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An Assessment of the Senegalese Groundnut Subsector

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Foreword

Food and agricultural trade is the vital link in the mutual dependency of the global trade system and developing countries. Developing countries derive a substantial portion of their income from food and agricultural trade. The emergence of food safety and agricultural health issues and the related tightening of market requirements form challenges to further gains from trade due to the lack of technical and financial capacities of many developing economies.

As part of a joint program between the World Bank's Agriculture and Rural Development Department (ARD) and International Trade Department (PRMTR), a survey on the Cost of Compliance of exporting developing countries was undertaken. The survey was focused on the supply chains of high-value food products (horticulture, fish, meat, spices, and nuts). The study quantified the costs incurred by both the public and private sectors; identified the coping strategies employed by the various stakeholders in the supply chains; determined the constraints that hinder compliance; examined the structural changes in the supply chain resulting from compliance with the safety standards; and evaluated the impact of these standards on small-scale enterprises and producers. The survey included Ethiopia (animal products), India (fish and spices), Jamaica (nontraditional agricultural exports), Kenya (fish and horticulture), Latin America Southern Cone (animal products), Morocco (fruits and vegetables), Nicaragua (shrimp), Senegal (fish and groundnuts), and Thailand (shrimp and horticulture).

This working paper is one of a series of such case studies that examined the strategies and costs of compliance of the various stakeholders in developing countries with international agro-food standards. This paper was prepared by Ahmadou Aly Mbaye with guidance from Gerard Gagnon (Consultant) and Francois Le Gall (AFTS3).

A complementary perspective is provided by the companion series of buyer surveys involving representative importers, brokers, retailers, and distributors in the European Union, Japan, and the United States. This series, in turn, discusses the buyers' perception of the strengths and weaknesses of their suppliers and describes the assistance and/or interventions offered by the buyers to their developing country suppliers.

The findings and conclusions derived from these country studies are discussed in a synthesis report that seeks to identify possible points of intervention by the World Bank and other donor agencies and to determine the types of technical assistance that would be most efficient and appropriate. It is hoped that the experiences of these exporter and importer countries will provide useful insights to practitioners in the field, and to national and international policymakers in both the public and private sectors.

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Acronyms and Abbreviations

ADE	Aide à la Décision Economique, Consulting and Advisory Services
ALARA	As Low As Reasonably Achievable
ARB	Arachide de bouche (confectionary groundnut)
ASPRODEB	Association Sénégalaise pour la Promotion du Développement à la Base
BNDS	Banque Nationale de Développement du Sénégal (National Development Bank of Senegal)
CFA	Colonies françaises d'Afrique (French colonies of Africa)
CFAF	CFA Franc (currency of Senegal)
CG	confectionary groundnuts
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement (Center for International Cooperation in Agronomic Reseach for Development)
cm	centimeter
CNCAS	Caisse Nationale de Crédit Agricole du Sénégal (National Farm Credit Bank of Senegal)
CNCR	Conseil National de Concertation et de Coopération des Ruraux
CNIA	Comité National Interprofessionnel de l'Arachide (National Committee of the Groundnut Industry Association)
COM	Cadres d'Obligations Mutuelles (mutual obligation agreements)
DAPS	Ministry of Agriculture
DISEM	Seed Department, Ministry of Agriculture
DRDR	Ministry of Agriculture
DSDIA	Ministry of Agriculture
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
ha	hectare(s)
HPLC	high pressure liquid chromatography
HPS	Hand Picking Selection
INRA	Institut National de la Recherche Agronomique (French Institute for Agronomic Research)
IRHO	Institut de Recherches sur les Huiles et Oléagineux (Oils and Oilseeds Research Institute)
ISRA	Institut Sénégalais de Recherche Agricole (Senegalese Institute for Agricultural Research)
ITA	Institut de Technologie Alimentaire (Food Technology Institute)
kg	kilogram
LPDFA	Lettre de Politique de Développement de la Filière Agricole (Letter of Development Policy for the Agricultural Sector)
MAE	Ministere de l'agriculture et de l'elevage
MAP	matrice d'analyse des politiques
MT	metric ton
NAP	New Agricultural Policy
NOVASEN	Nouvelle Valorisation d'Arachide du Sénégal
OCA	Office de Commercialisation Agricole (Agricultural Marketing Office)
ONCAD	Office National de Commercialisation et d'Assistance pour le Développement (National Marketing and Development Assistance Office)

PASA	Programme d'Ajustement Structurel de l'Arachide (Structural Adjustment Program for Groundnuts)
PNVA	Programme National de Vulgarisation Agricole (National Agricultural Extension Program)
ppb	parts per billion
PRSP	Poverty Reduction Strategy Paper (Document de Stratégie de Lutte contre la Pauvreté)
PSO	Private Storage Operator
SAPA	Structural Adjustment Program for Agriculture
SATEC	Société d'Assistance Technique et de Coopération
SEIB	Société d'Exploitation Industrielle du Baol
SEPFA	Société d'Exploitation et de Promotion de la Filière Arachidière (Operating and Development Company for the Groundnut Sector
SISMAR	Société Industrielle Sahélienne de Mécaniques de Matériels Agricoles et de Représentation
SODEC	Société de Décorticage (Dehulling Company)
SODEVA	Société de Développement et de Vulgarisation Agricole (Agricultural Development and Extension Company)
SONACOS	Société Nationale de Commercialisation des Oléagineux (National Oilseed Marketing Company)
SONAGRAINES	Société Nationale des graines
SONAR	Société Nationale d'Approvisionnement du Monde Rural (National Rural Supply Company)
SPIA	Société des produits industriels et agricoles
SPS	Sanitary and Phytosanitary
STABEX	Stabilisation des recettes d'Exportation
UEMOA	Union Economique et Monétaire de l'Afrique de l'Ouest (West African Economic and Monetary Union, or WAEMU)
UNCAS	Union Nationale des Coopératives Agricoles du Sénégal (National Union of Agricultural Cooperatives of Senegal)
UNIDO	United Nations Industrial Development Organization
UNIS	Union Nationale Interprofessionnelle des Semences (National Union of Seed Industry Associations)
WB	World Bank
WTO	World Trade Organization

Executive Summary

This study assesses the level of Sanitary and Phytosanitary (SPS) management capacity in the groundnut (peanut) subsector in Senegal.

The subsector includes two major commodities: oil-mill groundnut (peanut oil and oilcake) and confectionary groundnut (CG). The former activity dates back to the colonial era. In contrast, CG cultivation is much more recent. It was started in the late 1970s, with the support of the European Union, by a private firm SODEC (Société de Décorticage), which shortly became absorbed by SONACOS, a parastatal oil mill. By 1975, total production achieved 18,000 metric tons (MT) before dramatically falling in subsequent years (to only 542 metric tons (MT) in 1977). This drastic decline was mainly due to the termination of EU support to the program. In 1985 a SONACOS subsidiary (SEPFA) was created to take charge of the government's objective to boost CG activity in Senegal, without great success. Five years later, a private company, Nouvelle Valorisation d'Arachide du Sénégal (NOVASEN), was set up to operate in the CG subsector.[1] NOVASEN is required to sell at least 80 percent of its production in foreign markets. To date, it is the only company taking care of CG cultivation and exports in the country.

The groundnut sector makes up a very important share of the country's GDP and exports. It represents up to 60 percent of cultivated land and 80 percent of rural labor force (58 percent of the country's total labor force). In 2000 60 percent of household agricultural income was generated by groundnut, and this sector made up 5 percent of GDP.

It is very difficult to distinguish between the seeds and agricultural techniques used in oil-mill groundnut and CG, since these two activities use the same kinds of both. It is the quality of grains (size, grade, and level of contamination) that determines the final destination of output. Groundnut crops are submitted to a process of selection, particularly a Hand Picking Selection (HPS), through which the share of output that meets certain criteria as regards size and level of aflatoxin contamination, is qualified CG and exported as such. The remainder (*écarts de tri*) is sent for trituration in oil mills. Usually, certain particular seeds are more suitable for CG. These include Virginia (a variety of which, GH-119-20, was used in Senegal for CG at the beginning), Spanish, and Valencia. However, Senegalese actors in the fields have had problems reproducing seeds of standard qualities suitable for CG. Seeds that are now used both for CG and oil-mill groundnuts are obtained by skimming the best quality from harvested products. This method reduces the quality of the final CG product. Thus, only 9000 tons of CG of the 60,000 tons of groundnuts harvested in the 1990s (the peak production) were suitable for export.

Government policy in the field used to be very interventionist, with the state controlling almost all stages of the production process: extension, input distribution, and crops collection. In 1980 the state created a development bank (Banque Nationale de Développement du Senegal, or BNDS) to finance the agricultural sector. Reforms in the sector began to be implemented in 1984–85, with the New Agricultural Policy (NAP), which dissolved SONAR (a public entity previously in charge of distribution) and replaced it with SONAGRAINES (a subsidiary of SONACOS). The deepest reforms in the sector took place in the 1990s, mainly with the support of the EU. Following the Lomé IV convention, the EU established its cooperation with Senegal through frameworks of mutual obligations (COM). The two first COMs (1992 and 1993) linking Senegal to the EU focused on stabilizing the crisis in the groundnut subsector. The COMs proposed the privatization of SONACOS, the liberalization of seed as well as output production and marketing, and the establishment of an industry association to devise a flexible mechanism to set the

[1] NOVASEN was set up by private shareholders.

local groundnut price in line with its world price. The subsequent COMs (1994, 1995, and 1996) aimed at boosting the sector, notably by allowing the private sector to produce enough seeds of quality. Alongside the COMs, the Senegalese government implemented the PASA (Programme d'Ajustement Structurel de l'Arachide), whose objectives overlapped in most aspects with the recommendations from the COMs.

However, the outcome of this bundle of reforms has been very disappointing. They failed to increase the total volume of crops collected per annum above the maximum level achieved throughout the 15 last years of 300,000 tons. Only in 2000 and 2001, due to exceptionally good rainfall levels and a generous distribution of inputs to peasants, was the peak of more than 1 million tons achieved again–the first time since 1975. The EU suspended its support to the government in 2001 when the government raised the producer price to CFAF 145/kg, while the industry association set it at only CFAF 120/kg. Now the government has announced a new package of measures, including the privatization of SONACOS by December 2003, increase in irrigated land, and promotion of quality, especially for CG.

Senegal exports its groundnut products mainly to EU countries and is the most important supplier to these countries, especially for peanut crude oil and oilcake. SONACOS sells its peanut oil and oilcake to traders and manufacturers located mainly in three countries: France (CEREOL-LESSIEURS, EVIALIS), Italy (SALOV, ZUCCHI), and the Netherlands (TRACOMEX, NIDERA). NOVASEN sells its CG primarily to certain traders in Europe (ALIMENTA, J&JB). While the European demand for peanut oil is dwindling, its demand for oilcake and CG is very large and expanding. Europe's demand for CG is estimated at 500,000 tons. It is acknowledged that the European market is big enough to absorb all production realized by Senegal. The constraints on Senegalese exports to Europe are twofold: an insufficient level of domestic production and difficulties in complying with European standards.

Starting in 1999, the EU has harmonized and streamlined in member countries its aflatoxin standards. Aflatoxin is a toxin secreted by a poisonous mushroom called *Aspergillus Flavus*. Some experiments done on animals conclude that it is cancer-producing. Moreover, empirical medical researches show that areas in which aflatoxin-contaminated products are most consumed are the ones in which liver cancer is the most prevalent.

