



The World Bank

Agriculture and Rural Development Discussion Paper 39

Barrier, Catalyst, or Distraction? *Standards, Competitiveness, and Africa's Groundnut Exports to Europe*



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January, 2008



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Abbreviations and Acronyms

CIRAD	Centre de Cooperation Internationale en Recherche Agronomique pour Le Développement (Argentina)
CSIR	Council for Scientific and Industrial Research
EU	European Union
EFSA	European Food Safety Authority
FAO	Food and Agriculture Organization of the United Nations
FSB	Food Standards Board
GAP	good agricultural practices
GGC	Gambia Groundnut Corporation (The Gambia)
GCU	Gambia Cooperative Union (The Gambia)
GMP	good manufacturing practices
GNP	gross national product
HACCP	hazard analysis and critical control point
HPLC	high-performance liquid chromatography
IARC	International Agency for Research on Cancer
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
INTA	National Institute for Technology in Argentina
JECFA	Joint Expert Committee in Food Additives and Contaminants
MERCOSUR	Common Market of the Southern Cone
NASFAM	National Smallholder Farmers Association of Malawi
OPEC	Organization of the Petroleum Exporting Countries
PPECB	Perishable Products Exports Control Board (South Africa)
RASFF	Rapid Alert System for Food and Feed
USAID	United States Agency for International Development
SENASA	National Service for Health and Quality of Agri-foodstuffs (Argentina)
SSA	Sub-Saharan Africa

List of Standard Units

Mt	metric tons
kg	kilogram
ppb	parts per billion*
US\$	International dollar
ha	hectare
µg	microgram

* Throughout this paper, aflatoxin concentrations are given in parts per billion or ppb, equivalent to micrograms per kilogram (µg/kg) for regulatory purposes. Similarly, the terms *peanuts* and *groundnuts* are used interchangeably.

Acknowledgments

The authors would like to express their sincere gratitude to the industry leaders, exporters, and representatives of regulatory agencies, research organizations, and service organizations in several groundnut-exporting countries (Argentina, The Gambia, Ghana, Malawi, Nicaragua, Senegal, and South Africa) for their invaluable contributions to the preparation of this report. Appreciation is also extended to the EU groundnut importers/distributors for sharing information on market developments.

Additional thanks go to the reviewers who provided insightful and useful comments: Alan Randell (former Secretary of the Codex Alimentarius Commission), Michael Jensen (World Bank staff), Patrick Labaste (World Bank staff, Africa Region), and Manievel Sene (World Bank staff, Senegal Country Office). Finally, special thanks to the European authorities for facilitating full access to the Rapid Alert System for Food and Feed (RASFF) and other pertinent documentation; and for reviewing the accuracy of the report, in terms of the EU aflatoxin regulatory developments.

Introduction

In recent years, industrialized countries have sought to strengthen their food safety management systems to provide increased protection to consumers against long-standing and emerging risks. Increasingly strict measures are being adopted in the wake of a series of food safety scares or crises, and in the context of expanded trade in higher-value food products, increased scientific knowledge about various food safety hazards, and improved access to modern detection technologies and mitigation methods. In parallel with changes in official standards and regulatory measures, private protocols and other stipulations for food safety within national and international supply chains have proliferated and been strengthened.

Although countries have a legitimate right to protect their consumers, there is concern that increasingly stringent food safety standards would adversely affect the market access and/or competitiveness of developing-country suppliers. This could be because of their comparably weaker administrative, technical, and scientific capacities to comply with the emerging requirements, as well as the fixed and recurrent costs that they incur in the process of compliance. Even when rising standards do not result in absolute barriers to trade, there is the distinct possibility that they amplify underlying competitive (and managerial) strengths and weaknesses, thus working to (further) marginalize the position of smaller producers, industries, or countries. From this perspective, emerging standards are frequently cast as “barriers to trade.”

An alternative, and less pessimistic, view emphasizes the potential opportunities provided by the evolving standards environment and the likelihood that certain developing countries can utilize such opportunities to their competitive advantage. From this perspective, many of the emerging public and private standards are viewed as a necessary bridge between heightened (and demanding) consumer requirements and the participation of distant (and international) suppliers. Many of these standards provide a common language within the supply chain and promote consumer confidence in food product safety. Without that confidence, the market for these products cannot be maintained, let alone increased, in turn jeopardizing international trade.

From this “standards-as-catalyst” perspective, the challenge inherent in compliance with food safety and agricultural health standards may well provide a powerful incentive for the modernization of developing-country export supply chains, and give greater clarity to the necessary and appropriate management functions of government. Further, via increased attention to the spread and adoption of “good practices” in agriculture and food manufacture, there may be spillovers into domestic food safety and agricultural health, to the benefit of the local population and domestic producers. Part of the costs of

compliance could be considered necessary investments. In addition, an array of benefits, both foreseeable and unforeseeable, might arise from the adoption of different technologies or management systems. Rather than degrading the comparative advantage of developing countries, enhancement of capacity to meet stricter standards could potentially create new forms of competitive advantage. Hence, the process of standards compliance could conceivably provide the basis for a more sustainable and profitable trade over the long term, albeit with some particular winners and losers. (See Jaffee and Henson 2004 and World Bank 2005 for broader evidence and discussion of standards as “barriers” and “catalysts.”)

Among the more widely referenced assessments of the impact of standards on developing-country trade, supporting a trade-barrier perspective, are those by Otsuki et al. In these assessments, the authors employed gravity models to estimate the adverse effects on African trade from the EU’s adoption of Community-wide harmonized standards for mycotoxins. In a first paper, the authors examined the effects on African exports of cereals, dried fruits, and edible nuts (Otsuki et al. 2001a). Their findings suggested that the trade of nine African countries would potentially decline by \$400 million under the proposed, stringent new EU standards,¹ whereas this trade might have increased by some \$670 million had the EU based its new harmonized standards on the guidelines of the *Codex Alimentarius*. A second study, focusing only on edible groundnut exports from Africa, estimated that the new EU standard for aflatoxin would result in an 11 percent decline in EU imports from Africa, and a trade flow some 63 percent lower than it would have been had the Codex international standards been adopted (Otsuki et al. 2001b). Although Otsuki et al. employed a hypothetical and greatly simplified model, their findings have frequently been referred to as evidence that African countries in fact lost such levels of trade as a result of the EU regulation. This research is frequently cited as a clear example of the negative effects on developing-country trade of regulations adopted by industrialized countries.

It is empirically quite difficult to determine definitively how one country’s or region’s adoption of new or more stringent standards affects trade, given the multiple repercussions of such measures, the varied responses taken once such measures are adopted, and the multiple other factors affecting trade flows and competitiveness. In general, econometric studies using simplified models and cross-country data have tended to estimate rather large changes in (or adverse impacts on) trade. In contrast, most case studies have tended to find more modest impacts, varied winners and losers, and considerable difficulty in separating the distinct role of standards from the other factors affecting trade flows and performance.

It has now been more than six years since the EU harmonized aflatoxin regulation was adopted. This paper uses cross-country data, as well as information from individual country (or company) experiences, to revisit the issue of trade and other impacts of the EU’s harmonized aflatoxin standards. The paper examines the challenges of and the responses to the new standards by a range of developing countries, although particular emphasis is given to

the positions, responses, and predicaments of sub-Saharan Africa's groundnut industries. This experience is set within the context of the longer-term development (or decline) of developing-country groundnut industries and changing patterns in international groundnut product trade and demand.

The paper highlights the *varied* edible groundnut export performance patterns of developing (including African) countries both in the years or decades prior to the EU's enforcement of stringent harmonized aflatoxin standards and in the period following adoption of the new standards. Several African countries once dominated global exports and EU imports of raw groundnuts (shelled and in-shell) and processed products (oil/cake). This dominance, mainly for raw groundnut exports, came to an end in the 1970s, initially due to internal supply-side or macroeconomic factors, and subsequently due to market developments, including the rise of strong competition from Latin America and Asia. Although still of some importance to a few particular countries, Africa's trade in raw groundnuts was already marginalized prior to the EU's enforcement of more strict aflatoxin standards, either because of an inability to compete on the bases of cost, reliability, and quality, or because of other factors that undermined the incentives for producers and agribusiness to invest in improved production and quality control.

Arguably, the new standards have exacerbated the underlying competitive weaknesses of these industries. In contrast, for some groundnut industries, especially in Latin America and China, the stringency of the EU's aflatoxin standards (and increased member-country enforcement of these standards) has served as a catalyst for production and supply-chain upgrades. Some upgrade strategies have also been undertaken within Africa, although with more mixed results. The good news from the recent experiences is that a considerable amount of research has been done and other efforts made, yielding promising insights on ways to prevent and reduce aflatoxin contamination in groundnut production, storage, and trade—and achieve compliance with very stringent standards. Important challenges still remain in implementation and in achieving a necessary degree of collective action and public-private sector collaboration to ensure the cost-effectiveness of adopted approaches.

The objective of this paper is to improve understanding of the apparent trade impacts of the EU aflatoxin standards on edible groundnut exports from sub-Saharan Africa (SSA), within a framework that takes into account the multiplicity of factors determining the region's competitiveness in this trade over recent decades. Insights are also provided on how other developing countries have been affected by and have responded to the EU's more stringent standards. In some cases, a potential trade barrier has catalyzed technical and administrative changes, apparently resulting in improved competitive advantage. The paper draws upon data and other information from COMTRADE and the EU's Rapid Alert System for Feed and Food (RASFF). It also draws upon findings from prior global or country-specific studies pertaining to groundnut industry development and trade. Interviews were also conducted with selected industry, regulatory, research, and service

provider representatives in several groundnut-exporting countries, as well as with selected groundnut importer/distributors and regulatory authorities in Europe.

The paper is divided into four sections. Section 1 provides a brief historical perspective of the decline of SSA's raw groundnut exports during the 1960s to the mid-1980s and its subsequent marginalized position in the contexts of emerging competition and changing patterns of international product demand and buyer requirements. Section 2 reviews the EU regulatory developments regarding aflatoxin since the late 1990s, with a detailed analysis of the apparent trade effects of these regulatory developments on developing-country trade, particularly exports from SSA. Section 3 highlights the strategic approaches implemented by several exporting countries to ensure compliance with EU aflatoxin regulations and to gain competitive advantage. This section also provides an overview of the initiatives undertaken in the SSA region for effective aflatoxin management. Section 4 states conclusions.

Note

1. The EU levels were set at 2 ppb for aflatoxin B1 and 4 ppb for total aflatoxin in groundnuts for direct human consumption. In the case of groundnuts intended for further processing, the levels were set at 8 ppb for aflatoxin B1 and 15 ppb for total aflatoxin. The Codex established a level, set at 15 ppb, only for total aflatoxins in groundnuts intended for further processing; no level was set for aflatoxin B1.

Section 1 Africa's Groundnut Trade: From Dominant to Marginal Player

1.1 Rise and Decline of the SSA Groundnut Export Industry

Dating from developments during the era of colonialism, groundnut exports have traditionally been an important source of export revenue for several African countries. As a result of the increasing European demand for vegetable oil and industrial oils and fats (for lubricants and production of soap and candles), promotion of groundnut production and trade was a key part of the agricultural colonial policies in Africa. For example, while Senegal was a French colony, land grants, financial subsidies, and agricultural inputs were issued to those intending to undertake groundnut production; these incentives stimulated large-scale clear-cutting of forests in the central areas now known as the groundnut basin (Gning 2004).¹ Similarly, by 1947 the British had implemented the East Africa Groundnut Scheme, originally intended to clear nearly 3.2 million acres in East Africa, to produce about 600,000 to 800,000 tons of groundnuts, all to support Britain's postwar economic recovery. This project had failed by 1952, largely due to soil and climatic conditions in the chosen area and to the failure of second-hand tractors designed for use in North America (Morgan 2007). Groundnut production in Africa expanded considerably after World War II, mainly as result of high market prices, fairly stable rainfall, and domestic policies. In The Gambia, for example, implementation of the "oxenisation programme," which introduced draft animals in 1955, reduced the labor shortage and contributed to the expansion of groundnut production.²

At the beginning of the era of independence, sub-Saharan Africa dominated world trade in raw groundnuts. During the 1960s, SSA accounted for just under 89 percent of global exports, with Nigeria alone accounting for 46 percent of the total and Senegal and Sudan together accounting for one-fourth of global trade. The fate of Africa's position in the international raw groundnut trade changed dramatically during the 1970s; a decade later, Africa's share of world raw groundnut product trade had fallen to the low single digits (Table 1.1). It is important to note that this collapse in Africa's absolute trade and relative market position for raw groundnuts predated the enforcement of aflatoxin standards by most members of the European Union. The collapse of Africa's trade was attributable to a combination of macroeconomic conditions; climatic shocks; adverse sector-specific policies in the leading producer/exporting countries; and market developments, including the emergence of new global suppliers that captured market share on the bases of competitive cost, quality, and supply reliability. By 2005, SSA's share of the total raw groundnut trade had fallen further, to only 2 percent.

Badiane (2001) notes that severe droughts in the African Sahel, poor groundnut harvests in the United States, and massive grain purchases by the

Period	Share of World Exports (%)			
	SSA	Nigeria	Senegal	Sudan
1962–1969	88.6	45.6	17.4	8.2
1970–1981	43.5	8.5	2.7	15.2
1982–1991	4.4	0.0	0.6	1.7
1992–2005	5.2	0	1	0.4

Source: COMTRADE data.
¹Raw groundnuts include in-shell and shelled groundnuts.

former Soviet Union all contributed to patterns of reduced availability and higher world prices for groundnuts during the early 1970s. In response, major importers of raw groundnuts, such as the European Union (EU), shifted to other vegetable oilseed products, while also increasing domestic capacity for vegetable oil production. During the second half of the 1970s, the competition between groundnut oil and substitute vegetable oil became markedly fiercer. Global exports of soybean, sunflower, and palm products increased substantially. With the availability of other vegetable oils, the importance of groundnut products in the world seed trade progressively declined.³

Although the changes in the global trade of groundnuts during the 1970s were significant, Badiane and Kinteh (1994) attribute the decline of African raw groundnut exports primarily to macroeconomic and sectoral policies that reduced producer incentives through direct or indirect taxation. Overvaluation of country exchange rates resulted in net taxation levels of 10 to 20 percent in The Gambia, Senegal, and Sudan, contributing to reduced groundnut production and trade in those countries. In terms of sectoral policies, the period was characterized by heavy government involvement in various aspects of groundnut production and trade (e.g., input supply, marketing functions, and establishment of producer prices). Groundnut export revenues financed general development or political purposes and the share of export prices paid to groundnut farmers fell in most SSA countries (Diop et al. 2004). As illustrated in following paragraphs, macroeconomic conditions, climatic events, and sectoral policies sharply undermined the groundnut exports of the formerly market-dominant countries—Nigeria, Senegal, and Sudan—during the 1970s and early 1980s.

