countries. Bossard and Gabas (1987) call for better management of food aid to reduce its disruptive effects on production incentives.

Specific Topics

Assessment of Development Potential

Documents which discuss the potential of agriculture and related industries include:

- a) those which deal with currently available or prospective technology (Sène, 1987; Jammeh and Lele, 1988; Miller et al., 1988; Matlon, 1989 (millet/sorghum); and Crookston, 1989 (maize));
- b) those which deal with the resource base and economic factors including market prospects (Magnuson et al., 1985; Martin, 1988; Glenshaw, 1988 (phosphates); Pieri, 1989; and Holtzman, Stathacos, and Wittenberg, 1989 (horticulture)).

Because marine fishing was considered low priority for this review, only a few documents on the fishing industry were annotated. Others which were not annotated will be supplied to the Mission.

Privatization

Documents which treat this topic are identified by the keywords "privatization," "private sector," or "liberalization." Private merchants are considered to carry out important functions in addition to marketing, e.g., credit provision, storage, and de facto insurance (Newman, Sow, Ndoye, 1987). In general, traders are not exploitative; their margins are higher than officially allowed markups, but not excessive considering the cost of capital, the risks and uncertainty they face, and the costs of dealing with government regulation and control (Morris, 1986; Ouédraogo and Ndoye, 1988; Newman, Sow, Ndoye, 1988).

Many studies point to the negative effects of government regulation, and of unclear or frequently changed rules and policies, on private sector activities (Holtzman, 1989; Newman, Sow, Ndoye, 1988). Liberalizing these rules and providing better information about them would improve the incentives for private entrepreneurship (Ouédraogo and Ndoye, 1987; Holtzman, Stathocos, Wittenberg, 1989). While the government should lighten its grasp on the private sector, it remains important for the government to provide a supportive climate for private sector activity--to reduce the risks faced by traders, stabilize prices, improve infrastructure and financial markets, and provide other policy incentives. Other assistance is needed to overcome the weaknesses of some private businesses, e.g., limited access to capital and lack of technical know-how and management skills (Holtzman, Stathocos, Wittenberg, 1989).

Several studies discuss the role of private traders in distributing fertilizer. Traders have not been enthusiastic about carrying fertilizer, because they are unsure about the level of effective farmer demand without credit and with prices relatively unsubsidized, because of the high working capital requirements and potential transport problems (in remote areas), and because they lack knowledge about fertilizer use (Glenshaw, 1988; Goetz et al., 1987, 1988). A chicken-and-egg problem exists, with farmer demand low in part because of a limited network of fertilizer distributors, and the fertilizer distributors remaining pessimistic about the extent of farmer demand, especially if the full costs of fertilizer and its distribution are passed on to farmers (Goetz, 1988c).

Livestock

The documents emphasize the close links between livestock and cropping activities (Huguenin, March 1989). Livestock serves multiple roles in the household economy, providing a source of draft power, maintenance of soil fertility, revenues which complement those from cropping, a means to accumulate capital, and a consumption and social exchange good (Huguenin, February 1989; Lhoste, 1987; Sonko, in Bingen and Crawford, 1989). Investment in livestock is often considered more profitable than investment in equipment or fertilizer (Kelly, 1986b). The use of animal draft power allows an expansion of area cultivated and an increase in labor productivity, although generally not an increase in yields (Lhoste, 1987). Livestock development faces problems of managing herd size--in some areas animal numbers are excessive relative to carrying capacity (Guerin et al., 1986)--and constraints of inadequate dry season water and grazing, and poor animal health (Huguenin, February 1989). Various studies of livestock fattening conducted in Senegal (e.g., Tourrand and Ndiaye, 1988) indicate that such

activities can be profitable. The macroeconomic aspects of the livestock/cropping linkage were scarcely mentioned in the documents annotated, although there is some relevant material in Ndione (in Landais and Faye, 1986) and Josserand (1985).