In most European countries, aflatoxin standards date back to the early 1980s. However, prior to 1999, the maximum levels tolerated of aflatoxin in groundnut by-products varied widely among individual countries. Normally, aflatoxin is not contained in crude peanut oil, since the toxin completely disappears with trituration. However, aflatoxin does contaminate oilcake. This latter is mostly designed for animal consumption. It is proven that animals fed with contaminated oilcake can have their milk contaminated by a special form of aflatoxin called M1 aflatoxin, which is particularly dangerous for children. There are four different types of aflatoxin in peanut oilcake and CG: B1, B2, G1, and G2. The B1 type is deemed the most poisonous. To date, there is no technical way to completely eliminate aflatoxin in foodstuffs. In setting standards against aflatoxin contamination, the ALARA (As Low As Reasonably Achievable) principle is used. The maximum tolerated levels are:

- 2 ppb for B1 and 4 ppb for the sum of the 4 types (B1+B2+G1+G2) in CG consumed directly, that is, without any treatment (for example, roasted groundnut),
- 8 ppb for B1 and 15 ppb for the sum of the 4 types, in CG consumed indirectly, that is, for example groundnut sold in candy stores
- 20 ppb for the sum of the 4 types in peanut oilcake.

Since the early 1980s, SONACOS has developed a technical process using ammonia that reduces aflatoxin contamination in peanut oilcake to 10 ppb, far below the 20 ppb accepted in Europe. In contrast, Senegalese exports of CG are considerably hampered by product grade and level of contamination. Due to the poor quality of seeds used as CG, Senegalese products have problems meeting some basic

characteristics of CG in world markets regarding size. Consequently, a large share of collected groundnut as CG is downgraded to oil-mill groundnut. Another problem with Senegalese exports of CG is aflatoxin contamination, which occurs upstream, that is, at the field level. In effect, aflatoxin develops under certain conditions of temperature and humidity, which are all characteristic of CG production areas in Senegal. To avoid contamination, peasants have to adopt certain good practices during the production process in the field. Research of experience shows that a production process following good practices in CG cultivation results in a final product that has an acceptable low contamination rate, with a probability of 99 percent. Furthermore, these good practices in the field are the only way to control contamination. At the transformation level, there is very little scope for this.

While managing quality to reduce aflatoxin contamination is within the capacity of Senegalese farmers, *lack of incentives* is making good agricultural practices very difficult to implement. NOVASEN selects the farmers it works with according to criteria that include farm size (should not exceed 4 hectares, or ha) and the availability of agricultural materials. NOVASEN makes loans to these farmers to buy seeds and fertilizers, and the money is repaid after the harvest is sold. In addition, NOVASEN it avails to the farmers supervisors to follow the production process. As a result of the NOVASEN loans and technical assistance, in the mid-1990s, NOVASEN tripled nuts collected to nearly 60,000 tons, of which roughly 10,000 tons were suitable for export as CG. However, recently, with an almost constant level of harvest, NOVASEN's exports of CG hardly surpass 1000 tons.

The reasons for this dramatic decline are twofold. First, peasants are not rewarded for quality management. Normally, the price of higher quality nuts is superior to the prices of the others; but for more than 15 years, farmers have not gotten appropriate seeds for CG. Hence, whatever effort they devote to managing quality during the production process are not likely to result in a product that meets international CG standards, especially as regards size. Second, agricultural activity is very uncertain in Senegal due to high dependence on rainfall. In case drought occurs (which is highly probable), farmers have problems paying their debts. In this case, the government very often pays in their place, but usually it pays only for farmers working with SONACOS, not for those working with NOVASEN. In 1998 this lack of a level playing field compelled NOVASEN to stop providing loans to peasants and to send them instead to CNCAS. This disconnection of NOVASEN from the farmers dramatically reduces its control on the production process and, hence, on quality management at the field level.

For this paper, a cost/benefit analysis of compliance with international standards for oil-mill production, as well as for CG, has been done. The author adopts the "with and without the project" approach to cost/benefit analysis, and compare the discounted incremental costs and benefits to compute the net present worth associated with the compliance strategy, at each level of the production chain. The situation "without" is the one in which the producers in the various chains of production considered–cultivation and processing in oil mills and in NOVASEN–do not comply with international standards on aflatoxin, and the situation "with" is the one in which the producers do comply with such standards. At the oil-mill level, the costs incurred due to quality improvement include an investment cost of CFAF 2 billion and recurrent costs of approximately 15 percent above that of a normal activity of trituration. The difference in price for improved-quality product is approximately 30 percent relative to nondetoxified oilcake. There is also a difference in quantity, since without detoxification no more than 25,000 tons of oilcake can be sold. The net present value resulting from oilcake detoxification is estimated at CFAF 138 billions.

For CG, the author has distinguished three different levels in the production chain: production in the field, transformation in NOVASEN, and certification. In the production level, the agricultural good practices result in costs such as soil treatment, purchase of certified selected seeds, increased use of fertilizers, increased labor input (in the field and for supervision), and higher labor costs. The benefits are a higher yield per ha and a higher producer price. The net present value of improved quality in production at the field level is approximately CFAF 21 billions.

At the transformation level, the costs of compliance include the purchase of a new grasshopper, and a new sifting machine. Incremental recurrent costs include mainly the costs of aflatoxin testing and certification in the lab. The benefits are a higher export price for NOVASEN, and a greater quantity exported. Net present worth of compliance at this level is approximately CFAF 44 billions.

Finally, at the certification level, donors have helped upgrade the ITA laboratory by acquiring new machines and putting in motion the process of registering it in the EU, so that certification by this lab is acceptable to the EU. Investment costs at this level include the costs of newly installed machines and all the costs associated with the registration process (training and creation of a manual of procedure on quality). The net present value associated with this activity is a loss of approximately CFAF 550 million. The consolidated net present value for all CG segments is approximately CFAF 65 billion, with the assumption of only 60,000 ha of cultivated land.

Introduction

This study is aimed at assessing the capacity of Senegal's groundnut sector to meet quality standards in export markets.[2] The groundnut (peanut) sector consists of two subsectors: oilseed groundnuts (used to produce oil and groundnut cake) and edible groundnuts (for human consumption). While the oilseed groundnut subsector is relatively long established, production of groundnuts for food was introduced as a cash crop only in the early 1970s. Currently, there is practically no difference between the seeds used for edible groundnuts and oilseed groundnuts. The final use of the product is determined by the quality of the groundnuts, which are sorted in a multistep process that reserves the best for food and sends the rest to be crushed for oil and cake.

Brief History

The cultivation of groundnuts in Senegal goes back to the beginning of the nineteenth century during the colonial period. At that time, the role of the colonial administration in the sector extended from distributing seeds, fertilizer, and seasonal loans to marketing the crop. Groundnut production increased from 31,000 tons in 1885–90 to 579,000 tons on the eve of independence in 1953–59 (Diop 2000). At independence, during the 1960s, groundnuts provided 80 percent of exports and the lion's share of rural incomes in Senegal. The sector employed 87 percent of the active population, covered half the arable land, and accounted for 42 percent of revenues in industry.

Although groundnuts long have been grown for oil in the country, the same is not true of groundnuts grown for human consumption. The first trials of this variety of groundnut date from 1963 in the department of Sédhiou, in the south, and were carried out by the Casamance agricultural and industrial development company *(Société de développement agricole et industriel de la Casamance)*. In 1964 the Oils and Oilseeds Research Institute (IRHO) was given the task of selecting varieties that would grow well in Senegal and meet the requirements of the world market. The Virginia variety GH-119-20 was chosen. Cultivation of edible groundnuts did not actually begin until 1969. That year 20,000 ha were planted in the Kaolack region, with support from the European Development Fund. From 1969 to 1972, the dehulling (shelling) company SODEC (Société de Décorticage) had an exclusive arrangement to process and export the product. SODEC, which was a private company, built a factory for this purpose with an annual capacity of 10,000 tons. The edible groundnut subsector grew quite rapidly at first but then entered a phase of marked decline in the mid-1970s. The land initially devoted to this cash crop thus decreased from 21,600 ha in 1975 to 5,963 ha in 1977, and the harvest shrank from 18,000 tons to 542 tons over the same period. The dehulling plants were no longer assured of sufficient supply (Gaye 1999). This crisis was explained by the fact that the European financing had run out, and failures had occurred in collecting the harvests and distributing the seeds.

In the early 1980s, the National Oilseed Marketing Company SONACOS *(Société Nationale de Commercialisation des Oléagineux)* was asked by the government to rescue the sector. SONACOS bought SODEC and in 1985 set up a new subsidiary, SEPFA *(Société d'Exploitation et de Promotion de la Filière Arachidière)*. In 1990 the edible groundnut subsector was privatized, and a new operating company, NOVASEN *(Nouvelle Valorisation d'Arachide du Sénégal)*, was created. Senegalese and French private investors held 91.7 percent of the new entity's share capital, and SONACOS held the rest. NOVASEN advises and assists more than 32,000 contract workers and, at the end of the 1990s, was producing in the neighborhood of 60,000 tons a year. Its main grading and sorting facility, with a capacity

[2] It was prepared in accordance with the methodological guides written by Henson and others 2002.

of 300 tons a day, is based in Kaolack. NOVASEN controls the entire subsector. It chooses and advises the producers and takes charge of collecting, processing, and marketing the product. Eighty percent of its output by value is exported, notably to the European Union, and the rest is absorbed by the local market.

Rising Standards for Groundnuts

Since 1999, Europe has harmonized the standards of the various member countries concerning contaminants of groundnuts, making these standards stricter. The maximum allowable content of aflatoxin B1 is set at 2 parts per billion (ppb) for edible groundnuts and 20 ppb for groundnut cake. In theory, the oil that Senegal produces is not contaminated, by aflatoxin because any aflatoxin present is eliminated in the crushing process. For the presscake, SONACOS uses an ammonia detoxification process that is approved for the European market. It is primarily in edible groundnuts that there appear to be problems. The quantity of Senegalese edible groundnut products shipped to Europe has decreased sharply in recent years, falling from 10,000 metric tons (MT) a year in the 1990s to approximately 500 tons at present. The contamination of edible groundnuts by aflatoxin occurs mainly in the field, and with the current state of technology, there is no method of detoxifying edible groundnuts during processing at the factory. The agricultural practices that can prevent groundnuts from being contaminated by aflatoxin are well known and not costly. It is a question of providing growers with a minimum of extension services and incentives so that they will follow these practices in the field.

In this study, the author reviews the evolution of policies in the groundnut sector; the role of this sector in the national economy; the requirements that it must meet, notably in terms of quality management; and the measures that can be taken to improve quality. The author also performs a cost/benefit analysis of groundnut production that meets quality standards to see which net benefits accrue to each of the different production segments.

Groundnut Sector: Production and Stakeholders

Place of Groundnuts in the National Economy

The agricultural sector in general and the groundnut subsector, particularly, play a prominent role in the national economy. For this reason, the poverty reduction strategy paper (PRSP) identifies the subsector as a key element of the measures that the Senegalese government plans to implement to reinvigorate growth and reduce poverty. The groundnut crop is the principal source of income for the rural population and ranks among the top export products alongside fish, phosphates, and tourism. Besides the formal activities of collection, processing, and marketing that the groundnut crop entails, it also supports other business activities that are significant in a rural context: artisanal oilseed crushing and sales of peanut butter and roasted groundnuts. In recent years, the sector has encountered some fairly severe difficulties, but its role in the economy remains a considerable one. The record harvests of 2000 and 2001 increased rural income by CFAF 71 billion in the first year and CFAF 81 billion in the second. Over the 1993–99 period, income to producers had averaged approximately CFAF 28 billion a year (ASPRODEB 2002). Some 700,000 farming operations, each of which supports a family or a village, are active in the subsector.

Groundnut production has varied considerably over the years. The most remarkable years for output were the middle to late 1970s and the years 2000 and 2001. Annual production exceeded 1,000,000 tons during these periods.