Mini-Case: Nigeria: The Collapse of the Groundnut Export Sector in the Mid-1970s

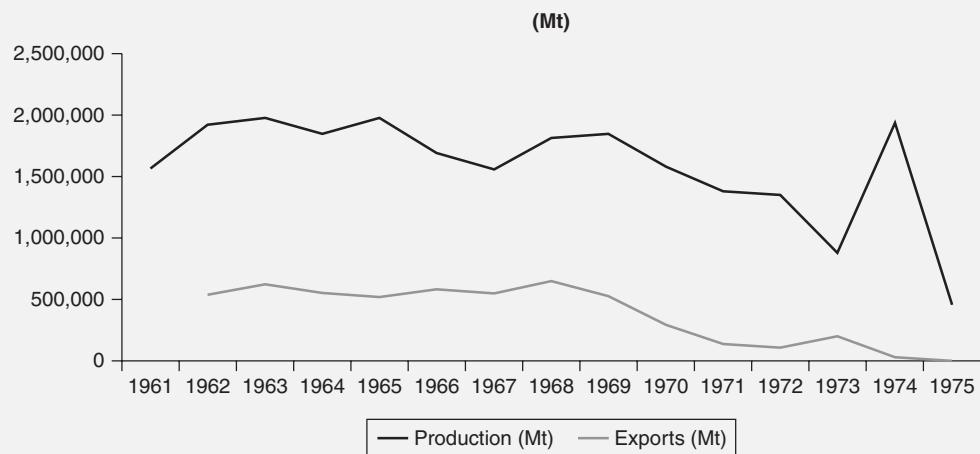
Nigeria experienced a surge in raw groundnut exports in the post-World War II period, expanding from 180,000 tons in 1945 to more than 600,000 tons in 1963. This export growth was facilitated primarily by the coincidental occurrence of good harvests and good prices. After 1964, however, the trend reversed. Reduced world prices, coupled with increased local taxation of the groundnut crop, translated into reduced incentives for farmers. Rising oil revenues subsequently caused significant

Mini-Case (Continued)

appreciation in the value of the naira, creating a “Dutch disease effect” and negating the incentives to export numerous agricultural goods, including groundnuts. Drought and crop diseases also played adverse roles, with rosette virus nearly wiping out groundnut production in Nigeria’s northern and middle areas in 1975. Nigeria’s groundnut exports had virtually ceased by the mid-1970s (Figure 1.1). In recent years Nigeria’s groundnut production has experienced a resurgence, increasing from 1.3 million tons in 1993 to 3.5 million tons in 2005 (Figure 1.2). Nigeria is now the world’s third leading producer, yet the country does not currently export edible groundnut products (either raw or prepared).⁴ Increased production has occurred to satisfy growing domestic demands for edible groundnuts and processed products.⁵ Utilization of groundnut production for domestic oil production has increased remarkably, from about 110,000 tons in the 1960s to more than 627,000 tons in 2005. However, exports of groundnut oil/cake are marginal.

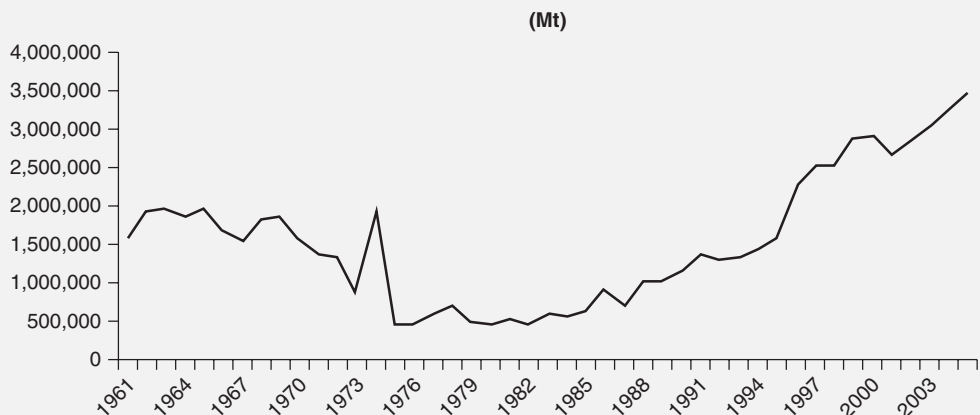
Sources: World Bank 1955; World Bank 1974; World Bank 1984; World Bank 2003.

Figure 1.1 Nigeria: Groundnut Exports (1961–1975)



Source: COMTRADE data.

Figure 1.2 Nigeria: Groundnut Production (1961–2005)



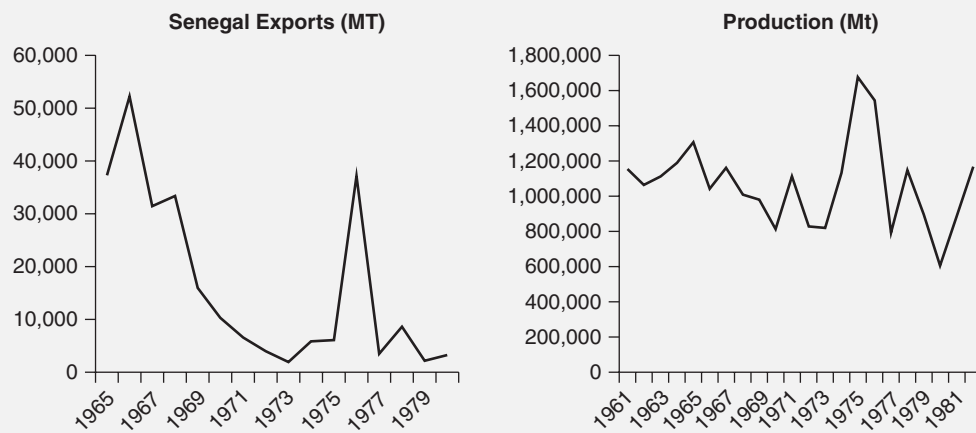
Source: COMTRADE data.

Mini-Case: Senegal: Sectoral Policies during the 1970s Considerably Undermine Groundnut Exports

Senegal's exports of raw groundnuts reached more than 37,000 tons at the beginning of the 1960s, benefiting from an expansion in planted area, favorable weather conditions, and preferential access to the French market.⁶ During the 1960s and 1970s, Senegal's policies were based on specialization in production and groundnut exports to finance cereal imports, and consequently there was heavy state involvement in agricultural production and marketing. However, declining world groundnut prices, coupled with the end of French price supports for Senegalese groundnut producers and a parallel steep increase in local fertilizer and other input prices, contributed to reduced production. Exports fell sharply. Both groundnut production and exports temporarily recovered, in the late 1970s, due to favorable international prices. However, government policies heavily taxed producers, with farmers typically receiving only one-quarter to one-half of the export price. By the 1980s, government policy had shifted to emphasize self-sufficiency in cereals production. The government withdrew from input supply for groundnuts. These factors, together with an appreciating exchange rate and reduced global demand for groundnuts for crushing purposes, contributed to a collapse of Senegal's groundnut exports, which have never fully recovered. Currently, Senegal's exports of raw groundnuts are marginal (see Figure 1.3). Although the country still has a leading position on the global stage for processed products, its exports of oil/cake have significantly declined.

Sources: Badiane 2001; Akobundu 1998.

Figure 1.3 Senegalese Exports and Production of Raw Groundnuts (Mt)



Source: COMTRADE data.

Mini-Case: Sudan: Macroeconomic Factors and Political Instability Affect the Groundnut Export Sector

Although Sudan increased its area under groundnut production by more than two-thirds during the 1970s, with 40 percent of groundnut production under irrigated land, severe foreign exchange constraints considerably affected the groundnut

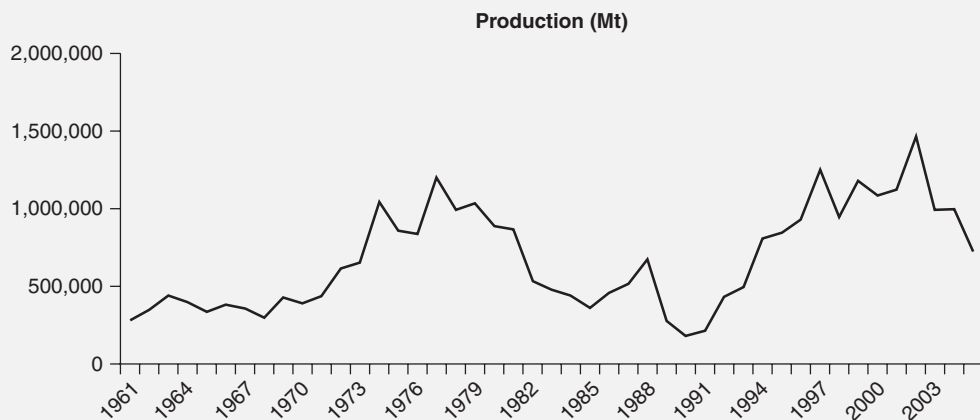
Mini-Case (Continued)

export sector during the 1970s and 1980s. As in the cases of Senegal and Nigeria, adverse external factors also contributed to this decline in exports, as the world prices for groundnuts and cotton fell by about 30 percent in the early 1980s. This, together with rising import prices, war, and severe droughts, significantly undermined the competitiveness of the groundnut export sector. By the early 1990s, exports were already marginal (see Figures 1.4 and 1.5).

As in the case of Senegal, Sudan engaged in an initial stabilization program in the late 1970s. However, from late 1983 onward, Sudan's macroeconomic recovery program fell apart, and many of the policy reforms previously undertaken were reversed. Political instability in the mid- to late 1980s was followed by a period of hyperinflation and a real effective exchange rate appreciation of more than 450 percent. This negative macroeconomic environment, coupled with severe weather events and subsequent social strife, has severely suppressed Sudan's groundnut sector.

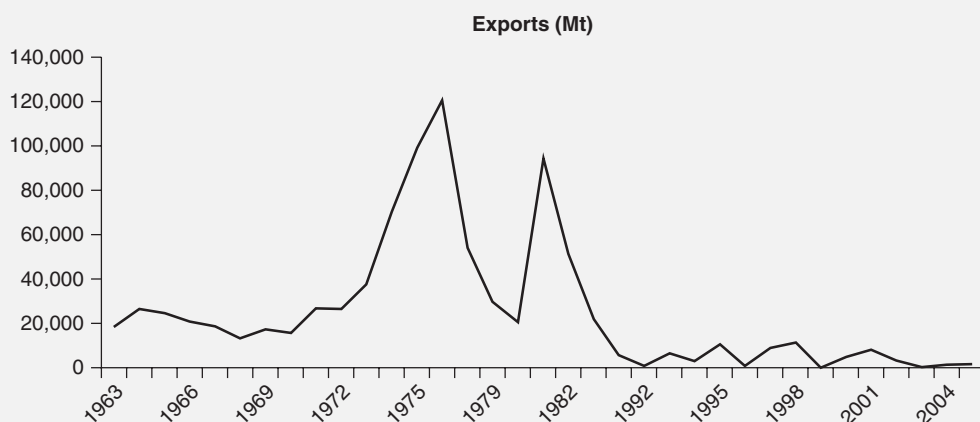
Source: World Bank 1996.

Figure 1.4 Sudan: Groundnut Production (1961–2005)



Source: COMTRADE data.

Figure 1.5 Sudan: Raw Groundnut Exports (1963–2005)



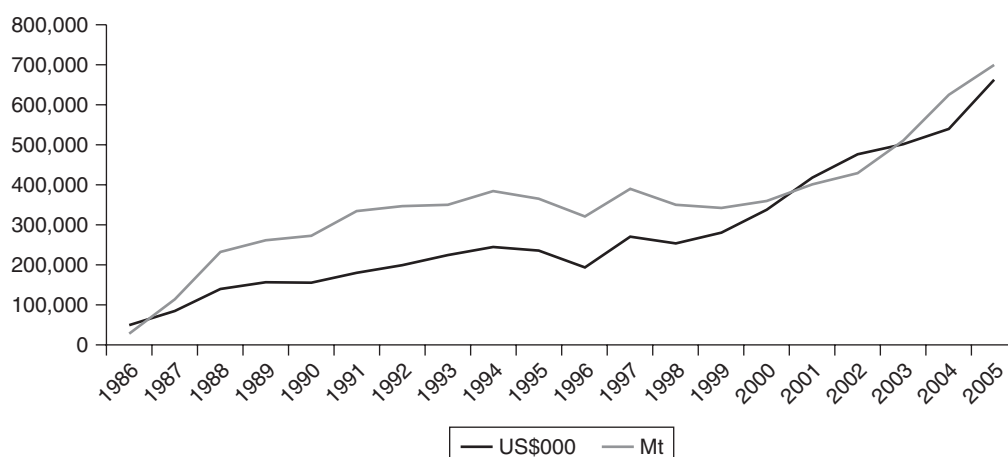
Source: COMTRADE data.