Availability of Analytical Models

A variety of models of Senegalese agriculture have been developed. Recent ones include:

- a) the SEDES/World Bank model (Freud et al., 1988, 1989), used to study the impact of alternative price policies. This model is a second-generation version of the model developed in the early 1980s by Braverman (cf. Braverman and Hammer, 1986). The model covers the agricultural sector as a whole, and includes production and demand functions for 8 regions, and calculation of domestic market prices, the government budget, imports and exports, value-added, and distribution of producers' cash incomes.
- b) the model developed at ISRA/BAME by Frederic Martin (1988). Martin's work includes a definition of 11 production zones, construction of detailed crop budgets (each including several levels of technology) and typical farm models for each zone, and construction of an agricultural sector model based on aggregation of results from the typical farm models. The model generates farm income, crop area, output, input use, inter-regional trade, imports and exports, and the government budget balance.

Broadly speaking, the SEDES/World Bank and Martin models are capable of addressing the same issues and incorporating the same constraints. Compared to Martin's model, the SEDES/World Bank model has stronger treatment of demand and domestic price determination, but weaker treatment of production. The components of Martin's model (crop budgets and farm models) can be used individually and independently of the agricultural sector model. The SEDES/World Bank model has apparently not yet been installed within a Senegalese institution. Martin's budgets and models are being used by a Senegalese economist in ISRA/BAME, and have served as the basis for studies done by the GRAND and RAPID II projects.

Pearson, Josling and Falcon (1986) discuss the Policy Analysis Matrix (PAM), which is presented more fully in a recent book by Monke and Pearson (1989).² The PAM is a method of organizing the analysis of comparative advantage and of the economic benefits, costs, and distributional impacts of alternative policies. To date, the PAM methodology has not been applied in Senegal, although training workshops have been conducted under the University of Arizona Strengthening Agricultural Research Project design contract.

²Monke, Eric A., and Scott R. Pearson. **The policy analysis matrix for agricultural development.** Ithaca, NY: Cornell University Press, 1989. Not annotated.

Alternative Agricultural Development Strategies

To get a better feel for how the above constraints come into play, it is worth considering several alternative agricultural development strategies which have been explicitly or implicitly proposed in recent years. For each strategy, we suggest the major issues which would need to be addressed in implementing the strategy.

1. The "Self-sufficiency" strategy: diversify away from groundnuts and cotton and boost local cereals production. This is essentially the strategy proposed in the 1984 New Agricultural Policy. Issues include:
 - production constraints on local cereals expansion (Martin, 1988; Braverman and Hammer, 1986; Freud et al., 1989; Magnuson et al., 1985)
 - limits on consumer demand for local cereals (Reardon, 1989; Bollinger, 1987)
 - complementarity of cash and food crops (cash crops provide an important source of inputs and income; deemphasizing them is likely to reduce rather than increase food production) (Goetz, 1989)
 - viability of the reorganized cooperative system (Gaye, 1988a,c; Sarr, 1988), and role of the GIEs.
2. The "Productivity" strategy: abandon the northern Peanut Basin and emphasize irrigated agriculture in the Fleuve and rainfed agriculture in southeastern Senegal. Issues include:
 - the cost and feasible rate of irrigation development and intensified rice production (Martin, 1988; Freud et al., 1989; Boutillier and Schmitz, 1987; Jamin, 1986)
 - potential for higher-value crops than rice under irrigation (Miller et al., 1988; Sène, 1987)
 - agronomic, processing, and consumer demand constraints on expansion of maize production (Crookston, 1989; Gaudio, 1989; ABC, n.d.; Agel and Yung, 1985; Ndiame, in Bingen and Crawford, 1989; Holtzman, 1989)
 - institutional requirements (supply of inputs, output marketing, extension support) (Kelly, 1988, 1986b; Magnuson et al., 1985; Ba et al., 1989a,b; Morris, 1986, 1987b)
 - political feasibility
3. The "Short-run Agricultural Comparative Advantage" strategy: reinvest in the groundnut industry and boost local cereals production simultaneously. Issues include:

- world and regional market prospects for peanuts (SOFRECO, 1988, 1989; Badiane, 1989)
 - prospects for resolving technical problems (aflatoxin, peanut processing/marketing costs, millet/sorghum productivity) (Matlon, 1989; Caisse Centrale, 1989; Arthur Young Conseil, 1987; CILSS, 1988a,b)
 - weaknesses of input distribution, credit and extension systems (Gaye, 1988b, 1989; Kelly, 1986; SENAGROSOL, 1989; Caputo, 1988)
 - degree of stimulus provided by crop/livestock complementarities (livestock as source of demand for increased cereals production, and source of income for rural people) (Landais and Faye, 1986; Josserand, 1985; Lhoste, 1987)
 - political feasibility (Waterbury, 1989)
4. The "Long-run Nonagricultural Comparative Advantage" strategy: abandon agriculture and push development in the light manufacturing and services sectors. Issues include:
- which industries are promising? Few papers make specific suggestions other than financial services, tourism, and horticulture (e.g., World Bank, 1989b; Holtzman, Stathacos, Wittenberg, 1989)
 - labor costs are high, partly a function of the cost of cereals (a "wage good") (World Bank, 1989b,c)
 - need to invest in infrastructure and education (Mellor, 1986)
 - how to maintain rural incomes, especially in the short run?
 - difficulty of developing nonagricultural sectors without growth in rural incomes to provide demand for their products. (Mellor, 1986; Mead and Liedholm, 1989).³
5. The "Agriculture- and Employment-Based" strategy: develop agriculture not as an end in itself, but as a necessary stage in the process of structural transformation leading ultimately to a greater role for services and manufacturing and a smaller role for agriculture (Mellor, 1986). Agricultural growth is needed to generate effective demand for services and nonagricultural goods, to generate employment, and to reduce poverty through higher incomes and food output. In some respects this is the strategy proposed in World Bank (1989b), which recommends support for agriculture along with promotion of services and manufacturing. Issues include:

³Annotations of the Mellor and Mead/Liedholm papers are found in the "General Interest Documents" bibliography.

- need for open trade regime to provide export revenues and agricultural inputs (Shapiro and Berg, 1988; Gentil and Ledoux, 1988)
- widening regional disparities and poverty during transition phase (Mellor, 1986)
- role of government in sponsoring physical investment and institution building (World Bank, 1989b)
- importance of technical change (and hence agricultural research) as basis for agricultural growth (Mellor, 1986)
- need for foreign assistance to support investment in education, research and policy analysis, and infrastructure (World Bank, 1989b; Jammeh and Lele, 1988; Jaeger, 1987)

Areas of Agreement and Disagreement

Gentil and Ledoux (1988) point to a lack of consensus on agricultural potential, the price-responsiveness of production and consumption, the rigidity of food habits, and the effectiveness and adequate level of tariff or price protection of local cereals production. The summary of the World Bank/MADIA Symposium (1989) reports general agreement concerning the complementarity between food and cash crops, and of price and nonprice factors as important in stimulating production. Areas of continuing disagreement include:

- the role of protection of local cereals production
- the role of public intervention, e.g., in input and output markets
- need for price stabilization
- developed country policies, e.g., concerning import restrictions, export subsidies, and food aid
- appropriate models of agricultural extension
- smallholder vs. large-scale production

Principal Knowledge Gaps

1. Topics relatively little studied or written about to date:
 - likely speed and magnitude of changes in consumer food preferences
 - potential for significant expansion of maize production

- opportunities for agricultural diversification: world market niches for, e.g., expanded fruit production
 - potential demand for Senegal's exports within the West Africa region
 - costs and potential payoffs of a major revamping of the Senegalese educational system
 - the costs, design, and potential payoffs of alternative programs of support to cooperatives and other village or farmer organizations
 - potential economic role of small-scale enterprises, and linkages to agriculture
 - macroeconomic linkages between livestock and crop production
 - effect of price stability on agricultural investment
2. Topics which have or can be studied, but where the knowledge sought is subject to considerable uncertainty:
- world market prospects for cereals prices and peanut and cotton exports, including within the West Africa region
 - future technological advances, especially for cereals production
 - national commitment (at government and individual levels) to belt-tightening and investment for future growth.