Groundnut production occupies 45 percent to 60 percent of the land under cultivation in the groundnut-growing basin and accounts for nearly half of all cultivated land in Senegal. Agriculture is the occupation of 80 percent of the rural population, which itself is estimated at 58 percent of the total population, and the vast majority of growers are in the groundnut sector. Sixty percent of the farming income of rural households derives from groundnuts. In 2000 and 2001, groundnuts accounted for approximately 5 percent of GDP, and income from this product totaled approximately CFAF 180 billion. This amount represents net income from the sale of groundnuts and groundnut stalks, taxes, bank interest and insurance premiums (ASPRODEB 2002). The number of jobs generated by the sector is substantial. The number of agents and other operators involved in marketing is estimated at 10,000, and the number of permanent and temporary jobs at the processing plants (oilseed and edible groundnuts) at approximately 4,000. For comparison, total employment in the modern sector in Senegal runs approximately 120,000. In years of favorable harvests such as 2000 and 2001, the sector represents roughly 12 percent of exports. The crop also serves a significant function as a source of food and fodder: groundnut kernels and pastes are used in preparing various foods for human consumption, while the leaves and stalks serve as feed reserves for temporarily stabled livestock such as draft animals and small ruminants.

Players in the Sector: Production and Marketing Chain

The chain of production in the groundnut sector includes several different types of players: seed suppliers, producers, collectors, processors, and exporters.

Seed Suppliers

Seed production in Senegal is done in several stages. At the bottom of the ladder is the research institute, ISRA *(Institut Sénégalais de Recherche Agricole,* Senegalese Institute for Agricultural Research*)*, which performs varietal testing, production of pre-basic seed stock in target volumes between 25 and 30 tons a year, and multisite trials. ISRA's products thus are intended to be seeds of excellent quality that will be reproduced in quantity during several later phases to provide crop seed for planting by farmers. Downstream from ISRA there are:

- Contract producers. They supply basic seeds and certified seeds for the distributor-operators of UNIS (*Union Nationale Interprofessionnelle des Semences*, National Union of Seed Industry Associations).
- Operators. These are the collectors and distributors who distribute seed to farmers. In 1999 there were 188 of them operating 314 seed collection locations. Their capacities vary between 12,000 and 25,000 tons of seed per year (ASPRODEB and CNCR 2003).
- DISEM. This is Senegal's Seed Department, responsible for controlling and certifying seed quality.
- CNCAS *(Caisse Nationale de Crédit Agricole du Senegal)*. Senegal's national farm credit bank is responsible for managing the guarantee fund that underwrites the collection and marketing of groundnuts.

Before the privatization, the state was producing 120,000 tons of seed a year, including 50,000 tons of pedigreed seed. With the state's withdrawal from the sector in 1994, the private operators have been struggling to produce 15,000 tons of certified seed a year.

For edible groundnuts, it should be noted that NOVASEN does the seed selection by skimming, that is, setting aside the best seeds from current crops for planting in following seasons.

Producers

These are the rural farmers who produce groundnuts on farms, sometimes in combination with raising livestock. Most of the crop is sold for subsequent processing, but a portion of it is retained as personal seed reserves or consumed in place. Since the SONAGRAINES *(Société Nationale des Graines)* entity disappeared, farmers have been selling their crops to private operators authorized by SONACOS, which takes charge of reselling the crop to the processors. It must also be said that a substantial fraction of the harvest goes to independents operating outside the SONACOS-authorized circuits.

For edible groundnuts, the producers are farmers selected and advised by NOVASEN. The selection criteria include geographic location, size of farm, and degree of mechanization. NOVASEN supplies the needed inputs on credit and buys the resulting crop at a price that varies according to the grade of the groundnuts.

Collectors

Since the implementation of the Structural Adjustment Program for Agriculture (SAPA), two types of players can be distinguished in collection of the crop: the official circuit and the informal circuit (Badiane and Gaye 1999). The official circuit is controlled by SONAGRAINES, which relies on the private storage operators (PSOs) and agricultural cooperatives. SONAGRAINES sets beginning and ending dates for the groundnut season and supplies funds and transport equipment for crop collection. The PSOs and cooperatives are paid a fixed commission rate per ton. It should be noted, however, that this system has become inoperative since 2001, when the system of delivery to the factory gate was put in place. Since November 2001, SONACOS is no longer involved upstream from the collection phase. It authorizes private operators, who obtain financing from the banking system, to carry out their crop collection operations and deliver the crop directly to the oilseed crushing company. To be authorized, the operator must fulfill the following conditions: have working capital sufficient to buy 500 tons of groundnuts, have the necessary equipment, and be able to pay the official price in cash. This new collection system has given rise to many failures in recent crop years, and these failures have brought calls and proposals to reform it (Government of Senegal 2003a, ADE 2002, ASPRODEB 2002).

For edible groundnuts, the producers are advised by agents recruited by NOVASEN who also do the crop collection during the harvest period for the company's account.

Processors

These are essentially SONACOS and NOVASEN.[3] SONACOS crushes groundnut kernels to produce unrefined oil and presscake for export markets, particularly the European market. It also imports raw vegetable oil that it refines and sells on the local market. NOVASEN deals mainly with edible groundnuts. Groundnuts that meet European standards are exported; the remainder (the sorting culls) are crushed and sold in the form of unrefined oil and presscake.

These two companies export directly to traders (brokers) and to companies that refine the crude groundnut oil before putting it on the market.

Sector Performance

Appendix 1 gives historical figures for groundnut production and area under cultivation.[4] It shows that production of oilseed groundnuts has fluctuated greatly from one year to another, with a minimum of 260,000 tons in 2002–03 and a maximum of 1,434,000 tons in 1975–76. Production of edible groundnuts, on the other hand, shows a steep rise, from 8,000 tons at the beginning of the 1970s to more than 60,000 tons in the mid-1990s. This dramatic rise is explained partially by the agricultural extension work of NOVASEN, which had considerable success during this period. However, the most important determinant of these production figures is, without question, the amount of rainfall: harvests fall significantly in years of drought such as the 2002–03 season. In contrast, with the ample rains of the 2000–01 and 2001–02 seasons, oilseed groundnut production hit annual highs of approximately 1,000,000 tons, and edible groundnut production reached approximately 60,000 tons. Besides this purely exogenous factor, though, there are many others that are of more or less importance, depending on the crop (Freud *and others* 1997)

When harvests are poor, groundnut production falls short of installed crushing capacity. Thus, SONACOS, with installed capacity of 960,000 tons, achieved its best output figures since the 1990s with the good harvests of 2000 and 2001. In most years during that period, however, collections were less than 300,000 tons, with a low of less than 100,000 tons in 1997 (ADE 2002). As for NOVASEN, it was able to export more than 10,000 tons of edible groundnuts a year in the late 1990s, but its exports have declined to approximately 600 tons in the past few years. This drop seems to be due more to the quality of the harvests than to their quantity.

The age and lack of availability of farm equipment probably explains a good part of the industry's difficulties. The problem is persistent for both crops but more pronounced for oilseed groundnuts. For edible groundnuts, for which equipment quality requirements are more demanding (for example, 20-notch disks and appropriate seeding shares), NOVASEN's extension agents target farmers who already have a certain minimum amount of farm machinery.

Moreover, the land area planted in groundnuts has declined sharply over the years due to land pressure, certain institutional factors, and pricing policies (Freud and others 1997). Yields also declined, especially in the mid-1970s, although there has been a fairly significant recovery in yields since 1999 due to the government's deep phosphate treatment program and the record rainfalls in 2000 and 2001. The decline in

[3] Not counting traditional oilseed crushers and producers of peanut butter for the local market.

[4] Note that the figures in this table are for groundnuts in the pod. On average, the kernels account for two-thirds of the weight, the hulls one-third.

yields is explained by deterioration in soil quality, reduced consumption of fertilizer, unfavorable cultivation practices, and degradation in seed quality.

The last of these factors is the one blamed most for the crisis in groundnut production, notably for edible groundnuts. Seed production follows a fairly long cycle–from selection of the cultivar to preparation of level 2 seeds–and this cycle seems to have been broken in recent years. Pedigreed seed is becoming increasingly scarce, and more ordinary seed is being used. For edible groundnuts, NOVASEN's procedure is to set aside the best seeds from past harvests as seed capital. This approach means that the seeds that are no longer reproducing lose some of their quality, and the mixing of varieties ultimately alters the purity of the seed stock.

Structure and Performance of the NOVASEN Production Chain

In the areas in which it operates, NOVASEN works with a number of growers and provides advice and assistance to them. The company has three production zones. The northern zone, around Louga, covers approximately 14,000 ha. It receives much less rainfall than the other areas. NOVASEN provides minimal extension services and no seasonal credit. This zone produces a Spanish variety (55-437) that yields much larger kernels than the Virginia variety (GH-119-20). The southern zone, around Kolda, covers approximately 5,000 ha. It is a pioneer zone that enjoys more favorable climatic conditions than the others. The third zone, around Kaolack, covers approximately 41,000 ha. A dual-purpose variety (73-33) is grown there for both oil and food, as well as the GH-119-20 variety, which is more specifically an edible groundnut. The company chooses the farmers with whom it works based on a number of criteria, mainly the size of the farm, which must be between 2 ha and 4 ha, and the availability of farm equipment.

Normally, NOVASEN extends seasonal credit to the farmers with whom it works and gets reimbursed when these farmers sell their crops to the company. It also provides extension agents, who advise the farmers in the production process and handle collection of the harvest at the various collection points.

Appendix 1 shows that since NOVASEN was established in the early 1990s, production of edible groundnuts has practically tripled, reaching 64,247 tons of pods during the 1999–2000 season. In the middle of the 1990s, the volume of kernels exported annually as edible groundnuts had been approximately 10,000 tons. Subsequently, although the quantity harvested has still been close to 60,000 tons, the volume of edible groundnuts exported has barely exceeded 1,000 tons a year owing to the size of the kernels and the degree of contamination by aflatoxin.

Many factors contributed to this poor performance. The author draws attention to the following:

- Lack of incentives for farmers, who get almost the same price from the company for edible groundnuts as for ordinary groundnuts. Normally, there is a substantial price differential between the premium-grade crops, which yield kernels more suitable for export, such as confectionery groundnut (Arachide de bouche, or ARB) and the other grades (A and B), which include a higher proportion of kernels whose size and level of contamination make them unsuitable for export and therefore are downgraded to oilseed groundnuts. Appendix 5 shows that NOVASEN has gotten practically no premium grade from the farmers since 1997, and the price difference between the A and B grades has been virtually nil most of the time.
- It is becoming harder and harder for farmers to grow premium-grade crops because their seed capital is not being renewed. Increasingly, NOVASEN uses a skimming procedure to select the seeds to be planted for the next crops. The company has not renewed the seed capital in more than 15 years. Given the quality of seed available, it is difficult for farmers to achieve premium-grade harvests.

- The fact that in recent years the company has chosen to favor the processing business and has installed substantial machinery for this purpose can be understood as an alternative solution in lieu of agricultural practices that would meet the technical and quality standards for ARB. Instead of reconstituting the seed capital and putting more effort into advising farmers, which route could have improved the quality of edible groundnuts suitable for export, the company seems to have resigned itself to crushing the lower-quality groundnuts that farmers are delivering to it.
- The company has had a number of problems in the past few years involving collection on the loans that it makes to farmers. It must be understood that agriculture is an activity that remains highly uncertain in this country, particularly owing to its very heavy dependence on rainfall. In years of poor harvests, farmers' incomes decline drastically so that farmers are unable to pay their debts. The government frequently finds it necessary to step in and assume this debt. Usually, however, it is only the debts of farmers working with SONACOS that are absorbed by the state, while the debts of farmers working with NOVASEN are left untouched. This government policy has led the company to stop extending credit to the farmers with whom it works and to tell them to turn to CNCAS for financing, as all the other farmers must do. This company policy has of course sharply reduced the company's hold on the production process of the farmers with whom it has ties.

Evolution of Sector Policies

The history of government policy in the sector can be divided in two phases: a phase of very far-reaching intervention by the state (1960–79) and a phase of liberalization of the sector beginning in the 1980s.