1.2 Global Trends in Groundnut Trade

Global trade in groundnuts mainly comprises edible groundnuts (raw⁷ and prepared/preserved), processed products (oil and cake/meal), and peanut butter.⁸ During the 1970s, at least half of the global trade of groundnuts was for subsequent oil production (FAO data, reported in World Bank 1984). The decade of the 1980s saw a shift in trade from the oil market to edible groundnuts. According to Diop et al. (2004), during this period demand for edible groundnuts showed dramatic growth and world trade increased by more than 20 percent per year. This growth slowed in the subsequent decade, although it was still considerable (at 8 percent per year). In contrast, since the early 1980s, global exports of groundnut oil and cake have declined (1 and 2.5 percent per year respectively), despite growing global consumption of both products. Increases in per capita incomes, consumer health awareness, and industry demands are regarded as responsible for the rise in consumption of edible groundnuts in developed countries. Groundnuts are consumed as roasted nuts or used by the confectionery industry in many different ways (for example, as a seasoned snack, as peanut butter, in sauces, and in chocolate bars). Groundnuts are also a key component of Mediterranean, Indian, and Asian cuisines; this has been a key factor stimulating the demand for groundnuts as ingredients in ethnic dishes and sauces in the European Union.⁹

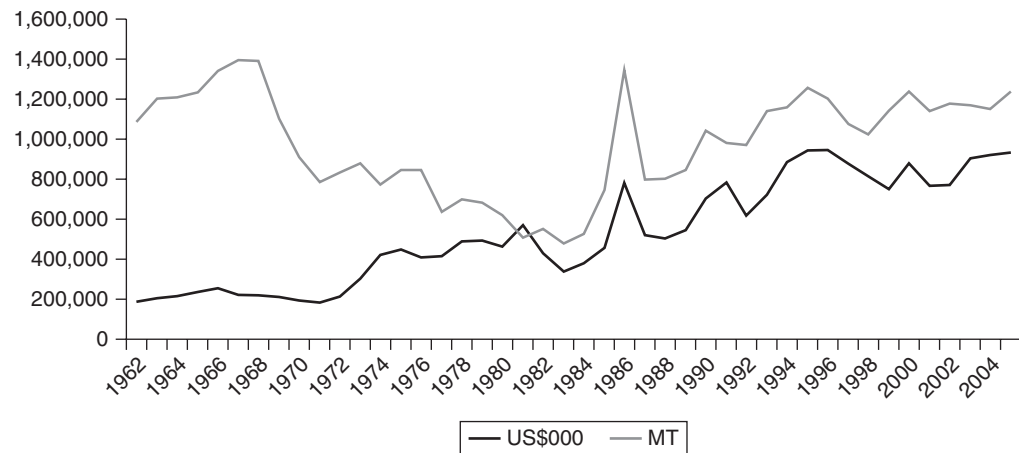
Within the edible groundnut sector, trade for prepared groundnuts (i.e., roasted, salted, etc.) has had especially rapid growth, whereas trade in raw edible groundnuts has leveled off in recent years (Figures 1.6 and 1.7). As a result of these differential trends, the share of prepared/preserved groundnuts in total groundnut product trade increased from 9 percent in 1995 to 27 percent in 2005 (Annex 1). Some importing countries, especially in the European Union, are increasingly demanding blanched groundnuts,¹⁰ which apparently are reported in international trade statistics as “prepared groundnuts.”¹¹

Figure 1.6 Evolution of Global Exports of Prepared^a Groundnuts (1986–2005)



Source: COMTRADE data.

^a Groundnuts otherwise prepared (roasted, salted, etc.).

Figure 1.7 Evolution of Global Exports of Raw^a Groundnuts (1962–2005)

Source: COMTRADE data.

^a Groundnuts not roasted or otherwise prepared.

The growing demand for edible groundnuts experienced since the 1980s offered opportunities for new participants to enter the international market. Argentina and China, in particular, emerged as major suppliers; by the mid-1980s, they had completely overtaken SSA as sources of raw groundnuts. Although the pattern of Argentina's trade in raw groundnuts has since been uneven, China has retained more than a 30 percent international market share over the past two decades (Table 1.2).

Over the past decade, several newer suppliers—including Brazil, Nicaragua, and Vietnam—have entered the market and achieved notable success. In the case of SSA, after the strong decline in exports experienced during the 1970s to early 1980s, exports of raw groundnuts from the region have shown a slight upward trend since the mid-1980s.

During the mid-1980s, Argentina and China consolidated their positions as leading exporters of raw groundnuts to the world market. Argentina is narrowing its participation in this market, but gaining participation in the market for prepared groundnuts. The U.S. and SSA shares of worldwide exports are continuing to decrease. Although export levels showed a positive

Table 1.2 Shares of Leading Exporters of Raw Groundnuts (By Volume)

	SSA	USA	Argentina	India	China	Total Share
	%	%	%	%	%	%
1962–1971	86.0	4.0		1.7		91.7
1972–1981	37.2	34.7	3.8	6.4		82.1
1982–1991	4.4	31.1	12.1	2.6	31.2	81.4
1992–2001	4.8	19.9	16.2	11.2	30.5	82.6
2002–2005	4.5	13.3	8.3	12.2	37.3	75.6

Source: COMTRADE data.

trend during the period 1993 to 2005, continuous fluctuations of export volume have characterized India's participation in the worldwide trade of raw edible groundnuts: 75 percent of its exports go to Indonesia, Malaysia, and the Philippines.

In the higher-value segment of edible groundnuts (prepared/preserved groundnuts), exports from Argentina and China more than doubled during the period 1995 to 2005. In 2005, their combined share of world trade in this segment was 68 percent. The participation of other developing countries in this segment of trade is still very low, although suppliers from India, Vietnam, and Mexico have achieved some gains.

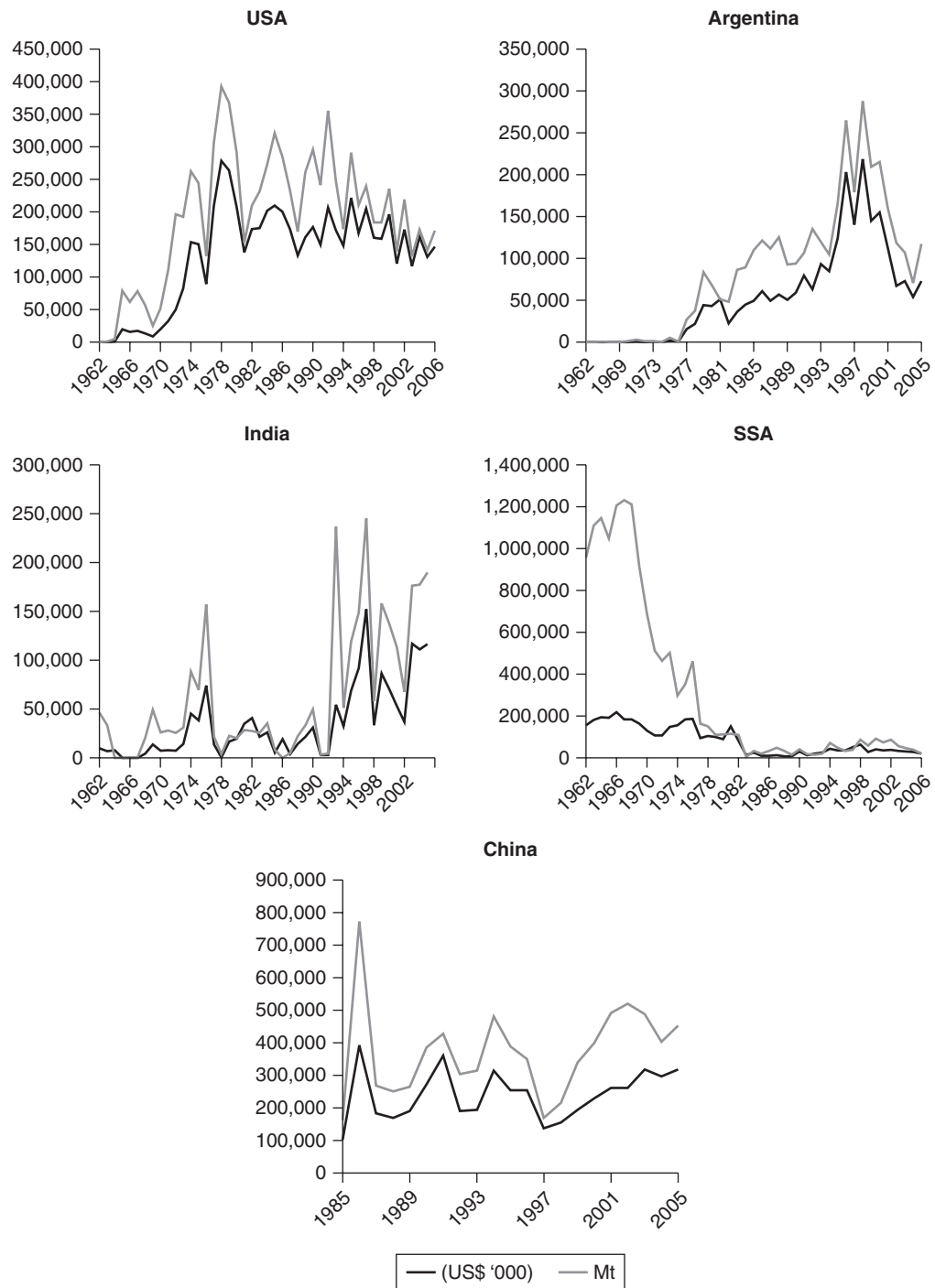
Although the global trade in edible groundnuts has continued to grow, that for groundnut oil and cake has contracted sharply, primarily because of competition from other oilseeds and vegetable oils.¹² Senegal and other African countries were traditionally major players in the groundnut oil market. Senegal remains one of the largest world exporters of groundnut oil, yet its exports of this product fell from nearly 131,000 Mt in the early 1990s to less than 24,000 Mt by 2005.¹³ The participation of other African countries in the global trade of groundnut oil has been marginal and very erratic during the last decade. Similarly, in the segment of groundnut cake, Senegal traditionally was one of the three largest exporting countries. Yet, by 2005 its share of world exports had fallen to less than 4 percent, from a share of about 30 percent in the early 1990s (Figure 1.8).

Reduced competitiveness and constrained demand for groundnut oil, along with an inability to shift industry focus to the edible confectionery¹⁴ market, have contributed to the marginalization of SSA's global market position. Thus, SSA's participation in the global trade of groundnut and groundnut products has been decreasing both in the dynamic (edible groundnuts) and the less dynamic (oil/cake) sectors (Annex 2). SSA's decline in exports was exacerbated by the shift in the trade from the oil market to edible groundnuts—a market with higher quality and safety requirements.

1.3 The New Major Players in the EU Edible Groundnut Market

The increasing demand for edible groundnuts (both raw and prepared) has been led mainly by the European Union and Asia. EU imports of both prepared and raw groundnuts were estimated at approximately US\$850 million in 2005, with a remarkable growth in the segment of prepared groundnuts since the mid-1980s (see Annex 3). The Netherlands has been the leading importer of edible groundnuts into the European Union, accounting for just under 39 percent of EU imports in 2005.¹⁵ The United Kingdom, Germany, and Italy are the next largest importing countries. As illustrated in Figure 1.9, EU dependence on the SSA region as a source of raw groundnuts has changed dramatically since the mid-1970s. Emerging exporting countries gradually took the lead and consolidated their positions as key suppliers to this market. Argentina is now the top supplier of raw groundnuts to the EU market, accounting for 35 percent of import value in 2005 (see Figure 1.10). China is the second leading supplier, with a 24 percent market share. With regard to prepared nuts, the United States is the leading supplier, followed by Argentina and China.

Figure 1.8 Evolution of Exports of Raw Groundnuts—Main Suppliers to the World Market



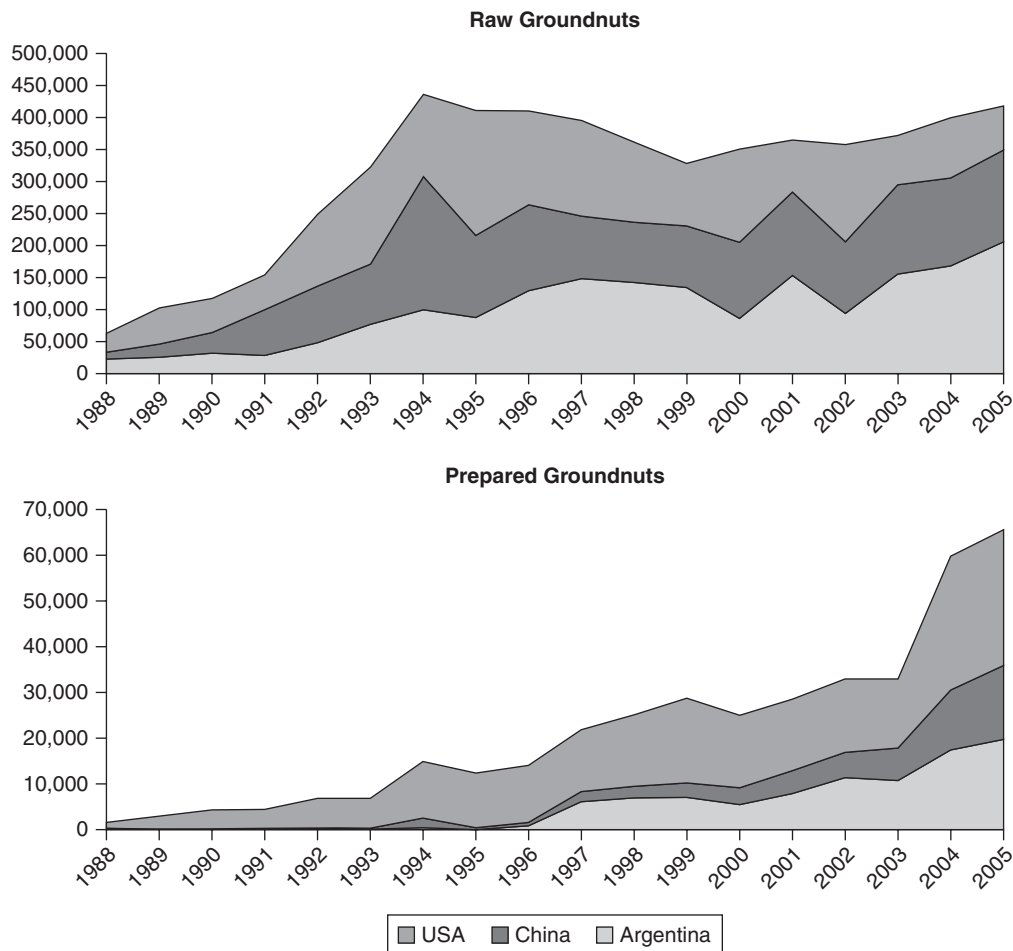
Source: COMTRADE data.

Figure 1.9 EU Imports of Raw Groundnuts from SSA Region and the World (in US\$000)



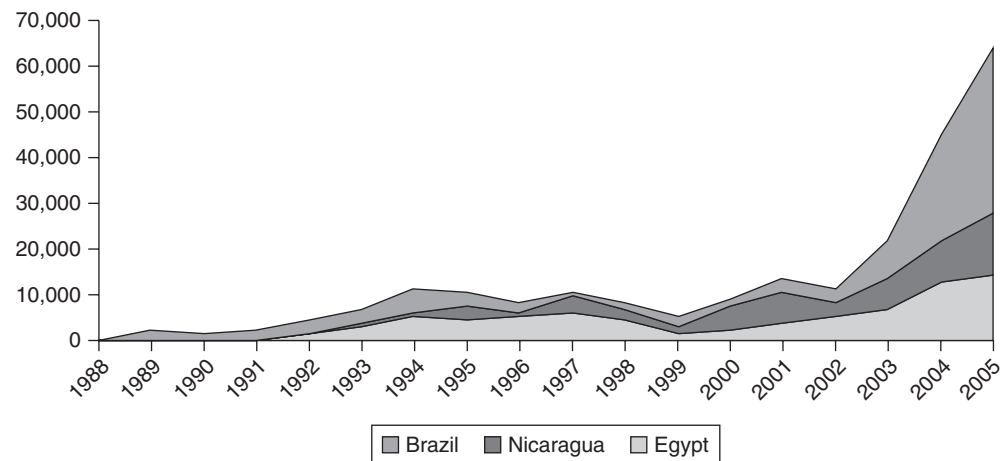
Source: COMTRADE data.

Figure 1.10 Main EU Suppliers of Edible Groundnuts (in US\$000)



Source: COMTRADE data.

Figure 1.11 Emergence of New Participants in the EU Market for Raw Groundnuts (in US\$000)



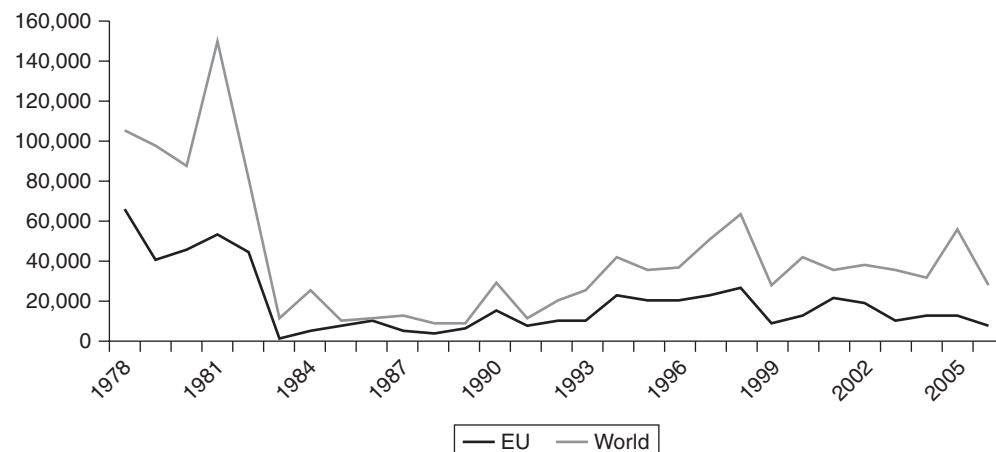
Source: COMTRADE data.

Although the EU raw groundnut market has traditionally been highly concentrated, there has been room for new suppliers to enter this market in the current decade. Brazil, for example, increased its share of the EU market for raw groundnuts from less than 1 percent to 6 percent during the period 2001 to 2005. Similarly, Nicaraguan suppliers have successfully penetrated this market, and Egypt, following a temporary ban on its products in 1999, has recently increased its market share (Figure 1.11).

While larger and emerging players are significantly increasing their participation in the EU market, SSA has been very uncompetitive in this market. In 2005, SSA countries accounted for only 4 percent of EU import value (with South Africa accounting for half of this). The year-to-year fluctuations in groundnut export volumes experienced during the 1970s and 1980s also characterize SSA supply to the EU market during the 1990s and the present decade. SSA suppliers irregularly enter the EU market, depending on their crop quality and world market demand (Diop et al. 2004). For example, for Sudan, the value of exports to the European Union reached more than US\$10 million in 1998 and dropped to less than US\$2 million the following year.

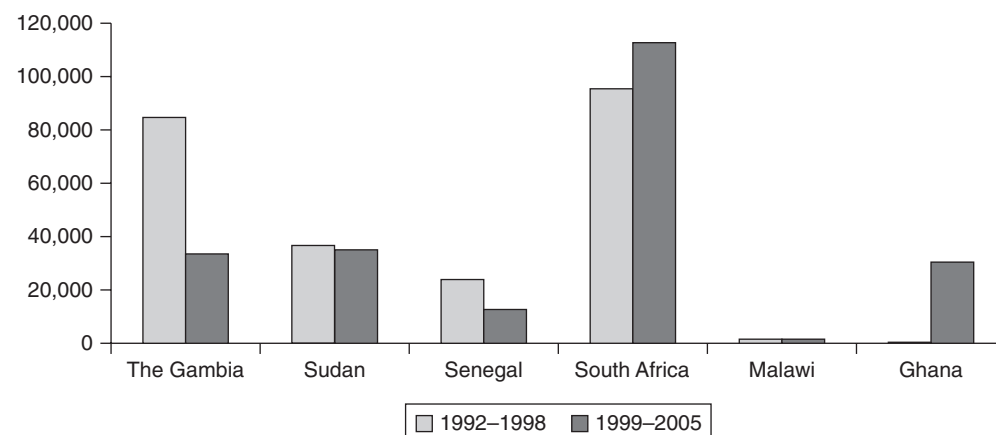
Although the overall performance of the SSA region in the EU market has been poor during the last three decades, the region's exports to the European Union have shown a slight upward trend since the mid-1980s (Figure 1.12). This has been due mainly to higher production achieved in The Gambia in 1998 and Senegal and Sudan in 2000–2001.¹⁶ Also, it is apparent that alternative markets emerged as important destinations for SSA exports of raw groundnuts during the 1990s. In terms of the performance of individual SSA countries, EU imports from Senegal and The Gambia have shown negative trends during the past few years (Figure 1.13). In the case of The Gambia, the failure of the privatization process in the mid-1990s had a significant adverse impact on groundnut exports, as will be discussed later.¹⁷ In contrast, Ghana—not a traditional exporter of edible groundnuts—has experienced

Figure 1.12 SSA Exports of Raw Groundnuts (in US\$000)



Source: COMTRADE data.

Figure 1.13 EU Imports of Raw Groundnuts from SSA Countries (Mt)



Source: COMTRADE data.

some positive gains in its trade during this decade. Thus, with the exception of South Africa and Ghana, EU imports from other SSA countries have been marginal since 2003.

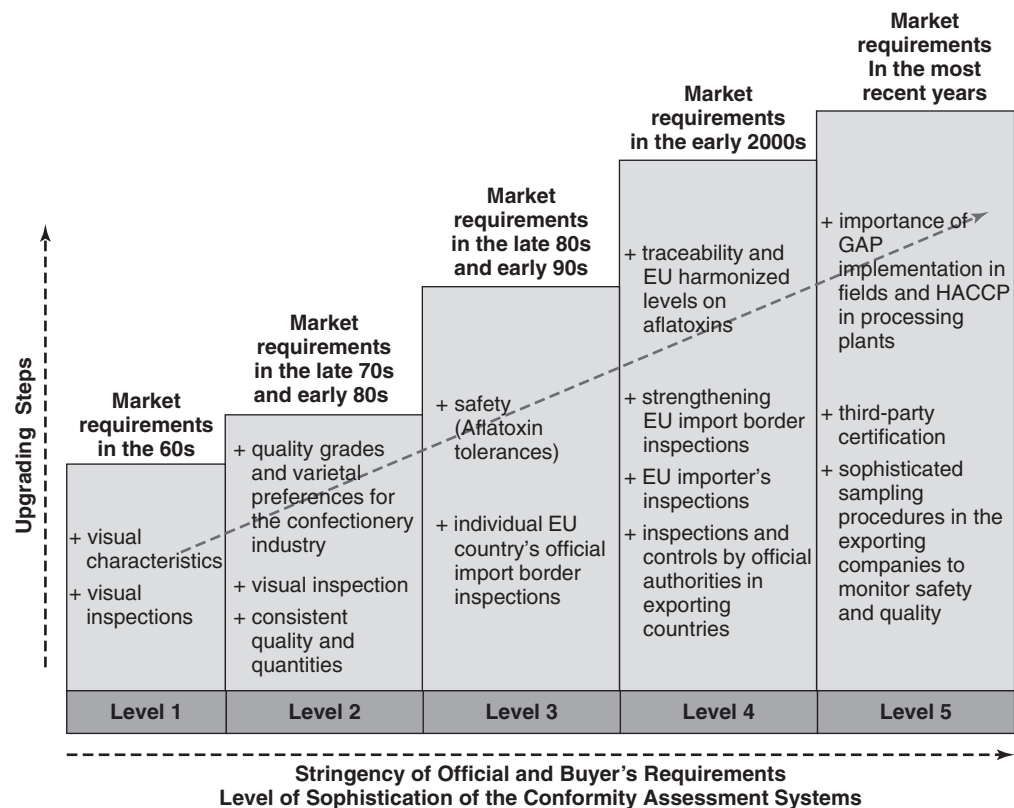
1.4 Consolidation of New Participants in the Global Trade of Edible Groundnuts

The shift in the trade of groundnuts away from raw nuts for processing and toward the sale of edible (raw and prepared/preserved) nuts has been accompanied by higher market requirements for product quality and food safety. The latter results primarily from improved knowledge about the food safety risks associated with groundnut production and processing and improved technologies for the detection and analysis of hazards, both known and unknown.¹⁸

Initially, EU buyers' demands related to specific product quality characteristics desirable for the confectionery industry (e.g., taste, size). Compliance with these buyer requirements implied a process of upgrading at production level, in terms of replacement of varieties and improved production technologies to produce basic quality characteristics and consistent quantities. Later on, safety concerns resulting from enhanced knowledge of the serious effects of mycotoxins—especially aflatoxins—on human and animal health, and the association of mycotoxins with consumption of contaminated groundnuts and other food, led many importing countries, including the EU countries, to enact regulations establishing maximum levels for aflatoxins in groundnuts and groundnut products.

With improved knowledge of the factors associated with the prevention and control of aflatoxin contamination, processes of upgrading at the production and processing levels have gradually incorporated specific methods of production and processing, under good agricultural practices and the Hazard Analysis and Critical Control Points (HACCP) system.¹⁹ To further minimize risk, these improvements have been combined with end-product testing and inspections at different stages of the supply chain implemented by the officials in importing and/or exporting countries, as well as by the buyers and exporters (see Figure 1.14).

Figure 1.14 Evolution of EU Market Requirements and Associated Conformity Assessment Systems for Groundnuts and Groundnut Products



Source: Adapted from the Research Project 'Smallholder Project African Smallholder Farmers and Participation in Higher-Value Supply Chains: Lessons Learned and the Efficacy of Interventions to Achieve Assured Compliance. The World Bank/University of Guelph (ongoing).

These system improvements can be characterized as occurring across five stages or levels of supply-chain development. Initial upgrades center on adopting improved (and market-preferred) varieties, increasing yields, and meeting basic quality requirements (i.e., shifts from level 1 to 2 in Figure 1.14). After that come upgrades that also ensure compliance with aflatoxin (and other food safety) requirements at farm and packhouse/processor levels and introduce the traceability of nuts through the supply chain (i.e., upgrades from level 2 to level 3 and beyond). This section reviews various countries' experiences in upgrading from level 1 to level 2. Section 3 examines recent experiences with achieving and demonstrating compliance with aflatoxin and other food safety requirements.

1.4.1 Upgrading Steps: Preferred Varieties and Productivity Measures

During the late 1970s to early 1980s, several countries implemented policies to promote production and productivity gains to satisfy increasing demands in domestic and export markets. China, for example, experienced an impressive expansion of groundnut production, as a result of market reforms in 1978 and the use of higher-yielding varieties and agricultural inputs (Diop et al. 2004). Since 1992, China has consistently ranked as the largest groundnut-producing country, accounting for 39 percent of world production in 2005. During the period 1990 to 2005, China's production increased from 6 to 14 million tons, with average yields improving from 2.1 tons/ha to 3.1 tons/ha. Nevertheless, less than 10 percent of Chinese production is exported, enabling exporters to select only the highest-quality product to meet overseas requirements.

Similarly, in Argentina, Brazil, Nicaragua, and Egypt, production has grown steadily, as a result of increased growing areas as well as significant increases in yields. In contrast, production trends within Africa have been quite varied. Nigeria has experienced significant growth in groundnut production, yet has not reentered international markets. Ghana, Malawi, and The Gambia have experienced modest production growth during the 2000s, whereas traditionally larger producers—including Senegal, Sudan, and South Africa—have experienced stagnant or declining production over much of the past decade. Although Africa as a whole increased its share of worldwide production during the period 1995 to 2005, this has been due mainly to the remarkable growth in production experienced by Nigeria rather than the result of improved yields. With the exception of South Africa, average yields per hectare have consistently been below 1 ton/ha in SSA countries, rising above this level only during years of exceptional weather conditions (Table 1.3).

Efforts to increase productivity within Africa have been constrained by market inefficiencies in the distribution of agricultural inputs (seeds and fertilizers). During periods of high government involvement, the provision of fertilizers and seeds was irregular and insufficient. After the exit of governments from this market, farmers mostly relied on informal (including farmer-to-farmer) sources of seed, which is often of low or variable quality (World Bank 2003; Mbaye 2004; World Bank 2007). Upgrades accomplished through the use of varieties suitable for the confectionery industry (e.g., Valencia, Virginia, Spanish) have also been constrained by the difficulties in reproducing seeds of

Table 1.3 Average Yields/ha in Different Groundnut Producing Countries

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Nicaragua	2.6	2.3	2.3	3.0	3.1	2.8	2.9	2.6	2.1	3.0	3.0	3.8	3.8	4.1	3.9	4.0
USA	2.2	2.7	2.9	2.3	2.9	2.6	3.0	2.8	3.0	3.0	2.7	3.4	2.9	3.5	3.4	3.3
China	2.2	2.1	9.0	2.5	2.6	2.7	2.7	2.6	2.9	3.0	3.0	2.9	3.0	2.7	3.0	3.1
Egypt	2.1	2.2	2.3	2.3	2.9	2.9	2.9	2.9	3.0	3.1	3.1	3.2	3.2	3.2	3.2	3.1
Argentina	2.0	2.5	2.1	3.0	2.2	2.2	2.8	1.3	2.3	1.5	2.7	2.2	2.3	2.0	2.5	2.8
Brazil	1.7	1.6	1.7	1.8	1.1	1.1	1.9	1.6	1.9	1.8	1.8	1.9	2.0	2.1	2.3	2.3
South Africa	1.2	1.3	0.5	0.8	1.3	1.1	1.6	1.7	1.8	1.7	1.6	1.3	1.4	1.3	1.8	1.6
Nigeria	1.6	1.2	1.2	1.2	0.9	0.9	1.0	1.1	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.6
Mali	0.7	1.1	0.7	0.8	0.8	0.9	1.0	0.9	1.1	1.1	0.8	0.6	0.6	0.9	0.7	1.1
Ghana	0.9	0.7	0.8	0.9	0.9	0.9	0.9	0.9	1.1	1.0	1.0	1.0	1.4	0.9	0.9	1.0
Senegal	0.8	0.8	0.6	0.8	0.8	0.9	0.7	0.7	1.0	1.1	1.0	1.0	0.3	0.8	0.8	0.9
Sudan	0.6	0.8	0.7	0.5	0.8	0.7	0.9	0.7	0.6	0.7	0.6	0.6	0.9	0.7	0.7	0.5
Malawi	0.8	0.8	0.4	1.5	0.3	0.6	0.6	1.2	1.0	0.7	0.7	0.8	0.7	0.8	0.7	0.4

Source: FAO STAT.

standard quality suitable for food purposes. In Senegal and The Gambia, for example, seeds used in groundnut production are obtained by screening the best-quality seeds from harvested products, thus reducing the quality of the final product (Mbaye 2004; Lojpur and Neering 2006). The deterioration of seed quality is a generalized problem in SSA countries (Fabre and Mayeux 2006). Senegal's difficulties in participating in the higher-value confectionery market are highlighted in the following mini-case study.