Period of State Intervention

Upon independence in 1960, Senegal established a marked preference for import substitution activities. The groundnut sector was supposed to play a prominent role in this strategy by generating the foreign exchange needed to finance imports of capital goods and other necessary inputs. The government also sought to make this sector the foundation of the country's industrial activity. A comprehensive intervention scheme was therefore developed around the sector. Very early on, a system of syndicated lending was introduced to ensure that farmers were supplied with seed and other inputs, and in 1980 the BNDS (*Banque Nationale de Développement du Senegal*, or National Development Bank of Senegal) was created primarily to finance groundnut cultivation. Farmers were also organized into cooperatives to take charge of distribution. ONCAD (*Office National de Commercialisation et d'Assistance pour le Développement*, or National Marketing and Development Assistance Office) was created in 1966 to centralize the various state-run functions in the sector. Owing to its monumental deficit, ONCAD was finally wound up in 1980, leaving behind liabilities of CFAF 120 billion. SONAR (*Société Nationale d'Approvisionnement du Monde Rural*, National Rural Supply Company) took over the distribution function after ONCAD's dissolution and continued to prefinance the acquisition of inputs by withholding a portion of the value of crops purchased. With the New Agricultural Policy (NAP) in 1984-85, SONAR in turn was dissolved, and a new bank, CNCAS, was created to provide loans to producers. At the same time, SONAGRAINES, a subsidiary of SONACOS, took over more and more of the crop collection and seed distribution functions.

On the marketing side, the OCA (*Office de Commercialisation Agricole*, or Agricultural Marketing Office) was established in 1960 to guarantee crop prices to producers. With the creation of SONACOS in 1965, almost all marketing activities came under the state's wing. Under the New Agricultural Policy (NAP), the birth of the Private Storage Operators (PSOs) marked a return of the private sector in oilseed marketing, although still under the control of SONACOS.

On the agricultural extension side, SATEC *(Société d'Assistance Technique et de Coopération)* was created in 1964 to increase crop yields. It was subsequently replaced by SODEVA *(Société de Développement et de Vulgarisation Agricole)* and later by PNVA *(Programme National de Vulgarisation Agricole)*, which, however put less emphasis on groundnuts than its predecessors.

Reforms of the 1990s and Support from the EU

In the early 1990s, the EU's system of aid via the STABEX (*Stabilisation des recettes d'Exportation*) mechanism was changed in conformity with Lomé IV to allocate resources according to mutual obligation agreements (*Cadres d'Obligations Mutuelles*, or COMs) negotiated between the beneficiary country and the European Commission. Between 1992 and 1996, the Government of Senegal signed five such agreements with the EU, at a pace of one COM per year. The first two COMs (1992 and 1993) were aimed at consolidating the sector's finances, whereas the next three sought to revive the sector.

Fiscal consolidation of the sector (COM 1992, 1993). The objective of the fiscal consolidation phase was to put in place a new organizational scheme for the sector. The sector had fallen into a severe crisis after the harvests of 1992 and the seven seasons that preceded it, which, with the exception of 1990, had all ended in deficit. World groundnut prices had collapsed from $960 per ton in 1990 to $610 per ton in 1992. Despite this price decline, the Senegalese government had raised its price from CFAF 70 to CFAF 80 per kilogram. This price increase provoked a huge deficit, estimated at CFAF 48 per kg of groundnuts, which the government's guarantee fund, instituted in 1986–87, could not cover. The themes of COM 1992 were much the same as those of the SAPA: privatization of SONACOS; privatization of seed production and marketing; reduction of costs in the sector in the collection, processing, and marketing stages; and institution of a more flexible mechanism for determining the prices paid to producers. In the very short term, the COM sought to achieve the following: get the producers involved in sector management, keep SONAGRAINES in the crop collection business, and restructure the industrial activities in the sector. To set prices, the COM called for establishing a guarantee fund with appropriate legal status and managerial autonomy. Thus, most of the resources under COM 1992 were to go to the guarantee fund to cover loans for the 1991–92 season and reduce the cumulative deficit from past seasons.

COM 1993, which was not actually signed until 1995, called for implementing an industry-wide association for groundnuts. As for pricing policy, the goal was to make it more flexible while ensuring a minimum income level to the farmer. It should be noted that privatization of SONACOS, which was the main objective of this phase, still had not been accomplished, despite two abortive attempts to do so.

Revival of the sector (COMs 1994, 1995, 1996). Starting in 1994, the next three COMs sought to restore agricultural production. The diagnosis of the production problems emphasized soil depletion, late arrival of the rainy season, lack of suitable credit, and poor seed capital. A production target of 400,000 tons was set for 1994, and this was raised to 1,000,000 tons in 1997. To achieve this objective, it was decided to (a) set up a price-setting mechanism administered by an industry-wide association, which would announce and guarantee a price before the beginning of the season, and (b) implement a seed supply plan to ensure production of quality seed by the private sector. COM 1995, signed in 1998, and COM 1996, signed in 1999, provided financial resources to support the industry-wide association and the seed program.

Toward the end of the 1990s, groundnut production increased significantly, rising from 578,768 tons in 1992–93 to 1,061,540 tons in 2000–01 and 943,837 tons in 2001–02, before it plunged to less than 300,000 tons in the 2002–03 crop year. However, this variation seems to have been entirely unrelated to actions under the program. In fact, prices were set without reference to the chosen plan; the seed program was compromised by massive distribution of seeds set aside from prior harvests; and although SONAGRAINES was finally liquidated, both it and SONACOS accumulated large deficits that were absorbed by the government.

*Structural Adjustment Program for Agriculture (SAPA***)**. The Letter of Development Policy for the Agricultural Sector sets forth principles for liberalization of the sector as part of the SAPA. These principles are fairly close to those in the various COMs, although they do diverge on several points (World Bank 1998, IDC 1999). Both call for establishing a floor price before planting begins, but whereas the SAPA speaks of a support fund financed by levies on members of the industry-wide association, the COMs speak of a support fund financed by STABEX funds and levies on imports. The SAPA also includes a process for privatization of SONACOS, liberalization of the sector in respect of domestic commerce in groundnuts, and elimination of prior authorization requirements for imports of vegetable oils.

CNIA and the framework agreement. CNIA *(Comité National Interprofessionnel de l'Arachide)* was established in 1995 as a trade association. Its origin goes back to 1989–90 and the former rural development ministry, which wanted to foster more interplay among players in the industry. The necessity of creating an industry-wide association for the sector was subsequently recognized not only in the COMs but also in the SAPA. The members of CNIA are the producers' associations, such as UNCAS; the private organizations that perform crop collection, storage and transport; industrial processing companies (SONACOS and NOVASEN); and manufacturers of inputs (Senchim, UNIS, SPIA) and agricultural equipment (SISMAR). No government department or agency is a member of CNIA: the state must content itself with performing certain public service missions such as research. Relations between the state and CNIA are covered by a framework agreement signed in 1997 by the state, CNIA, and SONACOS; and amended in 2001. This agreement ended in December 2003. The privatization of SONACOS took place in 2005.

CNIA is responsible for determining how the resources available under the COMs are to be used. However, the EU suspended its financing of the sector in 2001, and discussions continue on what uses are to be made of resources available under the COMs and not yet committed. CNIA's role is primarily to facilitate concerted action by the various players in the sector. It must also commit to set the floor price for producers before the season begins and help to professionalize the sector. CNIA's funding comes mainly from the COMs and from the rather marginal dues paid by the rest of its members. Its activities have slowed considerably in recent years, and its edible groundnut program has even been halted. The World Bank has stepped in by financing an experimental research program on edible groundnuts conducted by CIRAD in the river region.

New Directions of Government Policy in the Sector

The reform measures of the 1990s, with the notable exception of the privatization of SONACOS**,** which did not occur until 2005, all have reached a fairly advanced stage of implementation. However, some catastrophic reversals were seen at the beginning of 2000, notably in collection and marketing. Furthermore, the system faces a persistent crisis that calls for new measures on the part of the public authorities.

Assessment of the 1990s Reforms

The reforms undertaken since the 1990s have affected every segment of the production chain. Even so, many problems persist in the various segments, and new problems have emerged that the sector must address.

Groundnut production has been on a very pronounced downturn, which has persisted despite the successive waves of reform in the sector. Over a 15-year period, average annual production of oilseed groundnuts was 500,000 tons, and the average annual collection by SONACOS was 300,000 tons (Government of Senegal 2003). Over the past 16 years, collection of oilseed groundnuts has exceeded 300,000 tons only three times; the rest of the time, it has varied between 100,000 and 280,000 tons. The

causes of this poor performance are varied and amply documented (Government of Senegal 2003a, 2003b, ASPRODEB 2002, 2003, Freud and others 1999). First, the seed capital has not been renewed in a very long time and consequently has deteriorated. In addition, poor farming practices have greatly degraded soil quality. The production equipment is rudimentary and poorly maintained. On top of all of this, there are multiple institutional constraints.

In the area of distribution of inputs and collection of the crop, it must be noted that, despite the privatizations that have been undertaken, there have been enormous disturbances in recent years, and these have disrupted crop years considerably. When SONAGRAINES was eliminated, the system of delivery to the factory gate was instituted. This change has meant that the processing company is no longer involved in collecting the crop. Instead, authorized private operators seek financing from the banking system and deliver the crop to the processor. *One difficulty of this system is that it is not really operational*: the number of private operators who can raise the necessary funds is not sufficient for the system to operate as it should. Consequently, SONACOS has been obliged to prefinance virtually all of its purchases delivered by the PSOs (70 percent), UNCAS (19 percent), SOSEN (9 percent), and others (2 percent). Another problem in this area is related to the equipment used in the collection phase, notably the antiquated sifting screens and the inadequate transport equipment. The crop is now transported to the factories by the private sector, which has a fleet of 500–600 trucks. This fleet consists mainly of old and dilapidated vehicles, and operators have a hard time serving all of the collection points.

In the processing area, the major problem is insufficient supply. SONACOS, which has a theoretical production capacity of 960,000 tons, operates well below this level. It has even had to shut down its Diourbel plant (200,000 tons), closed since 1991. For edible groundnuts, the main problem is quality management and meeting aflatoxin standards.

The price-setting mechanisms also pose a problem. Their stated objective is to align the prices paid to producers with prices on the world market. In practice, however, a difference of at least 20 percent is still seen between the two sets of prices. In 2001 CNIA set the producer price at CFAF 120 per kilogram, which the government later raised to CFAF 145. This action greatly displeased the European Union and was one of the reasons that the EU suspended its support for the sector.

New Directions for Reform

The new directions of government policy for the sector are set forth in two recent documents of the Senegalese government: the Agricultural Orientation Act and the Letter of Development Policy for the Groundnut Sector (Government of Senegal 2003b). The objectives are to ensure food security and increase the competitiveness of the sector to make it an important source of jobs and foreign exchange.

The Agricultural Orientation Act seeks to improve the institutional framework of the farm sector in general, and the groundnut sector in particular. It makes explicit mention of the objectives of increasing agricultural exports and improving the quality of products destined for export. It gives farmers a legal status that provides them with social security, as is done in the modern sector. A vocational training program tailored to their needs will be offered to them. The act also calls for strengthening the land use rights of agricultural operators. The state's role in agricultural research and sustainable soil management likewise is strengthened. It must be noted, however, that various criticisms have been leveled against the act, not only by the farmers' organizations but also by public interest groups and some donors. For example, many people think the act is not realistic and gives too many powers to the government as regards field attribution to the detriment of local communities.

Concerning the groundnut sector more specifically, the government's new strategy is set forth in the LPDFA *(Lettre de Politique de Développement de la Filière Arachide)*, adopted by the Council of Ministers in May 2003. The LPDFA seeks to improve functionality in the various segments of the sector by addressing the failures observed in previous seasons.

On the institutional front, as mentioned above, the government accomplished the privatization of SONACOS in December 2005. The framework agreement between the state and CNIA will not be renewed. CNIA will be reformed to make it administratively and financially autonomous. As a member of the UEMOA (Union Économique et Monétaire Ouest Africaine, or West African Economic and Monetary Union)], Senegal will accelerate implementation of WTO agreements on antidumping laws and farm subsidies. Regulations governing the marketing of cash crops and seed supplies and control and certification of seed quality were revised to make them more compatible with free competition and were put in effect for the 2003–04 season. Full liberalization of the sector will achieved, and the state's role will be limited to public service missions relating to agricultural statistics, soil protection, agricultural research, enhancement of producers' capacities, and seed quality control and certification.