Efforts to improve productivity through improved varieties have not always resulted in positive outcomes. For example, Malawi and Zambia grow a groundnut variety called "Chalimbana," which produces relatively large-sized kernels with excellent flavor—highly valued in the confectionery market. Research efforts, however, have focused on developing a better-yielding and more disease-tolerant variety. The CG7 variety has been successfully developed, yet this yields a crop with smaller-sized kernels and higher oil content—for which there is not a distinctive demand, either in regional or international markets (World Bank 2007). Most recently, ICRISAT efforts in Malawi and Tanzania have focused on the development of groundnut varieties with improved yield performance, greater resistance to foliar diseases, and better market acceptance.²⁰ Under this initiative, a survey was undertaken, in March 2007, among 613 farmers in Malawi and 395 farmers in Tanzania. The survey aimed at identifying the main constraints on groundnut production. Inadequate finance for inputs, unfavorable weather, unavailability of seeds, and poor management skills were the critical factors identified by farmers in both countries; while pests and diseases were an additional (major) critical factor in Tanzania. The results of the survey are presented in Annex 4. Similar perceptions among groundnut farmers should be expected in other SSA countries.

These basic critical production constraints are, undoubtedly, limiting the realization of edible groundnut exports to the European Union and regional markets. Clearly, most SSA groundnut industries have not successfully made the adjustments necessary to enable maintenance of a consistent and reliable supply of quality product that can satisfy the basic quality requirements of the buyers (that is, upgrade from level 1 to level 2).

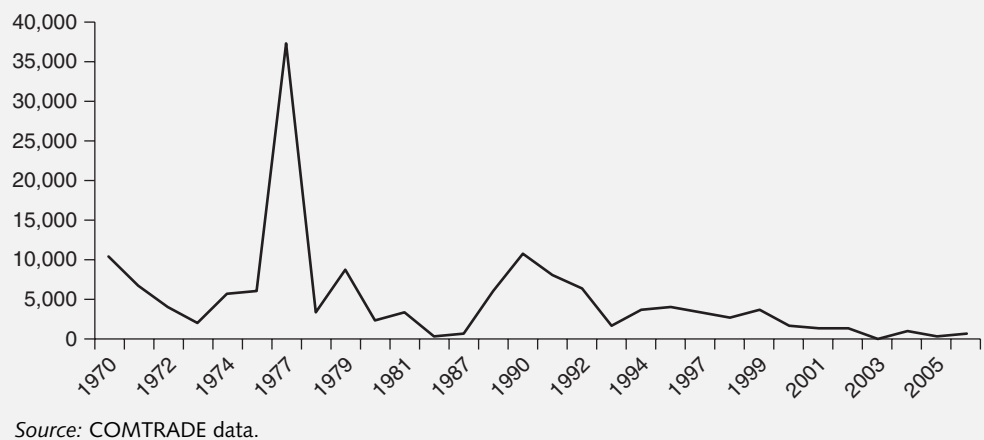
**Mini-Case: Senegal's Performance in the Edible Groundnut Trade:
Inconsistent Quality and Variable Supply**

The share of Senegal's total exports shipped to the EU market has fluctuated continuously during the past 30 years, even during years when total exports were relatively high. The industry has been unable to maintain a consistent and reliable supply of quality product that can satisfy the requirements of European buyers of edible groundnuts. This inability stems from many factors, including persistent droughts and inadequate rainfall in the groundnut basin, use of poor cultivation techniques, the high costs of agricultural inputs, and degradation of seed quality (Boakye-Yiadom 2003; Mbaye 2004). Senegal has seen its participation in the EU edible groundnut market reduced, with a shift to the market for the lowest-quality

Mini-Case (Continued)

products with the fewest requirements. In 2005, its share of EU imports was estimated at only 0.05 percent (Figure 1.15). During the early 1970s, France was the main destination market for Senegal groundnut exports, mainly for crushing purposes.²¹ During the 1980s and early 1990s, the Netherlands was the leading destination country; but when higher quality and safety requirements were instituted, Senegalese supply shifted, after the mid-1990s, toward the U.K. market, where, apparently, much of the product exported from Senegal is used for bird feed purposes (Mbaye 2004).²²

Figure 1.15 Senegalese Exports of Raw (Shelled and In-Shell) Groundnuts (in US\$000)



1.4.2 Upgrading of Production and Processing Systems

As mentioned earlier, process upgrades in China have focused mainly on achieving productivity gains. China's source of competitiveness in the international market has been its ability to provide consistent quantities at competitive prices. Groundnut production in China is highly fragmented. According to FAS (2003), the average area planted to groundnuts ranges from 0.1 to 0.5 ha. Given the ample supply of low-cost labor, most harvesting and shelling is still done by hand, thus resulting in less damage. Comparative advantages are derived from the fact that in the leading producing provinces, harvesting coincides with the dry season, so farmers can sun-dry their product, minimizing problems with aflatoxin contamination.

Argentina, in contrast, has combined an initial upgrade of capacities at the production level, for supplying consistent quality and quantities (from level 1 to level 2), with process upgrades based on the development of competitive advantages, through a cycle of continuous improvements and innovations to supply high-quality and safe groundnuts to highly differentiated markets (levels 3 to 5). Supply-chain coordination and increased collaboration between the private and public sectors were critical factors facilitating the supply-chain upgrade processes.

Mini-Case: Continuous Improvement in Product and Process Stages to Respond to and Anticipate Market Demands: The Success of the Argentine Groundnut Export Industry

The Shift in Groundnut Production

Since the mid-1970s, the groundnut industry in Argentina has shifted its production paradigms, moving from the production of groundnuts for crushing purposes to the production of high-quality groundnuts to supply the confectionery industry. Several local and international factors contributed to this shift. At the local level, the competition generated by other oil crops (e.g., soybeans) and improved technologies for production, mainly in aspects related to groundnut production and harvesting, were critical. At the international level, the low international prices for groundnut oil and the opportunities created by increasing EU demands for high-quality edible groundnuts certainly contributed to the emergence of Argentina as an important supplier of groundnuts to the global markets in the late 1980s and early 1990s. The Argentine National Institute of Agricultural Technology (INTA) initiated its work on improving varieties of the “runner”-type peanut—optimal for confectionery purposes—with assistance provided by the University of Florida in the United States, in 1975. Toward the mid-1980s, the industry started replacing traditional varieties with those specifically oriented to producing high-quality groundnuts for the confectionery industry.

Innovations at Production and Postharvest Stages

During the first half of the 1990s, Argentina considerably increased groundnut production, and consequently its exports, mainly as a result of the implementation of a project called “Maní 2000,” led by the INTA. The project focused on improvements in marketing systems and improved practices at the production and postharvest stages. The partnership between the private sector and universities and research centers was critical to promoting technological developments regarding varietal development, improved water management, plant disease control, prevention of aflatoxin, and improved postharvest practices. In August 2001, the “Fundación Maní Argentino” was created, aimed at consolidating the research efforts in this sector.

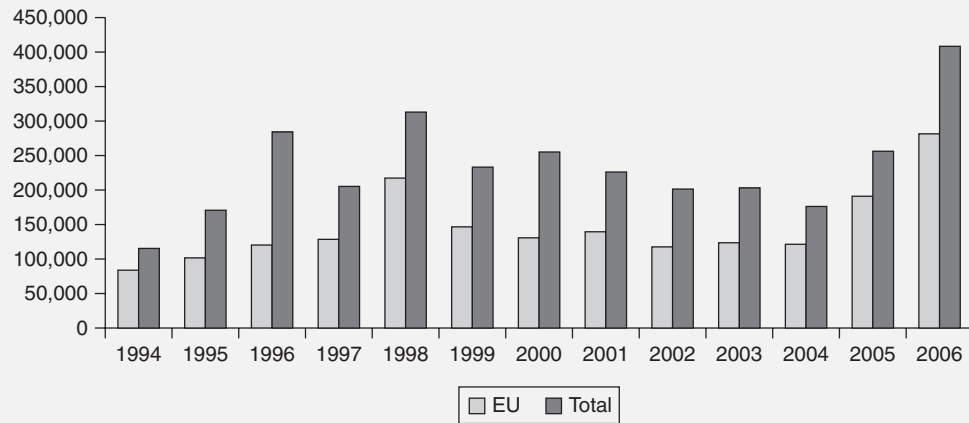
The sector comprises about 1,000 highly experienced producers. Several public and private institutions provide training to farmers and promote the implementation of good agricultural practices for the prevention of aflatoxin contamination. Given the high production costs per hectare (approximately US\$700/ha), close coordination between suppliers and processing/exporting companies is fundamental. The producers are generally linked with the exporting companies through contractual agreements, by which agricultural inputs and technical assistance are provided. The dynamics of the sector have been quite impressive; the country’s exports of groundnuts were estimated at 115,532 Mt in 1994 and reached 408,048 Mt in 2006.²³ Argentina has risen to become the world’s third largest exporter of shelled groundnuts and the second largest exporter of prepared groundnuts (Figure 1.16). The ability to ensure a reliable supply of quality and safe produce has certainly been one of the pillars of the success achieved by the Argentine groundnut industry in international markets.

The Focus for Development: Satisfy Export Markets

Argentina’s groundnut industry developed as an export-oriented industry: 90 percent of Argentine groundnut production is exported, and there is not a significant domestic market for groundnut products and subproducts. Therefore, the capacity of

Mini-Case (Continued)

Figure 1.16 Groundnut Exports from Argentina (Mt)



Source: Cámara del Maní, 2006.

the industry to anticipate and effectively respond to export market requirements has been vital for its sustainability. This is clearly not the case with groundnut production in SSA and China, where there is strong domestic consumption. The Argentine dependence on export markets is reflected in the importance placed on enhanced competitiveness through technological improvements and innovations. In the past decade, the processing sector has invested about US\$70 million in innovations and modern technologies for improved logistics, storage, and value addition.

Most of the processing companies are increasingly exporting blanched groundnuts, both to respond to the growing demand for this product in international markets and as a way to reduce aflatoxin problems and improve profits, as this product category receives a price premium (US\$100–\$120) compared to raw product. In fact, exports of shelled groundnuts have shown a decreased trend, while exports of blanched groundnuts have been growing significantly. Recent efforts to differentiate the product in international markets include the development of the seal of origin “Groundnut from Cordoba—Maní de Córdoba.” In conclusion, the public and private investments made to comply with EU market requirements have paid dividends, as Argentina enjoys a reputation of being a reliable supplier of high-quality, safe groundnut products in international markets. Clearly, for the Argentine groundnut industry, emerging standards have served as a catalyst for modernization of the sector—in effect, compliance with standards has been used as a tool to develop competitive advantages.

Sources: Personal communications with representatives from the Argentine Peanut Chamber and SENASA; INTA Website.

The industry in Argentina, and most recently also in Nicaragua and Brazil, has developed with a clear orientation toward the confectionery industry and with an export-oriented focus. Therefore, exports of groundnut oil and cake are complementary industries, as the supply of groundnuts for crushing purposes comes from the product that does not fulfill the quality requirements for the confectionery market. This strategic approach toward development of

the sector to supply export markets, with a clear specialization for the confectionery industry, has been, in general terms, lacking in the SSA region and, to a lesser extent, also in China. Within many SSA countries, domestic market demand has remained strong, although most of this demand is for low-cost groundnut products. Only very limited food safety controls are in place.²⁴ Furthermore, in the case of SSA, significant constraints at the marketing level, with intermittent periods of public and private intervention in marketing functions, have severely damaged the sector, reducing its ability and possibilities to achieve even preliminary upgrades in production systems, which would enable the industry to supply reliable volume with the basic quality characteristics required by the confectionery industry.

1.4.3 Attempts to Develop Specialized and Coordinated Supply Chains in SSA

After years of problematic or nonsustainable government intervention in the groundnut sector, the transfer of marketing infrastructure and functions to private sector operators seemed to be the way to revitalize the industry in the early 1990s. Nevertheless, the privatization process did not favor the emergence of free competition among private operators, but instead created private sector monopolies. For example, in Senegal, the monopoly of the edible groundnut sector was transferred to NOVASEN, while the government retained control of the processing (oil/cake) sector. The privatization process in Senegal had a clear focus on the differentiation of supply chains by strengthening the production of groundnuts for confectionery purposes. Backward integration through contract farming was seen as a key tool for strengthening the edible groundnut supply chain. In The Gambia, in contrast, privatization covered industry assets for both crushing and confectionery purposes.

These initiatives did not realize the expected and intended results. Technological gaps and lack of market incentives were crucial factors militating against the success of the private sector initiatives. In The Gambia, an additional critical constraining factor was the poorly managed privatization process, characterized by a lack of understanding of the residual role that government should play. A brief summary of these experiences follows.

Mini-Case: Shifting Toward the Confectionery Groundnut Market: Senegal's Uneven Experience

Recognizing the potential of confectionery peanuts, in 1969 the Senegalese government began promoting the commercial production of edible groundnuts, with financial support provided by the European Fund for Development. By 1975, more than 20,000 ha were under cultivation. During the period 1965 to 1985, control over the confectionery groundnut program shifted between no fewer than five public institutions (Warning and Nigel 2000). This institutional instability, along with failures in collecting the harvest and distributing seeds, as well as unfavorable weather, were the major factors responsible for the decline of the sector during the
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Mini-Case (Continued)

mid-1970s and 1980s. In 1990, the Senegalese edible groundnut sector was liberalized and a new operating company, NOVASEN (with majority French investment), assumed control of the confectionery peanut program. To gain participation in the EU confectionery market, major improvements in quality production were needed. NOVASEN's strategy to achieve this was to assume control of all aspects of groundnut production and marketing. The company set up a contract farming scheme known as *arachide de bouche* or ARB, which involved careful screening of farmers, their organization into groups, the provision of seed and other inputs on credit, extension services, guaranteed prices, and close company monitoring of production and postharvest functions.

According to Mbaye (2004), results have been uneven. Although the contracted farmers have substantially increased their production of preferred confectionery varieties, most of the output has not been of a quality adequate to service the export (and especially European) market for confectionery nuts. In the mid-1990s, collection of nuts reached nearly 60,000 tons, of which only about 10,000 tons were suitable for export as confectionery groundnuts. Most recently, exports of confectionery groundnuts hardly surpassed 1,000 tons.

Seed quality has remained a persistent problem, as the method traditionally used by NOVASEN consists of skimming the best seeds from current crops to be used in the next season. The company has not renewed the seed stock in more than 15 years; thus, production of premium grades has become extremely difficult. Additionally, proper oversight of farming production and harvest practices is limited by the lack of extension agents (1 extension agent covers about 1,200 farmers), and the company's limited storage capacity and transport difficulties significantly affect the quality and safety of the product.

Farmers have sometimes lacked incentives to stay with the program. In some years, NOVASEN has not paid prices higher than those offered by the parastatal SONACOS²⁵ for undifferentiated raw materials for oil crushing. Even when it has, prices do not compensate for the additional costs associated with seed purchase and fertilizer use.²⁶ While NOVASEN has been unable to recover outstanding loans in drought years, SONACOS frequently waives farmer debt in such years. Apparently, NOVASEN has stopped extending credit to farmers, making it even less appealing for farmers to grow confectionery groundnuts. In recent years, NOVASEN has reoriented its strategy to focus more on crushing groundnuts for oil, all but abandoning the quest to compete in the European confectionery market. For the company, this is a lower-risk strategy.

Conclusively, under the Structural Adjustment Program for Groundnuts (PASA) instituted in the late 1980s, the processing/crushing sector received most of the attention,²⁷ despite decreasing demand for these products in international markets. Shortages in groundnut production to satisfy the demands of the oil sector, and the repayment system implemented by SONACOS, dulled incentives for the production of high-quality groundnuts. With the dissolution in the late 1990s of SONAGRAIDES, a subsidiary body of SONACOS in charge of seed distribution and crop collection; the privatization of SONACOS in 2005;²⁸ and weak international demand for groundnut oil, there has been renewed interest within the industry and donor community to revitalize the confectionery sector, and recent projects targeting this objective are being implemented.

Sources: Warning and Nigel 2000; Mbaye 2004.

**Mini-Case: Stop-and-Go Sectoral Reforms in the Groundnut Sector
in The Gambia**

In The Gambia, since the mid-1970s, the Gambian Produce Marketing Board (GPMB) has been in charge of groundnut purchases. The GPMB heavily supported the Gambia Cooperative Union (GCU), which was responsible for the organization of producers and the primary purchase of groundnuts for delivery to GPMB depots and processing plants, as well as for the provision of agricultural services, including inputs and credit. By the early 1990s, the government had proceeded with privatization of the GPMB and renamed it the Gambia Groundnut Corporation (GGC). The monopoly in marketing activities was assumed by the multinational Alimenta S.A. Geneva in 1993, which bought all groundnut industrial assets. The GCU nevertheless retained its role in the distribution of inputs and provision of advisory services. Some immediate improvements were realized as the GGC made prompt payment for purchased crops, rehabilitated marketing infrastructure, supported technical research activities, and initiated a quality-oriented program involving a "Hand Picked and Selected" brand label.

However, continued government interventions jeopardized the potential gains from the privatization process. For example, farm-gate prices were fixed yearly by government, normally with no relation to prevailing international prices. In some years the GGC could not profitably export nuts because of the high costs of procurement. The GCU proved incapable of sustaining its inputs-on-credit program, as farmers were accustomed to periodic official waivers of repayment. The efforts to privatize the sector and operate on a sound commercial basis were undermined by the (often forgiven) farm-input credits and subsidized prices. GGC crop purchases became more irregular, and some farmers cut back production or sold through informal channels. In recent years, the stop-and-go pattern of groundnut market control and decontrol has continued, and groundnut exports have fluctuated widely from year to year. According to the World Bank (2007), the underlying problems of the sector are grave, and include loss of faith in the marketing institutions, poor transport and storage infrastructure, chronic lack of investment, poor maintenance of industrial facilities and river barges, and prices that do not reflect quality differences. Additionally, as illustrated in Annex 6, improper practices during production and harvesting result in aflatoxin contamination and, therefore, low possibilities of satisfying export markets.

In 2006, the GGC exported some 11,000 tons of shelled groundnuts to the United Kingdom. However, quality remains a consistent problem, with frequent product rejections and discounts by overseas buyers—and with a large proportion of such exports eventually being marketed as bird feed.

Sources: World Bank 2007; personal communications with Gambian firms.

Recent attempts by private and/or public entities to revitalize the industry in some SSA countries are showing more promising results, such as the initiative implemented by NASFAM in Malawi (as illustrated in the following mini-case study) and by ASPRODEB and CIRAD in Senegal (see Section 4 of this paper), through the establishment of synergies with research institutions and donors. However, these efforts are more isolated examples rather than generalized approaches implemented throughout the region.

**Mini-Case: Attempts at Quality Upgrade and Product Differentiation:
The NASFAM Experience in Malawi**

USAID's support to smallholder farmers in Malawi led to the creation of the National Smallholder Farmers Association of Malawi (NASFAM) in 1997, and more recently to the formation of a NASFAM group of companies that address the commercial and developmental aspirations of smallholders in Malawi: NASFAM Development Corporation, NASFAM Commodity Marketing Exchange, and NASFAM Centre for Development Support.

The Mchinji Area Smallholders Farmers' Association (MASFA) is a NASFAM member, founded in March 2000 with 206 clubs and 4,024 farmer-members operating 9 market centers. With the help of the farmer organization, smallholder producers in Mchinji District in the Central Region of Malawi have again begun to export groundnuts to Europe under fair trade agreements. NASFAM enforces strict quality control measures and closely monitors production, from planting through export, to ensure that these producers comply at any given stage. With the support of ICRISAT, the association has put in place screening methods for aflatoxin detection to ensure the safety of the product. The farmers, in turn, receive a premium price for their groundnuts and also receive an extra amount per ton sold to be used for community development. NASFAM markets the Chalimbana groundnuts that are grown only in Malawi and Zambia, and are recognized in South Africa and Europe for excellent quality (kernel size and taste). Although the value negotiated through fair trade agreements is still very low, there are possibilities for expansion. NASFAM has also negotiated non-fair-trade contracts with local processing companies and buyers in South Africa.

NASFAM represents an example of the catalytic role of standards in promoting supply-chain development and synergies between public and private sector actors.

Sources: NASFAM Website; ACIDI/VOCA 2003; personal communications with NASFAM extension workers.

Hence, within the SSA region several efforts have been made to upgrade groundnut supply chains—through the introduction of preferred varieties, changes in production practices, and increased attention to product quality control—yet progress has been uneven, and there are no significant cases of sustained success in international competitiveness. Inefficiencies in the provision of quality seed and other agricultural inputs, and lack of supply-chain coordination, remain core constraints hampering quality and productivity improvements in the region. As they have not achieved sustained gains in groundnut productivity and product quality upgrades, many of Africa's groundnut industries have been ill prepared to tackle the additional challenges of meeting stringent official and buyer requirements related to aflatoxin control and other food safety measures. As noted throughout this section, SSA's marginalization in world groundnut trade occurred over several decades and largely preceded Europe's imposition (and effective enforcement) of stringent food safety requirements. As will be discussed in later sections, the European Union's aflatoxin standards have had more of an impact on the groundnut industries of other countries (primarily in Latin America and Asia). Arguably, these standards have had at least as much of a catalytic effect as a negative "trade barrier" effect. For much of SSA, these standards, in and of themselves, seem to have had comparatively little impact, either positive or negative.

Notes

1. At present, the groundnut basin is characterized by poor soils, low and unpredictable rainfall, and poor vegetation (Boakye-Yiadom 2003).
2. Economy History of Rural Gambia, http://www.afrol.com/archive/economic_history_gambia.htm
3. The emergence of soybean oil in the United States in the 1950s, and in Argentina and Brazil in the 1980s; of palm oil in Malaysia and Indonesia in the 1970s; and of sunflower oils in the 1980s put the popularity of groundnut and copra oils into decline (Fabre and Mayeux 2006).
4. COMTRADE data report minor exports of preserved groundnuts only during 1998 and 1999, and no exports of raw groundnuts in the past decades, yet data on EU imports indicate marginal imports of raw groundnuts from Nigeria.
5. Per capita consumption of groundnuts has increased from 31 g/day in 1990 to 56.68 g/day in 2005 (FAOSTAT).
6. Agricultural policy in Senegal during the colonial era was focused on increasing groundnut production and improving the technical aspects; France's goal was essentially to turn Senegal into a groundnut-production machine (Akobundu 1998).
7. Raw groundnuts include shelled and in-shell groundnuts. COMTRADE data use the term "groundnuts not roasted or otherwise prepared."
8. Peanut butter is usually reported separately in international statistics.
9. Mediterranean cuisine has been highly promoted as a very healthful diet, which has contributed to increased consumption (for example, in Spain). In the United Kingdom, the highly developed taste for Indian and other Asian cuisines has been a key factor stimulating the demand for groundnuts as ingredients in ethnic dishes and sauces. As in other EU member countries, British consumers show a clear preference for shelled nuts. However, during the Christmas period, in-shell nuts are popular, being a traditional holiday food product (CBI 2005).
10. Blanched groundnuts are used to a large extent in the confectionery industry. Although the treatment is not specifically designed to reduce aflatoxin contamination, a significant reduction does occur.
11. According to personal communications with representatives of Argentine exporters and local authorities, Argentina basically supplies raw groundnuts to the international market—that is, shelled and in-shell groundnuts. The country has experienced remarkable growth in exports of blanched groundnuts, apparently reported in international statistics as "prepared groundnuts." This has important implications for the application of standards for maximum levels of aflatoxin and is currently a matter of discussion between the EU authorities and Argentine representatives.
12. Within the group of vegetable oils and fats, palm oil is the leading consumer product in the European Union, with a market share of 46%; it is followed by sunflower oil (30%), coconut oil (12%), palm kernel oil (10%), and groundnut oil (2%). The EU market for groundnut oil is comparable in size to the U.S. market. India and China are significantly larger markets for groundnut oil (CBI 2007).
13. Senegal's share of global exports of oil decreased from 37% in 1990 to only 12% in 2005.

14. The generic term “confectionery” includes all groundnuts intended for human consumption in forms other than oil (Fabre and Mayeux 2006).
15. According to the Dutch Peanut Council, the industry use of this product is estimated at about 80,000 Mt annually. This includes Dutch consumption of snack peanuts, estimated at about 20,000 Mt (Product Board for Horticulture), and consumption of peanuts as ingredients, such as in peanut butter and candy bars, estimated at about 30,000 Mt (OAA estimate). About 25,000 Mt is used by the Dutch industry as ingredients and then exported in food or feed products (OAA estimate). A significant but unknown volume is reportedly exported as bird feed (FAS 2004).
16. In 1999 and 2000, an important percentage of exports from The Gambia were directed to Senegal.
17. EU import of raw groundnuts from The Gambia during 1992–2005 reached its lowest level in 1999, a year in which the Gambian government reacquired the industrial assets privatized in 1993. Since 2000, mismanagement and policy instability have led to a downward trend in exports (World Bank 2007).
18. Modern analytical methods are capable of extreme sensitivity in detection (presence or absence), and relatively high precision in determination (concentration) of substances/contaminants in food.
19. General documents providing guidance in this regard include the general recommendations on the application of good agricultural practices, provided by the *Codex Alimentarius* in the “Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Peanuts,” CAC/RCP 55-2004; and the FAO manual on the application of the HACCP system (2001).
20. The research project is funded by the McKnight Foundation (USA) and implemented in collaboration with NASFAM in Malawi, and the Department of Research and Training (DRT) of the Ministry of Agriculture and Food Security in Tanzania.
21. Most groundnut producing countries do not differentiate, in their foreign trade statistics, between exports of edible and milling grades. Among the major EU importers of groundnuts, only France, Italy, Portugal, and Switzerland use a larger proportion of their imports for crushing. Until 1967, France provided a 25 percent export subsidy on Senegalese exports; with the beginning of the Common Agricultural Policy, the European Union provided a 10 percent export subsidy (Diop et al. 2004).
22. Mbaye (2004) also mentions that NOVASEN has contended that such alternative uses are rare.
23. Statistics provided by the Argentine Peanut Chamber (Cámara del Maní) in 2007.
24. Chalagiraud and Sagarra pointed out that in Senegal, for example, taking into account the low level of quality and safety required and the related production costs, the domestic market for edible groundnuts is more remunerative than the export market; in particular, it is much less commercially risky (reported by ASPRODEB/CIRAD 2006). Also, shortages in production created strong competition from the processing industry, undermining incentives for product differentiation based on quality and safety improvements to supply export markets.
25. The Société Nationale de Commercialisation des Oléagineux (National Oilseed Marketing Company), known as SONACOS, was privatized in 2005.

26. NOVASEN has received practically no premium grades from its farmers since 1997, and the price difference between the A and B grades has been virtually nil most of the time (Mbaye 2004).
27. The program attempted to create differentiated supply chains for edible groundnuts and groundnuts for crushing purposes (ASPRODEB/CIRAD 2006).
28. As a result of decreased production, the underprovisioning of groundnuts for processing, and other factors, SONACOS accumulated significant deficits. The years 1999 and 2000 were particularly problematic. For 1999, the loss was 4.9 billion CFAF and in 2000 the total deficit was nearly 30 billion CFAF (ASPRODEB Website).

Section 2 Implications of EU Aflatoxin Regulations for Groundnut Trade

2.1 Historical Perspective of the EU Regulatory Developments Regarding Aflatoxins

Groundnuts are produced and consumed worldwide. Because of high levels of domestic consumption, though, only about 5 percent of total production is traded internationally. Some of the main consumer regions of groundnut and groundnut products are net importers, as is the case with the European Union. Awareness of the safety risks associated with consumption of food products contaminated with mycotoxins—specifically, groundnuts contaminated with aflatoxins—varies among countries, and so do the regulatory measures put in place to protect consumers and ensure fair practices in food trade. According to FAO (2004), by the end of 2003, approximately 100 countries had developed specific limits for mycotoxins in foodstuffs and feedstuffs. Those limits vary among regions/countries. For example, in the case of aflatoxins, some countries established limits for aflatoxin B1, whereas others are basing their regulations on limits for total aflatoxin content (resulting from the sum of aflatoxins B1, B2, G1, and G2¹); sometimes these limits are in combination with a specific limit for aflatoxin B1, as in the European Union. The Codex Alimentarius Commission has set levels for total aflatoxins at 15 ppb.²

Box 1. Aflatoxins as a Human and Animal Health Hazard

Aflatoxins are toxic metabolites produced by certain fungi in or on foods and feeds. The first outbreak known to have been caused by aflatoxins occurred in 1960 when more than 100,000 young turkeys on poultry farms in England died in the course of a few months, as a result of eating contaminated peanut meal. Speculations regarding the nature of the toxin suggested that it might be of fungal origin. In 1961, the toxin-producing fungus was identified as *Aspergillus flavus* and the toxin was given the name *aflatoxin*, by virtue of its origin (*A. flavus* → afla). Later on, a number of epidemiological studies demonstrated the carcinogenic effect of aflatoxins, especially B1. Thus, in 1988 the International Agency for Research on Cancer (IARC) placed aflatoxin B1 on the list of human carcinogens.