On the production front, the government plans to develop small-scale irrigation to curb water use. A program to reconstitute seed capital with improved varieties was planned for the end of May 2003 but has not yet taken place. The edible groundnut subsector will receive more attention. To this end, a price-setting mechanism more appropriate for this crop will be proposed. The government plans to foster the emergence of small and medium enterprises in the business of dehulling and artisanal or semi-industrial processing of edible groundnuts.

On the quality management front, the *seccos* will be rehabilitated[5]; the collection equipment will be replaced; and pedigreed seeds will be cleaned. ITA (*Institut de Technologie Alimentaire*, or Food Technology Institute) laboratories will be upgraded for quality control of groundnut products destined for export and imported vegetable oils. Quality standards will be established in conjunction with the Senegalese Institute for Standardization, and quality awareness campaigns will be conducted with the support of UNIDO (United Nations Industrial Development Organization).

[5] Seccos are open barns in which stored groundnuts are exposed to sun and dew, favoring the growth of fungi.

Export Markets and Quality Standards for Groundnut Products

Senegal is one of the largest exporters of groundnuts in the world. If domestic supply were sufficient and quality were ensured, the earnings the country could make from the various secondary products of the groundnut sector would be substantial.

World Market for Oilseeds

Oils

Groundnut oil commands the highest price on the world market after olive oil. In 1999–2000, for example, groundnut oil sold for $655 a ton, compared with $328 for rapeseed (canola) oil, $330 for sunflower oil, $245 for palm oil, and $208 for soybean oil. However, in recent years, world trade in groundnut oil has followed a declining trend. It fell from 325,000 tons in the early 1980s to 275,000 tons in 1990, then to 225,000 tons in the late 1990s. One reason for the decline is the increased competition from other oils such as sunflower oil and soybean. The EU, for example, granted generous subsidies to EU farmers to encourage them to grow sunflowers.

World production of oilseeds in 1999–2000 amounted to roughly 250 million tons, of which groundnut kernels represented only 4.7 percent; rapeseed (13.4 percent), cottonseed (11 percent), soybean (55.5 percent), and sunflower (9.4 percent). The rest of the oilseeds accounted for 6 percent. World trade in oils in the same year amounted to 50 million tons, of which only 500,000 tons was groundnut oil. Thus, virtually all of the world's production of groundnuts is consumed where it is produced and does not enter world trade. The United States, the world's largest producer of groundnut oil, does not import any. India, the second-largest producer, targets mainly the Asian market. Argentina, which exports nearly 100,000 tons, targets the Latin American market. In Africa, Sudan, Mali, and Gambia are exporters of groundnut oil, with annual volumes of 50,000, 10,000 and 5,000 tons, respectively.

Senegal thus plays a leading role in the European edible oil market, which is estimated at 150,000–180,000 tons a year. Within the EU, the largest importers are France and Italy, which between them account for more than 80 percent of imports.

Senegal sells its groundnut oil either to industrial companies, which refine SONACOS's crude oil before putting it on the market, or to trading companies (brokers), which buy it for resale. For oil, Senegal's main manufacturing customers are Cereol-Lessieurs (France), Nidera (Netherlands), and Salov and Zucchi (Italy). The trader most active in the Senegalese market appears to be Alimenta. It should be noted that Senegal exports no refined oil; it exports only unrefined oil and presscake. On the other hand, Senegal imports vegetable oil, which it refines to meet the needs of its domestic market.

Cake

In contrast to the market for groundnut oil, the market for groundnut cake has expanded markedly in the past few years, spurred by the prohibition on animal-based feed in Europe following the mad cow crisis and the impossibility of importing transgenic presscake from the United States. Furthermore, the EU's agricultural policy favors meeting domestic requirements for vegetable proteins with imports rather than with domestic production, which is costly and necessitates enormous subsidies. Groundnut cake sells for $180 a ton, compared with a world price of $210 for soya. For groundnut cake, Senegal's main customers are Ballouhey (France), Evialis (France), and Tracomex (the Netherlands).

Edible Nuts

The world market for edible groundnuts is quite large. Around the world, groundnuts are used in many ways. They are roasted in the pod and eaten as is; the large kernels of the *Virginia* variety are used for snacks (salted, coated); and the small kernels and broken kernels of the same variety are used to make pastes and peanut butters. In confectionery, medium Virginia kernels are used for sugar-coated candies, and large kernels are coated with chocolate. The medium kernels of the *Valencia* variety are used in biscuits, while the small kernels and split kernels go into pastes and butters. Last, the small-kernel *Spanish* variety is used to produce snacks and peanut butter. World demand for edible groundnuts is estimated at 1.2 million tons, including 500,000 tons in the European market alone. The main producing countries are Argentina, China, India, and the United States. Prices for the edible nuts are much higher than for oil or presscake–between $480 and $540 a ton for edible nuts–whereas costs of production are comparable to those for oil. The majority of Senegal's exports go to Europe, but smaller quantities are exported to the Maghreb (primarily Morocco) and Saudi Arabia. The problem with the Saudi market is that consumers want the skin removed leaving the kernel intact, a technique that has not been fully mastered in Senegal.

For edible groundnuts, the trading company Alimenta is again among the buyers, but Senegal's biggest customer in Europe seems to be J&JB, a British trader, which, it is widely rumored, sells the Senegalese groundnuts as bird feed–an allegation denied by the NOVASEN managers with whom the author has spoken.

European Market and Aflatoxin Standards

The food safety requirements of the European Union, Senegal's main customer for oilseed groundnuts, are contained in Directive 98/53/EC (16 July 1998) and Commission Regulation 1525/98. The rules set the maximum allowable aflatoxin content of foodstuffs (primarily groundnuts) that can be marketed in the EU. All EU Member States have been required since December 1999 to implement these legislative and regulatory provisions. The EU began to establish these common standards in the 1980s. At that time, almost every European country had its own regulations concerning allowable aflatoxin content in foodstuffs for human consumption. In the late 1990s, these standards were harmonized throughout the Union. Between 1991 and 1998, for example, the maximum allowable content of aflatoxin B in European countries varied between 2–10 ppb (that is, between 0.002 and 0.01 milligrams per kilogram of groundnuts). The subsequent harmonization seems to have been accomplished by leveling down rather than up.

Aflatoxin is a toxic substance secreted by a fungus named *Aspergillus flavus*. This fungus grows in the temperature and humidity conditions that are found in Senegal. Experiments performed on animals have shown that aflatoxin is a powerful carcinogen. Furthermore, empirical medical research has shown that areas in which consumption of products contaminated by aflatoxin is greatest are also areas in which the prevalence of liver cancer is highest. Aflatoxin is not present in groundnut oil because it is completely eliminated in the crushing process; it is present, however, in the presscake and in edible groundnuts. The aflatoxin contained in the groundnut cake used as cattle feed, notably aflatoxin B1, gives rise to the aflatoxin M1 (highly carcinogenic, especially in young children), which is found in the milk of animals that have consumed the contaminated feed. There are four types of aflatoxins in groundnuts: B1, B2, G1, and G2. Type B1 is believed to be by far the most dangerous. According to the EU regulation, there is

> **"**There is…no threshold below which no harmful effect is observed. There is therefore no basis for setting an allowable daily dose. In the current state of scientific and technical knowledge, even with improvements in production and storage practices, it is not possible to completely prevent these molds from growing and therefore not possible to completely eliminate the presence of aflatoxins in foodstuffs."

On the strength of this finding, the EU has set the allowable standards at the lowest feasible level. It is indeed quite difficult to remove all aflatoxin from groundnut kernels. The limits therefore are set on the ALARA (As Low As Reasonably Achievable) principle.

The maximum aflatoxin contents allowed in the EU follow.

- For direct consumption of edible groundnuts: 2 ppb for type B1; 4 ppb for the sum of the 4 types (B1+B2+G1+G2) [6]
- For indirect consumption of edible groundnuts: 8 ppb for B1; 15 ppb for the sum of the 4
- For groundnut cake: 20 ppb for the sum of the 4.

Direct consumption occurs when the kernel is eaten as is with no further processing, for example, as in roasted groundnuts. Indirect consumption occurs when the kernel has received additional processing, as in confectionery. This distinction is taken into account in determining the maximum allowable content. Quality management of products exported to Europe is quite tricky. If the standards for the product are not met, the cargo is sent back to the country of origin. Moreover, imports of all such products from that country are suspended for a period of at least six months.

Aflatoxin and Senegalese Groundnut Products

The groundnut products that Senegal exports are oil, presscake, and edible groundnuts. Aflatoxin is a problem mainly for edible groundnuts.

Groundnut Oil and Presscake

In principle, the unrefined groundnut oil that Senegal exports is not contaminated by aflatoxin. The substance is removed entirely from the oil during the crushing process, but it remains in the presscake. Since 1980, Senegalese groundnut cake has undergone a detoxification process that uses ammonia. This process, which has been approved by the European Union, was implemented with the assistance of INRA, the French Institute for Agronomic Research. In the 1980s SEIB had developed a different detoxification process, using chlorine and soda, with technical assistance from Texas A&M University. This process gave good results at the experimental stage but had to be approved for animal consumption in Europe. Approval was requested, but the effort to obtain it was abandoned in 1984 when SEIB was absorbed by SONACOS. Obtaining approval is a long and costly process that requires a great deal of experimentation and many trials before it can be completed. SONACOS, which already had a method of detoxification that was accepted in Europe, did not see fit to pursue the experiments with chlorine and soda detoxification, which is widely used in the United States.

It must be noted, though, that SONACOS has a detoxification process that is protected by patent and is not available to the other oil processor, NOVASEN. Consequently, whereas SONACOS's groundnut cake meets European standards for aflatoxin content, NOVASEN's is sold as is, that is, in a contaminated state, and the European feed companies that buy it perform the detoxification themselves before putting in on the European market.

The product that arrives at SONACOS's factories is first dehulled, heated, and then crushed to extract the oil. The presscake that remains is subjected to a detoxification process using ammonia (the French system).

[6] 1 ppb (part per billion) is equivalent to 0.001 milligram of aflatoxin per kilogram of groundnuts.

Edible Groundnuts

The key point is that, at present, the same varieties of seeds that provide oilseed groundnuts also provide edible groundnuts to NOVASEN. It is the quality of the kernel at harvest time that determines its final use. The groundnuts that arrive at the factory of the processor (NOVASEN) undergo the following process. They are first treated with phytosanitary products before being stored. Next, they are dehulled. The kernels are then subjected to a mechanical sifting step to eliminate the small kernels that have the highest probability of being contaminated by aflatoxin. After that, they undergo sorting, first by an electronic sorting machine and then by hand, to select the kernels suitable for direct consumption. The rest, which are called sorting culls, are sent for crushing. Groundnuts destined for export must meet certain technical conditions including degree of contamination. For groundnuts in the pod, shells must be intact, not marred by insect attacks or stains, and strong enough to withstand the mechanical effects of transport and roasting. Depending on the botanical type (Virginia, Runner, or Spanish), kernels must fall within certain intervals related to the grade and the number of kernels per 100 grams. Appendix 3 gives the technical standards the kernel must meet to be fit for consumption as food. Once the kernels have been selected according to this criterion, they must undergo a laboratory analysis to determine their aflatoxin content. Owing to inappropriate cultivation practices, a very low proportion of the harvest is sold as edible groundnuts. During good harvest years, only 8,000–9,000 of the 60,000 tons handled by NOVASEN are exported as edible groundnuts. The rest, not counting the shells, are sent for crushing, either industrial or artisanal.

This is explained by the fact that contamination occurs at each stage of the process, in the field and in storage.

- In the field, the first problem arises from the groundnuts used as seed. The leading variety used for edible groundnuts in Senegal is GH-119-20, a Virginia type. This cultivar yields fairly large, good-quality kernels that are especially prized by the markets for edible groundnuts. Because the seed capital has not been renewed since at least 1988, even for edible groundnuts the crop seed consists of groundnuts skimmed from previous harvests. The result is that the seed loses all its qualities. Next, the fact that planting dates are not observed means that growers frequently have to harvest the crop before the rainy season is over. When that happens, the humidity due to the rains favors contamination by aflatoxin. Last, the traditional harvesting technique also poses problems. Growers very often begin by piling the harvest in small heaps, which are left exposed to moisture for days. They then pile them all together in bigger heaps (stacks) before threshing to separate out the pods. This technique subjects the groundnuts to moisture and heat that favor the development of aflatoxin. Furthermore, the threshing damages the shells, providing entry points for insects and molds including the *A. flavus* fungus responsible for aflatoxin.
- In the storage phase, the harvested groundnuts are collected by the PSOs and stored in *seccos* before being transported to the processors. Seccos are open barns in which the groundnuts are exposed to sun and dew, again favoring the growth of fungi. According to the experts with whom the author has spoken, if the groundnuts spent no more than one month in these barns, the practice would pose no problem, but NOVASEN's factories can receive only fairly limited quantities at a time. This capacity limitation, coupled with the transport difficulties in the sector, increases the storage time in the seccos to three or four months (appendix 7). This long storage means that the groundnuts arrive at the factory in a heavily deteriorated state with a high probability of contamination.

As can be seen from the above, most of the sources of contamination are upstream from the processing stage. If the harvesting and collecting are done in more appropriate fashion, the risk of aflatoxin contamination can be reduced considerably.

Best Practices in Quality Management for Edible Groundnuts

To reduce the likelihood of aflatoxin contamination in products for export, observance of a number of best practices identified by research is recommended. To be sure, it is still quite difficult to eliminate aflatoxin altogether from groundnuts. Nevertheless, according to CIRAD, which is running a pilot project on edible groundnuts grown under irrigation in the Senegal river valley, virtually all export groundnuts an meet the European standards if the appropriate production itinerary is adhered to. The CIRAD officials with whom the author has spoken estimate that they have shipped 1,000 tons of edible groundnuts to Europe following the indicated practices, and the tests performed there show that the degree of contamination was well within allowable limits under the European standards.

Best Practices in Production and Collection

First, at the production level, good practices begin with the choice of seed.[7] To have quality crop seed, NOVASEN must necessarily break with the skimming strategy it has been using and provide the farmers whom it advises with pedigreed seed of the GH-119-20 variety, which is more appropriate for edible groundnuts than ordinary seed. Furthermore, the company needs to favor seed varieties that develop greater natural resistance to the fungus.

Next, the agricultural extension service needs to be strengthened. The company makes extension agents available to the farmers with whom it deals in part to oversee application of the techniques required for proper production of edible groundnuts. According to the assessment of the company's experts, for proper supervision of the production activities, the ratio of ha to agents should be no more than 300 to 1, whereas at present it is approximately 1,200, or triple the accepted level. This lack of extension agents does not make for effective oversight of the farmers.

Third, as regards soils, deep phosphate treatment is needed to halt soil degradation and make it possible to obtain higher yields.

Fourth, concerning planting, the recommended timing must be observed. Seeding must be done after the first useful rain, that is, between June 15 and July 15. Premature planting can result in having to harvest the crop during the rainy season, which exposes the pods to moisture that favors the development of aflatoxin. In addition, a minimum spacing between the seedlings must be observed. For the edible groundnut variety (GH-119-20), the appropriate spacing requires 20-notch seeding disks. In practice, as pure seeds of this variety have become scarcer, farmers have adapted by using ordinary seeds and 30-notch disks (appropriate for oilseed groundnuts but not for edible groundnuts) in their seed drills. Using the right disk at this step makes it possible for the groundnuts to grow to the required size. The recommended seeding depth must also be observed. For edible groundnuts, it is 7 cm, compared with just 4 cm for oilseed groundnuts. The extension agents need to ensure that farmers use their appropriate seeding share for this depth on their seed drills. The size of the farmer's operation is another important element to consider in this context. In general, the window of time during which planting can be performed is quite short. Reckoning on the basis that one can cover at most 1 ha per day of planting with a seeder drawn by a horse, or 0.8 ha using a burro, or 0.5 ha using an ox, the ideal recommended size for a single farm is 4 ha maximum.

[7] A discussion of best practices in the production and storage of edible groundnuts is presented in CIRAD 2002.

As regards harvesting, there is a real oversight deficit on the farms that supply NOVASEN. The company's extension agents are also its crop collectors, and, at harvest time, just when they are needed most to supervise what the farmers are doing, they are at the collection points. In edible groundnut production, it has been shown that most of the contamination occurs during the harvest. In the harvesting step, the pods must stripped when the plant is still green, and threshing must be avoided in order not to damage the groundnuts. To avoid contamination, any damaged, immature, or perforated pods, which have a higher probability of being infected, must then be separated from the other groundnuts. Next, drying to reduce the moisture content should last no longer than five days. If the moisture content is still high (over 10 percent) after 5 days, it is recommended that the groundnuts be downgraded.

As regards storage, the pods should be sent for processing no longer than one month after the harvest. To avoid becoming contaminated while in storage, the groundnuts should not spend a long time in the seccos. Furthermore, the seccos should be cleaned and the remnants of previous harvests removed before any new batch of groundnuts is stored in them.

Best Practices in Processing

Once the groundnuts have been collected by NOVASEN and transported to the factory, they undergo a number of steps. They must be unloaded, dehulled, put through a mechanical sifter to eliminate undersized kernels, sorted by hand, bagged, and fumigated to prevent attack by insects. After each of these steps, they must be tested for aflatoxin content. The company's capacity to take delivery is limited and appears to be insufficient in periods of good harvests. As a result, loaded trucks must sometimes wait a long time before they can be make delivery. During this time, large quantities of groundnuts sit in the seccos, waiting to be transported to the factory. These delays could be reduced if NOVASEN acquired conveyor belts to facilitate storage at greater height. The sifting machinery should then be renovated for greater efficiency.

At the post-processing stage, groundnuts with no visible anomalies undergo tests to determine their aflatoxin content. SONACOS has its own laboratory for this purpose, and NOVASEN also has machines to perform the testing, although their reliability is rather doubtful. What matters most in this regard, however, is not the availability of equipment to perform the tests so much as the recognition accorded to those tests in export markets. To date, no laboratory in Senegal has been accredited by the European Union, which is Senegal's main groundnut customer. The aflatoxin laboratory of the food technology institute ITA was established in Senegal in 1973. Originally, it was intended only for aflatoxin; subsequently, its activities have been extended to other mycotoxins such as ochratoxin, a contaminant of cereals. With the support of donors, notably the European Union, the laboratory is in the process of being re-equipped to make it a national lab accredited by Senegal's export customers to conduct testing for aflatoxin content in groundnut products. With this in mind, high pressure liquid chromatography (HPLC) equipment was installed in 2000. Recently, other equipment such as an evaporator and a crushing machine for test samples has been installed. According to the lab technicians with whom the author has spoken, the problem now lies not with the reliability of the tests that are performed but with acceptance of the results by Senegal's trading partners. The lab is seeking accreditation by the EU, and to this end, besides the equipment upgrades noted above, the staff is undergoing training to meet the European standards. A manual of procedures and quality requirements is being written.

Accreditation of this lab by Senegal's export customers would enhance, in one stroke, the outside world's perception of the quality of Senegalese products. The government could then require every exporter of groundnut products to Europe to have a clearance from this lab before shipping the product. Such accreditation and required clearances are made all the more necessary by the fact that any importation into Europe of products found to be contaminated will cause all products coming from Senegal to be quarantined for at least six months.

Cost/Benefit Analysis of a Groundnut Sector That Meets Export Market Quality Standards

In this section, the author performs a cost/benefit analysis of groundnut production that meets quality standards in export markets. The author does the analysis separately for each of the subsectors affected by aflatoxin: the oil and presscake subsector and the edible groundnut subsector. The author also considers each of the activity segments in the subsectors.

Groundnut Cake

In this subsector, Senegal exports unrefined groundnut oil and presscake, mainly to the European market. Aflatoxin is not an issue with the oil, but it is with the cake. The author will not consider here the quality problem upstream, that is, in the field, given that the product that is exported is an industrial product that can be detoxified. Furthermore, the author will look only at SONACOS's activity, since NOVASEN's output in these two product categories is marginal. Furthermore, unlike SONACOS, NOVASEN does not have a detoxification process, so the results for the SONACOS case could readily be generalized to the NOVASEN case.

For this analysis, the author will compare the situations when SONACOS meets the standards (the actual case that the author observes) and when it does not (the theoretical case). This approach is all the more relevant in that the presscake detoxification process can be completely separated from the crushing process. The capital costs and recurring expenses that detoxification entails are separable. Thus, at each step, the author takes the difference in cash flows between the base case (meets the standards) and the test case (does not meet the standards). The working assumption is an annual volume of 500,000 tons of groundnuts.

The private costs of the presscake detoxification activity comprise the following[8] (table1):

- The capital cost of the equipment installed for detoxification: a machine with a capacity of 1,000 tons per day acquired at a cost of CFAF 2 billion. Its normal service life is approximately 10 years.
- The additional recurring expenses associated with the detoxification activity, which represent approximately 15 percent of total production cost. The total production cost for presscake is estimated by the Ministry of Agriculture (2003) at CFAF 33,000 per ton. Thus, for 500,000 tons in the pod, the author has: 500,000 tons x 42 percent[9] x CFAF 33,000 x 15 percent = CFAF 1,039,500,000.

The benefits of the presscake detoxification are:

- The price differential vs. nondetoxified cake, which is roughly 30 percent or CFAF 110,250 per ton

[8] The data used in the cost/benefit analysis for oil and presscake came directly from SONACOS during our meeting in 2003.

[9] As a percentage of weight in the pod, groundnuts yield 35 percent crude oil and 42 percent presscake (Government of Senegal 2003a).

- The quantity differential, which is equal to the average quantity of cake sold by SONACOS less the maximum quantity it would have been able to sell without detoxification, which is 25,000 tons. For 500,000 tons in the pod, the quantity of cake produced is:

  500,000 tons x 42 percent = 210,000 tons.

Table 1. Values from the presscake detoxification activity *(CFAF)*

	Value	*Present value*
A. Capital cost	2 billion	1,860,000,000[a]
B. Variable cost		
With detox		
500,000 tons x 42% x CFAF 33,000 x 1.15	7,969,500,000	53,276,107,500
Without detox[b]		
25,000 tons x CFAF 33,000	825,000,000	5,663,625,000
Difference		47,612,482,500
C. Annual production		
With detox		
500,000 tons x 42% x CFAF 110,250 x 1.3	30,098,250,000	206,624,486,250
Without detox		
25,000 tons x CFAF 110,250	2,756,250,000	18,921,656,250
Difference		187,702,830,000
D. Net present value		138,230,347,500

Source: Author.

Notes:

a The present value is derived by discounting over 10 years at 7.5%. The chosen discount rate reflects the cost of financing in this segment of the subsector. This is the rate at which CNCAS lends to farmers.

b The author starts from the assumption, derived from their inquiries of SONACOS, that, without detoxification, it would be impossible for Senegal to sell more than 25,000 tons of groundnut cake annually in export markets.

Edible Groundnuts

In this subsector, the author must consider all segments of production: cultivation, processing, and laboratory testing. Crop collection is done not by private operators, as in the oilseed groundnut subsector, but by agents employed by NOVASEN itself.

Cultivation Segment

It is at the level of agricultural production that the situation is most critical. Quality management during this phase would significantly reduce the possibilities for contamination in the later phases. As mentioned in the preceding section, contamination can be reduced to its simplest expression by following a number of cultivation practices. Here the author is concerned with measuring the costs and benefits of adhering to the recommended steps and timetable.[10] As in the previous case, the author takes the difference in cash flows between the case in which good practices are observed and the case in which they are not.

The costs associated with observing good cultivation practices are (table2):

- Purchase of pedigreed seed: The price per ton of pedigreed seed is CFAF 190,000, vs. CFAF 138,000 for ordinary seed.