Contamination of groundnuts often occurs in the field prior to harvest. Postharvest contamination can occur if crop drying is delayed and during storage of the crop if water is allowed to exceed critical levels for mold growth. Insect or rodent infestations facilitate mold invasion during storage. Fungal growth and aflatoxin contamination are consequences of interactions among the fungus, the host, and the environment, although the precise factors that initiate toxin formation are not well understood. Water stress, high-temperature stress, and insect damage of the host plant are major determining factors in mold infestation and toxin production.

Box 1 (Continued)

Similarly, poor production practices, such as poor soil fertility, high crop densities, and weed competition, have been associated with increased mold growth and toxin production. Before harvest, aflatoxin contamination of peanuts is promoted by high temperatures, prolonged drought conditions, and high insect activity; postharvest production of aflatoxins is accelerated by warm temperatures and high humidity.

Source: Department of Animal Science, Cornell University 2004.

Setting mycotoxin regulations is a complex activity that involves many factors and interested parties, and therefore regulations are subject to disagreements among countries, particularly the countries supplying products to the European Union, where stricter standards are applied (see Table 2.1). After more than five years of discussions, the European Union established harmonized maximum levels for aflatoxins on July 16, 1998 (CR 1525/1998).³ The EU regulation was developed in parallel with the limits set in the *Codex Alimentarius*, which were adopted by the Codex Commission in 1999, following the recommendations of a risk assessment published by the FAO/WHO Joint Expert Committee on Food Additives and Contaminants (JECFA) in 1997.⁴

The EU harmonized maximum levels for aflatoxins have been a subject of controversy because of the higher levels of protection established by the regulation. It has been argued—and is still a matter of discussion—that the strict levels applied therein would not result in a significant reduction in health risk to consumers, yet would impose serious costs and/or technical difficulties on the suppliers that must achieve compliance with the regulation.⁵ There were, in fact, legitimate health concerns behind the EU decision to adopt regulations regarding aflatoxins, given the well-recognized carcinogenic effect of these toxins. However, there was also a need for harmonization, as many EU member states already had national regulations in place, although the degree to which those regulations were previously enforced remains unknown.⁶

Table 2.1 Maximum Levels of Aflatoxins Approved by the EU and Codex

Aflatoxins	B1 (µg/kg)	Sum of B1, B2, G1, and G2 (µg/kg)
EU maximum limits for groundnuts to be subjected to sorting, or other physical treatment, before human consumption or use as an ingredient in foodstuffs	8.0	15.0
EU maximum limit for groundnuts and nuts, and processed products thereof, intended for direct human consumption or use as an ingredient in foodstuffs	2.0	4.0
Codex maximum limit for peanuts intended for further processing (hereafter referred to as "Codex limit")	n/a	15.0

The EU notification to the Sanitary and Phytosanitary (SPS) Committee of its intention to set maximum limits for aflatoxin B1 and total aflatoxin in groundnuts, nuts, dried fruit, cereals, milk, and processed products was followed by a set of written submissions from several countries⁷ emphasizing the potential adverse economic impact if the proposed measures were adopted.⁸ As a result of the complaints raised by these countries, the European Union adjusted the proposed total aflatoxin levels for raw product intended for further processing in line with the levels recommended by Codex, but did not adjust the levels for product intended for direct consumption, which remained considerably lower than the Codex level established for unprocessed peanuts.⁹ In addition to the stringency of the maximum aflatoxin levels, the discussions have questioned EU methods of sampling and analysis for control of aflatoxins. Each individual subsample of groundnuts for direct consumption must comply with the standard for maximum levels of aflatoxins. In the case of groundnuts for further processing, the average of the subsamples must conform to the maximum levels.¹⁰

According to Moonen (2004), the criticisms about the stringency of the aflatoxin standards extend also to the maximum levels set by Codex, as the recommendations resulting from the risk assessment carried out by JECFA compared two relatively low levels (10 ppb and 20 ppb). Critics argued that the developing-country perspective—that such levels would be very challenging to achieve and would not greatly reduce risk—was not considered during the process of setting the Codex international standard. Although the disagreements about the legitimacy of the stringent levels set by the EU regulation remain, the focus of this paper is not to air or resolve these concerns, but rather to contribute to the understanding of the effects of these regulations on the trade of developing (and especially African) countries.

Several attempts have been made to evaluate the trade impacts of the EU harmonized aflatoxin regulations. However, the studies most often cited are those by Otsuki et al. (2001a, 2001b). The assumptions made in these studies have been the subject of discussion and criticism; consequently, so have the study results.¹¹ As noted in Section 1, Otsuki et al. predicted large losses for Africa's trade in cereals, nuts, and dried fruit to Europe as a result of the European Union's adoption of mycotoxin standards more stringent than those set by Codex. Now that we have the benefit of hindsight, as well as six years of experience with the implementation of the new, stricter standards, it is possible to examine and, to some degree, to quantify the varied effects of those standards.

2.2 Selected Direct Impacts of the Aflatoxin Standards: Consignment Interceptions and Transaction Costs

Following the regulatory developments concerning aflatoxins that occurred in the late 1990s, further steps have been taken by the EU authorities to improve food/feed safety among member states. Table 2.2 summarizes several regulatory developments that relate, either directly or indirectly, to the control of aflatoxin contamination on feed and food.

Objective	Regulations/Description
Provision setting maximum levels of aflatoxins	The aflatoxin maximum levels (aflatoxins B1, B2, G1, G2, and M1), originally laid down in Commission Regulation (EC) No. 1525/1998, were maintained in effect from April 2002 by regulation EC 466/2001 and replaced by EC 1881/2006, whereby the maximum levels for aflatoxins remained in force.
Provisions for methods of sampling and analysis for the official control of aflatoxins	Provisions for methods of sampling and analysis for the official control of aflatoxins were laid down in Commission Directive 98/53/EC of July 16, 1998. This directive was replaced fairly recently by Regulation (EC) No. 401/2006, which unifies, in a single document, the sampling procedures and analyses for mycotoxins, including aflatoxins.
Specific provisions on groundnut and groundnut products originating in or consigned from Egypt and China ^a	Commission Decision 2000/49/EC, promulgated in 1999, and Commission Decision 2002/79/EC, of 2002, were amended by Commission Decision 2004/49/EC of 2004 and later replaced by Commission Decision 2006/504/EC, which unified the special provisions governing various foodstuffs.
Official controls performed to ensure the verification of compliance with feed and food law, animal health, and animal welfare rules	Commission Regulation (CE) No. 882/2004 ^b introduces the concept of risk-based controls: "frequency of official controls should be regular and proportional to the risk." Member states should have elaborated a control plan based on risk by the second half of 2007.
Guidance document for the competent authorities for control and compliance with EU legislation on aflatoxins	This document is also applicable to the control of aflatoxins in food products not subject to Commission Decision 2006/504/EC.
<p>^a These provisions detail the specific frequency of sampling and specify that analysis must be done immediately before the product leaves the dispatching port; they also specify that documentary evidence from the national authorities must accompany each consignment. This documentary evidence indicates the conditions of production, sorting, handling, processing, packing, and so on, as well as the results of the laboratory analysis.</p> <p>^b Discussions within the EU authorities with regard to the framework for the implementation of this rule are under way; but the list of at-risk products has not yet been discussed. The European Union has issued a guidance document for the competent authorities for the control of and compliance with EU legislation on aflatoxins, which interpret some of the provisions established in Regulation 882/2004.</p>	

A crucial step in the enforcement of EU safety regulations was taken in 2001 with official enforcement of the Rapid Alert System for Food and Feed (RASFF); this system had actually been in place since 1979, but a legal basis for its enforcement was provided by Regulation EC/178/2002.¹² The system requires mandatory notification of any direct or indirect risk to human health, animal health, or the environment within a network consisting of national

competent authorities, the European Food Safety Authority (EFSA), and the European Commission.

Although the European Commission publishes a weekly overview of product interceptions or “notifications,” this overview includes information only about the intervening country, the country of origin, the product, and the type of hazard. However, the Commission also maintains a database that includes additional information. In the case of aflatoxins, specific data on results of laboratory analyses, the companies involved, and (in a less systematic way) the volume of the consignment specified in the notification are recorded. A detailed review of this information provides some insights into the direct impacts of the EU regulatory developments on the groundnut trade, as discussed in the following subsections. Of course, the confidentiality of company-specific issues is maintained.

Box 2. The EU Rapid Alert System for Food and Feed (RASFF)

The RASFF is primarily an information exchange tool concerning instances in which health risks have been identified and measures taken, such as the withholding, recall, seizure, or rejection of products. It allows network members to identify immediately whether a specific problem affects them and to take measures to ensure consumer safety. Whenever a member of the network receives information relating to the existence of a serious direct or indirect risk to human health, this information is immediately transmitted to the Commission under the RASFF. The Commission immediately sends this information to the members of the network. Under the rapid alert system, the member states notify the Commission of:

- (a) any measure they adopt that restricts the placement of product on the market, forces withdrawal of product from the market, or recalls product.
- (b) any recommendation or agreement with professional operators that is aimed, on a voluntary or obligatory basis, at preventing, limiting, or imposing specific conditions on market placement or the eventual use of food or feed, on account of a serious risk to human health requiring rapid action.
- (c) any rejection of a batch, container, or cargo of food or feed by a competent authority at a border post within the European Union, when that rejection is related to a direct or indirect risk to human health.

To assist the members of the network, information is classified under two different headings:

1. **Alert Notifications**—These are sent when the food or feed presenting the risk is already in market distribution channels and immediate action is required. Alerts are triggered by the member state that detects the problem and initiates the relevant measures, such as withdrawal or recall.
2. **Information Notifications**—These concern a food or feed for which a risk has been identified, but regarding which the other members of the network do not have to take immediate action, because the product has not reached their market. These notifications mostly concern food and feed consignments that have been tested and rejected at the external borders of the EU.

2.2.1 Aflatoxins: A Recurrent Safety Problem in EU Imports

During the period 1997 to 2006, the RASFF reported a total of 14,293 notifications, of which 30 percent concerned mycotoxins. Aflatoxins were consistently reported as the most recurrent mycotoxin problem, representing almost 95 percent of the notifications concerning mycotoxins and 28 percent of total food product notifications received during this period (see Annex 6). The notifications on nuts, nut products, and snacks constituted about 28 percent of the total notifications received during 1999–2006. Hence, the issue of aflatoxins in nuts and nut products features prominently among the food safety problems highlighted by the EU’s RASFF system.

Within the nut product category, the most recurrent notifications have related to contaminated pistachios, groundnuts, and hazelnuts (Table 2.3). The number of notifications concerning groundnuts and groundnut products has increased continuously since the late 1990s, reflecting enhanced enforcement of the Community’s harmonized tolerance levels for aflatoxins. Virtually all of the European Union’s interceptions of groundnuts and groundnut products have occurred on entry borders and involved “information notifications.” Despite the growing number of groundnut (product) consignments that have been intercepted (and “notified”), as will be highlighted later, the volume of trade directly affected by such interceptions is very small and pales in significance compared with the volume and value growth of the EU import trade.

2.2.2 Countries Affected by Notifications

Reflecting their larger shares of the European groundnut import market, China and Argentina collectively accounted for slightly less than half of all the EU authorities’ notifications for groundnut products during 1999–2006 (Figure 2.1). China alone accounted for nearly one-third of all the interceptions. China faces ongoing challenges in managing the risk of aflatoxin contamination. As a result of past difficulties, groundnut products originating in or consigned from China are subject to special provisions,

Table 2.3 Number of Notifications Concerning Nuts and Nut Products and Snacks

	Total	Pistachios	Groundnuts	Hazelnuts	Almonds	Brazil nuts
2006	683	275	254	84	44	2
2005	825	498	217	63	33	6
2004	769	535	185	24	15	4
2003	722	508	132	55	4	17
2002	248	77	50	62	4	48
2001	150	73	49	4	1	21
2000	90	43	37	3	1	4
1999	74	37	28	2	6	1
1998	40	17	20		1	2

Source: The RASFF.

Figure 2.1 Percentage of Notifications Concerning Groundnuts by Country (1999–2006)

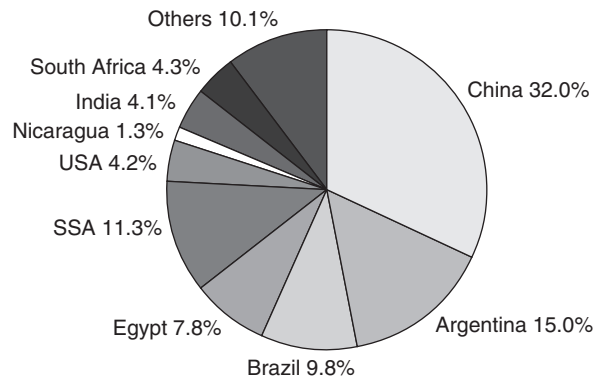


Figure 2.2 Groundnut Exports from Argentina to the EU (000 Mt)



Source: Data provided by the Argentina Peanut Chamber, 2007.

including a higher frequency of testing of consignment samples. Hence, regulatory oversight by EU authorities is stricter for Chinese products—and for Egyptian products, for which there are also special provisions—than for groundnut products from other origins. Argentina’s rapidly increased sales to the European Union in recent years have been accompanied by an increased number of consignment interceptions, although only a very small proportion of consignments have been affected (Figure 2.2). In 2006, there was also a sharp increase in the number of intercepted consignments of groundnuts from the United States (Figure 2.3). Aflatoxin contamination was apparently associated with adverse weather conditions in certain U.S. growing areas.