[10] These costs and benefits have been determined on the basis of discussions with NOVASEN and the Department of Agriculture.

Table 2. Values from cultivation segment *(CFAF)*

	Value per year	*Present value (CFAF)*
A. Cost		
With good cultivation practices:		
Deep phosphate treatment (every 3 years):		
0.5 tons x 60,000 ha[a] x CFAF 23,000	690,000,000	
Seed: 0.16 tons[b] x 60,000 ha x CFAF 190,000	1,824,000,000	
Supervisory labor:		
(60,000 ha/300 ha) x CFAF 1,200,000	240,000,000	
Field labor:		
40 person-days x 60,000 ha x CFAF 1,000	2,400,000,000	
Granox: 9,600 tons x CFAF 22,125	221,400,000	
Total (without phosphate treatment)	4,685,400,000	33,739,851,000[c] (including phosphate)
Without good cultivation practices[d]		
Seed: 0.2 tons[b] x 60,000 ha x CFAF 138,000	1,656,000,000	
Supervisory labor:		
(60,000 ha/1,200 ha) x CFAF 1,200,000	60,000,000	
Field labor:		
31 person-days x 60,000 ha x CFAF 1,000	1,860,000,000	
Granox: 12,000 tons x CFAF 22,125	265,500,000	
Total	3,841,500,000	26,371,897,500
Difference		7,367,953,500
B. Annual production		
With good cultivation practices		
1.5 tons x 60,000 ha x CFAF 178,000 x 90%[e] + 1.5 tons x 60,000 ha x CFAF 128,000 x 8%	15,339,000,000	105,306,354,000
Without good cultivation practices		
1.2 tons x 60,000 ha x 66%[f] x CFAF 133,000 + 1.2 tons x 60,000 ha x 10% x CFAF 128,000	7,241,760,000	49,714,682,400
Difference		55,591,671,600
C. Net present value		21,851,820,600

Source: Author.

Notes:

a Author assumes 60,000 ha under cultivation. Figure corresponds approximately to the observed situation in years of good harvests of edible groundnuts.

b Following the crop density for good cultivation practices, 160 kg of seed are needed for each ha. Currently, 200 kg of seed are used for each ha.

c The present value is derived by discounting over 10 years at 7.5%. The chosen discount rate reflects the cost of financing in this segment of the subsector. This is the rate at which CNCAS lends to farmers.

d The author starts from the assumption, derived from their inquiries of SONACOS, that, without detoxification, it would be impossible for Senegal to sell more than 25,000 tons of groundnut cake annually in export markets.

e When recommended technical practices are followed, it is reasonable to assume that 90% of the harvest is premium grade, and 8% is classified as grade B.

f Practically no premium-grade edible groundnuts have been produced since 1995–96. Furthermore, estimates are that only 66% of the groundnuts delivered from farmers to NOVASEN are grade A; 10% of the remainder is sent for crushing to make oil; the rest is scrapped as waste.

- Treatment of the seed with granox: CFAF 22,125 per ton.
- Deep phosphate treatment: 500 kg per ha at a cost of CFAF 23 per kg, for all crops. The last deep phosphating operation occurred in 1999 and was carried out by the Senegalese government. For quality cultivation, the author assumes that NOVASEN performs deep phosphate soil treatment every three years and passes the cost on to the producers.
- Fertilizer: 150 kg per ha at CFAF 106 per kg, vs. 36 kg per ha currently.
- Crop density: 160 kg per ha, vs. 200 kg per ha currently.
- Mean yield: 1.5 tons per ha, vs. 1.2 tons currently. The author can estimate production from yield per ha.
- Supervisory labor: one extension agent per 300 ha, vs. one per 1,200 ha currently. The agents are paid CFAF 1,200,000 per year on average.
- Field labor: the field labor requirement to meet the recommended timetable is 30 percent greater than the normal practice, which is estimated at 31 person-days per ha at a cost of CFAF 1,000 per person-day.
- Price differential (to the producer): CFAF 35 per kg between premium grade (top quality) and grade B (lowest quality).

Processing Segment

At NOVASEN's processing plants, most of the necessary equipment is already in place. The company just needs to increase storage capacity to avoid the long waiting lines at delivery, which prolong the time that the groundnuts spend in the seccos, losing even more of their quality.

To increase storage capacity, investments are needed for a conveyor belt to store groundnuts in higher piles and a scalping machine. To these must be added the expenses incurred at the ITA laboratory for measuring aflatoxin content (table 3).

On the benefit side, still starting from the assumption of 60,000 tons of groundnuts in the pod with a reject rate of 10 percent (kernels that do not meet the technical specifications for edible groundnuts), the author obtains 37,800 tons (60,000 tons x 90 percent x 70 percent[11]) of dehulled groundnuts.

The author assumes that, after the various sorting steps, the author is left with 36,000 tons (37800 x 95 percent) of kernels that meet European standards. This is 26,000 tons more than NOVASEN has been able to export as edible groundnuts in years of favorable conditions. The sorting culls that go to the crushing plant will amount to 6,090 tons (37,800 tons x 5 percent + 60,000 tons x 10 percent x 70 percent).

Last, the author assumes that NOVASEN gets 40 percent crude oil and 60 percent presscake from the sorting culls. These figures equate to 2,436 tons of oil and 3,654 tons of cake. The nondetoxified cake is sold at CFAF 110,250 per ton (30 percent less than SONACOS's detoxified cake). The unrefined oil is sold at CFAF 390,000 per ton (ASPRODEB 2002). The edible groundnuts that meet European standards can be sold at CFAF 360,000 per ton, according to CIRAD (2002), for the grade that Senegal exports (60–70 kernels per ounce).

[11] The whole peanut is constituted of 70 percent grain and 30 percent hull.

Table 3. Values from processing segment

	Value/year (CFAF)	*Present value (CFAF)*
Costs:		
Conveyor belt	20,000,000	
New scalping machine	100,000,000	
	120,000,000	111,600,000[a]
Additional expenses for measuring aflatoxin content[b]:		
(14000+18000) x 3 x 300	28,800,000	197,712,000
Total additional costs		309,312,000
With good practices:		
Exports of edible groundnuts		
CFAF 360,000 x 36,000 tons	12,960,000,000	
Exports of unrefined oil		
CFAF 390,000 x 2,436 tons	950,040,000	
Exports of groundnut cake		
CFAF 110,250 x 3,654 tons	402,853,500	
Total exports	14,312,893,500	98,258,013,877
Without good practices: [c]		
Production of edible groundnuts (2,810 tons)	944,160,000	
Exports of cake (18,900 tons)	1,771,156,800	
Exports of unrefined oil (13,000 tons)	5,070,000,000	
Total	7,785,316,800	
Difference		53,446,199,832
		44,811,814,045
Net present value		44,502,502,045

Source: Author.

Notes:

a Author assumes 60,000 ha under cultivation. Figure corresponds approximately to the observed situation in years of good harvests of edible groundnuts.

b Assumptions:

(i) CFAF 14,000 per batch for aflatoxin B1; CFAF 18,000 per batch for the sum of the four types (B1+B2+G1+G2).

(ii) To meet European standards, one must consider 3 x 10 kilograms per batch. The author assumes that there are 300 batches per year of edible groundnuts.

c The benchmark year used was 1999, when the volume of groundnuts processed was 58,000 tons, the highest figure in the past 5 years.

ITA Laboratory

As noted in the preceding section, this lab performs several kinds of analyses, on cereals as well as on edible groundnuts. The author will consider here only the portion of the lab's activity relating to edible groundnuts.

Table 4 presents the incremental total investment required to test for aflatoxin. Investment includes the acquisition of an HPLC line and incidental equipment, and the training of staff on the European standards and the preparation of a manual of procedures. If the total investment is set against revenue from the analyses (CFAF 197,712,000), exclusive of the lab's other activities, the resulting deficit is a present value of CFAF 550,573,000.

Table 4. Values for laboratory procedure *(CFAF)*

	Value	*Present value*
Investments:		
HPLC line and other equipment	40,000,000	
Staff training, preparation of manual	60,090,000	
Total	100,090,000	748,285,000
Revenue from laboratory analyses	Present value can be changed	197,712,000
Deficit	accordingly	550,573,000

Given that the laboratory has a public service mission, this deficit is understandable and should be charged to the cost of managing the "Product of Senegal" label for edible groundnuts in Europe.

In summary, the aggregate benefit of implementing best practices throughout the production chain to ensure that edible groundnuts meet European standards is CFAF 65,938,921,138. The present value of the aggregate benefit for both the edible groundnut and detoxified groundnut cake subsectors is CFAF 204,169,268,638.

Conclusion

In this document, the author considered the problem of quality management in the groundnut sector in Senegal. Production of groundnut oil for export is a relatively long-established activity in Senegal, dating from the beginning of the nineteenth century. Production of edible groundnuts is more recent, dating from the early 1970s. The latter crop soon experienced major difficulties (declining area under cultivation and output), which led the government to privatize it in 1990. Since then, NOVASEN, which is a private export-processing enterprise required to sell at least 80 percent of its production in foreign markets, has had control of practically the entire edible groundnut subsector. After a fairly short period of expanding production, which at one point attained 10,000 tons of exports to Europe, the company has had a great deal of difficulty achieving even 1,000 tons of exports in recent years. The reasons for this 90 percent drop seem to be closely related to the decline in output and yields in the entire sector, which affects both edible groundnuts and oilseed groundnuts. This decline has been so pronounced that no one hesitates to speak of a groundnut crisis.

Government policy in the sector has moved from a phase of marked intervention to a phase of liberalization, which began in the 1990s with the support of the European Union. However, this wave of reforms has not arrested the declining trend in the sector. Indeed, the trend has continued become even steeper in recent years, with the notable exception of the 2000 and 2001, when ample rainfall sharply increased production. The new directions of government policy in the sector call for further withdrawal by the state, which will increasingly confine itself to public service missions, and giving greater responsibility to the industry-wide association.

The world market for oilseeds is large and growing, especially for groundnut cake and edible groundnuts. The main difficulty that Senegalese products run up against in foreign markets, in Europe, particularly, is product quality in regard to aflatoxin standards. In principle, aflatoxin is not a contaminant of the unrefined *oil* that Senegal exports because any toxin present in the groundnuts is entirely eliminated from the oil in crushing. Senegalese *groundnut cake* undergoes a detoxification process that reduces its aflatoxin content to a level that easily meets the European standards. The problem is primarily with *edible groundnuts*, for which the standards are stricter, and Senegal seems to have more difficulty meeting them. The contamination of the edible crop occurs mainly in the field, and it can be reduced dramatically by strict application of good cultivation practices.

The author performed a cost/benefit analysis to evaluate the net gain that could accrue to each of the three subsectors from a production process that meets quality standards. The author found that the present value of the net benefit of production that meets standards is CFAF 138 billion for SONACOS's groundnut cake and CFAF 92 billion for edible groundnuts. This benefit is explained by the higher prices fetched by higher-quality products and by the possibility of selling greater quantities when products meet the quality standards of increasingly demanding markets.

Appendix 1. Annual Groundnut Production, 1960–2002
(area in ha, yield in kg/ha, production in MT)

	Oilseed groundnuts			*Edible groundnuts*		
Years	*Area*	*Production*	*Yield*	*Area*	*Production*	*Yield*
1960–61	976,994	892,494	914	NA*	NA	NA
1961–62	1,025,500	994,750	970	NA	NA	NA
1962–63	1,013,129	893,862	882	NA	NA	NA
1963–64	1,084,215	952,201	878	NA	NA	NA
1964–65	1,054,901	1,019,088	966	NA	NA	NA
1965–66	1,112,100	1,122,025	1,009	NA	NA	NA
1966–67	1,114,065	857,056	769	NA	NA	NA
1967–68	1,163,846	1,005,151	864	NA	NA	NA
1968–69	1,191,027	819,592	688	NA	NA	NA
1969–70	963,050	788,800	819	NA	NA	NA
1970–71	1,049,742	582,000	554	7,718	8,214	1,064
1971–72	1,060,344	985,396	929	10,856	12,645	1,165
1972–73	1,071,444	570,010	532	15,332	16,930	1,104
1973–74	1,024,947	657,026	641	18,549	16,540	892
1974–75	1,052,113	980,723	932	22,346	20,270	907
1975–76	1,312,612	1,434,147	1,093	24,285	23,795	980
1976–77	1,294,261	1,186,322	917	17,046	12,660	743
1977–78	1,161,098	509,285	439	23,743	11,167	740
1978–79	1,154,365	1,050,641	910	24,157	10,441	432
1979–80	1,047,988	672,887	642	21,187	3,136	148
1980–81	1,065,205	521,386	489	8,937	1,617	181
1981–82	1,010,340	866,624	858	7,832	4,611	589
1982–83	1,149,108	1,145,405	997	18,160	5,322	293
1983–84	1,080,670	570,488	528	29,118	10,167	349
1984–85	869,115	669,231	770	14,976	13,185	880
1985–86	594,388	590,499	993	10,185	10,975	1,078
1986–87	789,789	821,731	1,040	17,939	19,321	1,077
1987–88	831,158	946,445	1,139	14,180	16,655	1,175
1988–89	886,191	703,362	794	17,247	19,536	1,133
1989–90	764,400	819,641	1,072	19,459	24,584	1,263
1990–91	886,429	678,753	766	27,519	23,831	866
1991–92	843,518	697,329	827	28,096	27,087	964
1992–93	925,966	551,690	596	30,814	26,808	870
1993–94	739,031	605,766	820	25,255	25,532	1,011
1994–95	892,031	678,040	760	35,984	40,085	1,114
1995–96	841,384	760,617	940	39,985	36,518	913
1996–97	856,114	588,181	687	63,701	58,213	914
1997–98	727,773	505,894	695	59,922	45,500	759
1998–99	519,168	540,773	1,042	36,296	38,294	1,055
1999–00	863,636	950,000	1,150	53,205	64,247	1,208
2000–01	1,030,946	1,003,506	973	64,445	58,034	901
2001–02	920,534	887,356	964	63,623	56,481	888
2002–03	813,725	260,723	320	17,264	4,623	268

Source : Department of Agriculture 2003.
Note: NA* = Data not available (because edible groundnuts were not cultivated during these years).

Appendix 2. Edible Groundnuts in Senegal: Data from Recent Seasons

Regions	*Oilseed groundnuts*			*Edible groundnuts*		
	Area (ha)	*Yield (kg/ha)*	*Production (t)*	*Area (ha)*	*Yield (kg/ha)*	*Production (t)*
Dakar	82	325	27			
Diourbel	68,202	147	10,049			
Fatick	100,608	245	24,642	2,144	400	858
Kaolack	245,671	345	84,813		249	3,765
Kolda	52,916	898	47,514	15,120		
Louga	185,818	177	32,837			
Saint-Louis	7,947	72	568			
Tambacounda	54,575	687	37,486			
Thies	77,133	176	13,546			
Ziguinchor	14,436	440	6,357			
Matam	6,337	455	2,885			
Senegal: (1) 2002–03	813,725	320	260,723	17,264	268	4,623
(2) 2001–02	920,534	964	887, 356	63,623	888	56,481
Difference of (1) & (2), %	-12	-67	-71	-73	-70	-92
(3) Average last 5 years	793,613	933	740,322	55,883	877	48,995
Difference of (1) & (3), %	3	-66	-65	-69	-69	-91

Source: Senegal, Ministry of Agriculture estimate, sesame.

Appendix 3. Technical Norms for Edible Groundnuts

Botanical type	*US classification*	*Number of kernels or pods/100 g*	*Grade number/oz (28.35 g)*	*Varietal equivalency Senegal*
Virginia	Groundnuts in pod	56/63	16/18	
		49/56	14/16	GH 119-20
		45/49	13/14	73-27, 73-28
	Fancy	35/42	10/12	
	Jumbo		8/10	
	Kernels	98/112	28/32	GH 119-20
	Extra-large	112/141	32/40	73-27, 73-28
	Medium	158/194	45/55	
	N°1	176/211	50/60	
	N°2			
Runner[a]	Kernels	158/194	45/55	73-33
	US N°1	141/158	40/45	
	Medium	123/141	35/40	
	Jumbo			
			50/60	Fleur 11
Spanish	Kernels	211/246	60/70	
	N°1	246/282	70/80	55-437
	N°2			

Source: R. Chilling, *L'Arachide en Afrique Tropical* 1996.
Note:
a Type of groundnuts whose kernels are of average size (40–55 kernels/oz).

Appendix 4. NOVASEN: Production and Sales Statistics *(MT)*

Season	*1999*	*2000*	*2001*	*2002*
Treated groundnuts	58,000	47,000	38,500	67,000
Oil production/exports	13,000	17,200	8,500	18,300
Presscake production/exports	18,900	22,900	12,300	27,500
Edible groundnuts production/exports	2,810	2,034	810	578

Appendix 5. NOVASEN: Evolution of Prices Paid to Producers of Seeds and Products *(CFAF/kg)*

	Oilseed groundnuts					*Edible groundnuts*		
	Seeds		*Production*			*Seeds*		*Production*
Season	*Tararée*	*Non-Tararée*	*1st choice*	*Lot A*	*Lot B*	*N°1*	*N°2*	*"Regular"*
1990–1991	95		105	85	70	85	80	70
1991–1992	105			84	84	95	90	80
1992 - 1993	105			84	84	85	80	80
1993–1994	135			104	104	115	110	100
1994–1995	145			125	125	135	130	120
1995–1996	143		178	133	128	140	140	123
1996–1997	146			131	131	151	141	126
1997–1998	168			153	151			150
1998–1999	178			163	161			160
1999–2000	163			148	146			145
2000–2001	139			139	137			136
2001–2002	138			123	121			120
2002–2003	138			123	121			120

Source: NOVASEN 2003.

Appendix 6. NOVASEN: Statistics on Debt Refunding over 12 Years *(CFAF)*

Season	*Payable Due*	*Refunding*	*Refunding Rate (%)*	*Unpaid*
91–92	976,605,410	929,057,121	95,1	**47,548,289**
92–93	1,025,728,385	769,498,471	75,0	**256,229,914**
93–94	954,870,365	954,870,365	100	**0**
94–95	1,894,403,490	1,861,027,075	98,2	**33,376,415**
95–96	2,648,544,100	2,539,567,458	95,9	**108,976,642**
96–97	2,738,937,789	2,268,077,351	82,9	**470,860,438**
97–98	2,712,374,975	2,308,532,200	85,1	**403,842,775**
98–99	2,369,037,301	2,198,779,801	92,9	**170,257,500**
99–00	2,351,679,488	2,150,423,566	91,4	**201,255,922**
00–01	1,314,250,257	1,083,035,365	82,4	**231,214,892**
01–02	907,642,834	798,122,062	88	**109,520,772**
02–03	933,363,043	34,708,849	3,8	**898,654,194**
Total	**20,827,437,437**	**17,895,699,684**	**86**	**2,931,737,753**

Source: NOVASEN 2003.

Appendix 7. Edible Groundnuts Statistics (NOVASEN)

Designation	*1996–1997*	*1997–1998*	*1998–1999*	*1999–2000*	*2000–2001*	*2001–2002*	*2002–2003*
1. Pluviometry:							
Average height	514,30		536,83	983,53	788,59	436,79	500,19
Average days	31		34	54	45	24	30
2. Areas: (ha)	**55,626**	**47,562**	**41,124**	**36,553**	**30,150**	**21,234**	**17,564**
Edible groundnuts	43,497	38,202	29,472	25,017	27,732	20,048	17,264
Oilseed groundnuts	12,129	9,360	11,652	11,536	2,418	1,186	300
3. Staff:	**79**	**79**	**79**	**80**	**79**	**48**	**48**
Professional/managerial	10	10	10	10	10	7	7
Extension agents	62	62	62	63	62	34	34
Administrative	7	7	7	7	7	7	7
4. Inputs :							
- Seeds	8,876,185	716,755	5,746,430	5,747,690	5,421,720	3,373,720	3,149,520
• Edible groundnuts	7,176,305	6,405,538	4,132,670	4,132,640	4,853,100	3,207,680	3,107,520
• Oilseed groundnuts	1,699,880	1,311,217	1,613,760	1,615,050	388,620	166,040	42,000
- Fertilizer	8,343,900	7,134,300	6,168,600	6,000,000	974,100	2,012,100	2,631,000
- Plaster	2,144,400	2,800,000	2,800,000	2,800,000	0,000	0,000	0,000
- Granox	11,125,200	9,513,400	8,115,400	7,310,600	3,030,000	4,246,800	1,701,700
5. Density per ha (kernels):*							
Edible groundnuts	94	94,467	96,138	0	97	96,443	
Oilseed groundnuts	603	95,5556	90,141	0	146	81,269	
	91,080				89,619		
6. Collection season:							
Beginning			27/11/98			06/12/01	
End	22/11/96		28/05/99		29/12/00	17/07/02	
Length	13/03/97		184 days		31/05/01	224 days	
	110 days				154 days		

Source: NOVASEN.

References

ADE. 2002. “Senegal: Evaluation à mi-parcours du programme de relance de la filière arachide.” Study conducted for the European Commission. October.

ASPRODEB. 2002. “Etude sur l’arachide: Industrie–Production et Développement dans le Bassin arachidier.” Dakar. August-September.

ASPRODEB and CNCR. 2003. “Programme de Relance de la Filière Semence.” Dakar. January.

Badiane, O., and M. Gaye. 1999. “Liberalization of Groundnut Markets in Senegal: Impact on the Marketing and Processing Sectors.” Mimeo. Dakar. September.

Cissé, A.. 2003. “Evaluation de la campagne de commercialisation de l’arachide 2001/2002.” Study Conducted for ASPRODEB. February.

CIRAD. 2000. “Projet CNIA, Relance de la Filière Arachide de Bouche/Diversification au Senegal.”

_____. 2002. “Projet CNIA, Arachide de bouche–diversification.” CIRAD work program. 2002 season.

CIRAD/CNIA Agreement of 1 July 1999, Report on the beginning of the research and development program conducted by CIRAD. May.

Coulter, J. 2001. “Tierce détention et gestion des garanties, Instrument pour le développement rural au Senegal ?” Study for the Natural Resources Institute. Washington, D,C. April.

Diop, N. 2000. “Libéralisation, contraintes structurelles et performances agricoles dans une petite économie ouverte: l’exemple du Senegal.” Thesis. University of the Auvergne at Clermont-Ferrand I, France. September.

Freud, C., E.H. Freud, J. Richard, and P. Thenevin. 1997. “La crise de l’arachide au Senegal: un bilan-diagnostic.” Study conducted for CIRAD. Dakar. January.

Gaye, M. 1999. “La Filière Arachide de bouche au Senegal.” Mimeo. Dakar.

Government of Senegal. 2002. “Document de stratégie de réduction de la pauvreté.” Dakar,

Government of Senegal, Ministry of Agriculture and Animal Husbandry. 2003a. “Etude sur la compétitivité et la rentabilité des filières agricoles avec la matrice d’analyse des politiques (MAP): Analyse de la filière arachide.” February.

_____. 2003b. “Lettre de politique de Développement de la filière arachide.” April.

Henson, S., S. Jaffee, C. de Haan, and K. van der Meer. 2002. “Sanitary and Phytosanitary Requirements and Developing Country Agro-Food Exports: Methodological Guidelines for Country and Product Assessments.” World Bank.

KPMG. 2003. “Note de Politique et des Stratégies de la Réforme de la Filière Arachide.” Study conducted for the Ministry of Agriculture and Animal Husbandry. April.

Shilling, R., P. Dimanche, P. Crambade, and J. Gautreau. 1996. *L’arachide en Afrique tropicale*. Paris: Eds. Maisonneuve et Larose.