While accounting for only 4 percent of EU groundnut (product) import value, SSA accounted for 11 percent of the information notifications for these products over the years 1999 to 2006. The majority of these interceptions concerned products from Ghana and Sudan, although some consignments from South Africa, Malawi, and Uganda were also affected. Nearly all of the affected consignments from Ghana were of processed products, especially

Figure 2.3 Number of Notifications on Groundnuts and Groundnut Products for the Main EU Suppliers

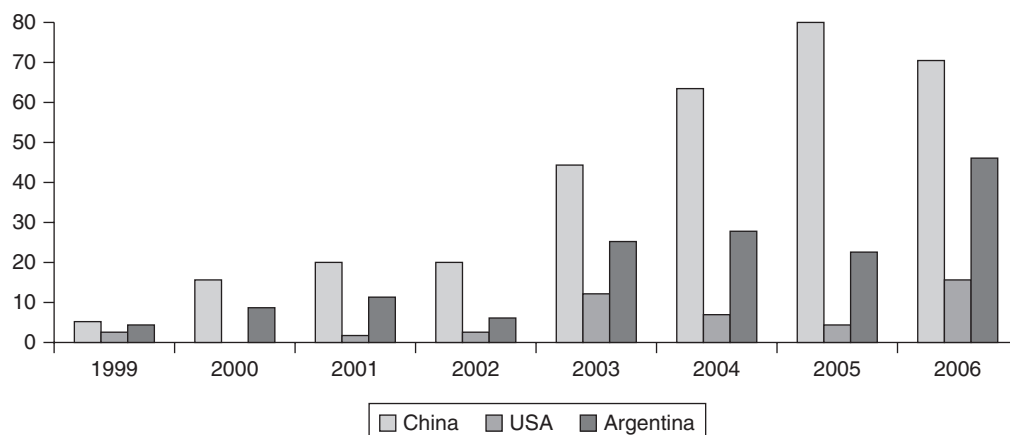
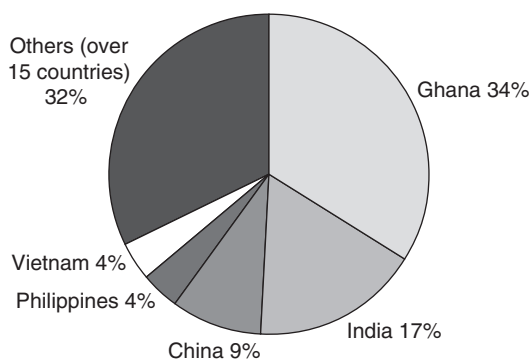


Figure 2.4 Percentage of Notifications per Country: Categories Peanut Butter and Prepared Groundnuts



Source: The RASFF.

peanut butter and paste. Ghana alone accounted for nearly 60 percent of all EU interceptions of peanut butter consignments (and one-third of interceptions of all prepared products combined) over the 1999–2006 period (Figure 2.4).

2.3 Economic Losses Associated with Intercepted Trade

If large economic losses have resulted, as some claim, from enforcement of the new, more stringent EU standards and regulations, one should be able to discern the levels of loss, and the countries that suffered them, from the data on products found unacceptable for the EU market.

2.3.1 Proportion of Trade Intercepted for Violative Aflatoxin Levels

A detailed review of the volume of groundnuts and groundnut products intercepted because of violative levels of aflatoxins during the period 2004–2006—which accounts for nearly 70 percent of the total notifications

recorded for these products since 1999—suggests that overall adverse direct effects of the aflatoxin regulations on developing-country exports to the EU, as measured by the proportion of the trade intercepted by notifications, have been very small.¹³ For raw groundnuts (shelled and in-shell),¹⁴ the volume of trade intercepted during 2004–2006 was slightly more than 10,500 tons, representing about 0.5 percent of the overall volume of that trade for that period. Notifications for peanut butter and other prepared groundnut products affected just 128 tons of product. Although the volume of trade affected is small, an increase did occur from year to year.¹⁵ In 2004, a total of 2,828 tons were intercepted, representing an estimated value of US\$2.7 million, or about 0.5 percent of the total EU import value of raw groundnuts for that year. In 2005, this amount reached 3,321 tons, representing US\$3 million and approximately 0.54 percent of total EU import value of raw groundnuts. In 2006, the total volume affected by notifications reached 4,418 tons (Table 2.4).¹⁶

In terms of countries affected, China and Argentina collectively accounted for 56 percent of the total quantity intercepted during the period. As mentioned before, in 2006, notifications concerning product from Argentina and the United States increased considerably, as compared to 2005; in the case of Argentina, the intercepted trade more than doubled, from 469 tons in 2005 to 1,187 tons in 2006. Still, for the major EU suppliers—Argentina,

Table 2.4 Intercepted Trade of Shelled and In-Shell Groundnuts—Percentages per Country

	2004	2005	2006
Metric tons	2,827.90	3,321.70	4,418
Million dollars	2.7	3.1	*
	%	%	%
Argentina	19.4	14.1	26.6
China	39.6	39.6	27.7
USA	3.8	1.3	11.1
Brazil	5.5	24.2	14.3
India	6.9	0.0	0.0
Egypt	6.6	6.4	5.1
Nicaragua	7.0	0.6	0.0
Israel	1.4	1.6	2.5
S. Africa	0.0	3.8	2.4
Sudan	8.3	3.3	6.0
Malawi	0.0	1.7	0.7

Source: Data from the RASFF.

Volume involved in notifications of prepared groundnuts and peanut butter is not included.

*Estimations of the value of the volume rejected in 2006 were not possible because of the lack of consistent trade data for that year.

	2004	2005	Increase in imports in imports 2004– 2005 (%)	2004	2005
	Trade intercepted as % of total imports	Trade intercepted as % of total imports		Value of intercepted trade (US\$000)	Value of intercepted trade (US\$000)
EU Total Imports	0.5	0.5	6.3	2,727.8	3,161.7
Argentina	0.3	0.2	20.7	539.3	421.4
China	0.8	0.8	4.3	1,040.4	1,149.0
USA	0.1	0.1	–26.8	110.2	42.7
Brazil	0.5	1.9	52.9	131.5	690.1
India	0.5	0.0	–54.3	138.1	0.7
Egypt	2.1	1.8	13.4	262.2	256.6
Nicaragua	1.9	0.1	49.7	166.9	18.6
S. Africa*	None	1.1	75.3	None	130.9
Sudan	21.3	5.7	81.4	217.0	104.4
Malawi*	None	42.0	–35.6	None	54.5

Source: Calculations based on RASFF and COMTRADE data.
*No notifications reported for the respective years.

China, and the United States—the trade intercepted for violative levels of aflatoxin in 2004 and 2005 represented less than 1 percent of the total EU import value per country (see Table 2.5). In the case of China, the country with the largest number of notifications, the value of its intercepted trade reached only US\$1 million each year. For Sudan and Malawi, in contrast, intercepted trade represented a significant percentage of their comparatively small levels of trade. Remarkably, Sudan accounted for 8 percent of the volume of intercepted trade in 2004, a year in which its market share was only 0.2 percent.

As illustrated in Table 2.6, widely varying patterns are observed among different suppliers in terms of the proportion and value of their groundnut product trade affected by EU authority interceptions in 2004 and 2005. The table also shows that there may be significant shifts in these results from year to year, possibly associated with weather conditions, improvements (or breakdowns) in postharvest and supply-chain measures to control aflatoxin, the effectiveness of pre-export screening and testing, and the frequency of sampling and testing of product entering the European Union.

When analyzing SSA as a whole, one sees that the proportion of EU imports from the region affected by notifications represented 1.3 percent of the total EU imports from this region during 2004–2005 (an amount equal to US\$535,000). Still, the direct impacts of the regulations, as measured by the

Table 2.6 Value of EU Raw Groundnut Imports from SSA Countries Intercepted for Violative Aflatoxin Levels

Country	2004 (US\$000)	Value of affected imports (US\$000)	%	2005 (US\$000)	Value of affected imports (US\$000)	%
Ghana	8,837	0		5,387	1.9	0.03
The Gambia	850	0		2,000	0.0	
Malawi	201	0		130	54.5	42.0
Sudan	1,017	217.0	21.3	1,845	104.4	5.7
Senegal	175	0		183	0.0	
South Africa	6,982	0		12,352	130.9	1.1
Zambia	4	0		20	0.0	
Total	18,066	217.0	1.2	21,917	291.7	1.5

Source: Calculations based on RASFF and COMTRADE data.

proportion of intercepted trade, vary sharply among countries within the region. For example, the EU groundnut imports from Ghana (shelled/in-shell) in 2004 were nearly seven times higher than imports from Sudan. Although there were no interceptions of raw groundnuts from Ghana that year, interceptions of consignments from Sudan were equivalent to 21 percent of that country's realized exports for 2004. A similar contrast in experience occurred in 2005, suggesting either differences in industry capacity to meet the EU standards or sharp differences in actual oversight of traded products.

When analyzing the direct impacts of the EU regulations on groundnut trade, it is important to consider that interruption of a consignment does not necessarily mean full economic loss for the business operators. According to the EU legislation (Regulation (EC) No. 882/2004), EU authorities can apply different measures to deal with products already imported or, at external borders, found to be in noncompliance with aflatoxin maximum levels. For product rejected at an external border, the EU authorities can: (1) order *destruction* of the consignment; (2) authorize *special treatment* (treatment or processing to bring the food into line with the requirements of Community law, or with the requirements of a third country of re-dispatch, or processing in any other suitable manner for purposes other than animal or human consumption); (3) permit *re-dispatch* of the product to outside the Community;¹⁷ or (4) take other appropriate measures, such as *use of the product for purposes other than that originally intended*.¹⁸ Although this regulation came into effect in January 2006, a review of the notifications during the period 2004–2006 indicates that the EU authorities were exercising these options even before the effective date of the regulation, as illustrated in Table 2.7.

Measure	Mt	%
Destroyed	372	3.5
Blocked	404	3.8
Physical treatment	4,222	39.7
Destination changed	669	6.3
Not determined	548	5.2
Re-dispatched	4,273	40.2
Returned to dispatcher	143	1.3
Product recall or withdrawal	66	0.6

Data include also volume involved in notifications concerning peanut butter and preparations, and all the alert and information notifications.
Source: The RASFF.

Thus, the review of the notifications during the period 2004–2006 indicates that only 3.5 percent of the trade intercepted for raw groundnuts involved full economic loss resulting from destruction of consignments (see Table 2.7). In terms of trade value, destruction of product for the period 2004–2005 was estimated at only US\$230,000 for product *from all sources*. In fact, most of the consignments found in noncompliance (80 percent of total volume intercepted) were either re-dispatched/returned to the dispatcher or underwent physical treatment. For 6 percent of the volume intercepted, the measure applied was “change of destination” (meaning a use different from that originally intended¹⁹). About 4 percent of the volume intercepted was blocked, but no further action was specified in the notifications. Similarly, notifications not specifying the action to be taken constituted 5 percent of the volume intercepted. In contrast, in the case of peanut butter and prepared groundnuts, 74 percent of the 128 tons affected by notifications was destroyed.

2.3.2 Costs Associated with Measures Taken with Consignments Found in Noncompliance

Physical treatment includes blanching and/or sorting. *Blanching* consists of removing the reddish skin covering the groundnut kernels; although the purpose of this treatment is not specifically to reduce aflatoxin contamination, a considerable reduction nonetheless occurs.²⁰ About 40 percent of the trade intercepted during the period 2004–2006 underwent physical treatment (Table 2.8). Estimates for the years 2004 and 2005 indicate that the value of the product receiving physical treatment was about US\$2 million. Thus, assuming that the physical treatments were successful in reducing aflatoxin to acceptable levels—thereby allowing the products to keep their value in the EU market as edible groundnuts—the direct effects of the EU regulation, in terms of the economic losses from trade intercepted, are only about US\$3.7 million for the period 2004–2005 (see Table 2.8).

	2004	2005	Total
Value of product found in noncompliance (US\$ 000)	2,727	3,161	5,889
Volume undergoing physical treatment (Mt)	767	1,563	2,330
Value of product undergoing physical treatment	736	1,438	2,175
Other measures applied—value of the product (US\$ 000)			3,714

Data also include volume involved in notifications concerning peanut butter and preparations, and all the alert and information notifications.
Source: Calculations based on RASFF and COMTRADE data.

Regarding the options available for individual countries, the data suggest that there were few possibilities for physical treatment of product intercepted from China and Egypt. Only 8 percent of the product intercepted from China, and none from Egypt, underwent physical treatment (see Table 2.9). Thus, affected suppliers from those countries are generally unable to maintain the value of groundnuts for direct consumption within the EU market.

However, the data seem to suggest that the country of origin is not the determinant as to the type of measures to be applied, but rather the country where the noncompliance is observed. Physical treatment was the measure applied in about 28 percent of the total notifications reported during the

	Physical treatment	Re-dispatched/ returned to dispatcher	Destination changed	Destroyed	Product recall or withdrawal	Blocked	ND*
Argentina	60.0	18.0	13.0				9.0
China	7.7	73.5	3.7	1.5		6.5	6.7
Brazil	79.6	17.0	1.6				1.2
Egypt		83.5		5.9			10.3
USA	34.0	37.0	4.3	17.0	7.0		
Nicaragua	50.0				40.0	10.0	
Sudan	100.0						
South Africa	85.3	7.6	7.0				
Malawi	15.5	20.3	42.5			21.3	

Source: The RASFF.
*ND: not determined.

period 2004–2006, yet 97 percent of those notifications (for which physical treatment was applied) were issued by the Netherlands. Apparently, the food business operators, as well as the competent authorities in the Netherlands, are more inclined to opt for physical treatment for noncompliant consignments, as compared with food business operators and competent authorities in other member states; this may in part be due to the availability of facilities close to the port that can perform the treatment.

Only about 13 percent of notifications concerning product from China and 2 percent concerning product from Egypt were issued by the Netherlands (Table 2.10). In contrast, countries with the majority of their notifications issued by the Netherlands, such as Argentina (60 percent), Brazil (80 percent), Sudan (100 percent), and South Africa (85 percent), have benefited the most from the possibilities provided by physical treatment, given that a significant percentage of their intercepted trade can be traded in the EU market for its intended initial use. In the case of SSA countries, for example, from a total of 949 tons of raw groundnuts intercepted during 2004–2006, some 87 percent underwent physical treatment and were then sold. In the case of Malawi, an important percentage of the intercepted trade was sold in the EU market for a use different from that initially intended (probably as bird feed), and was therefore subject to price discounts. Thus, these data indicate that the direct trade effects for the SSA region have been exceedingly low.

Most recently, the European Union has provided new directions regarding the enforcement of aflatoxin regulations, through Commission Decision 2006/504/EC, which imposes special provisions on imports of certain foodstuffs from certain countries. In the case of groundnuts and groundnut products, the regulation specifically affects exports from China and Egypt.²¹ According to the

Table 2.10 Leading EU Countries Issuing Notifications on Groundnuts and Groundnut Products during 2004–2005

Country notified	Total notifications	Italy	Germany	Spain	UK	Netherlands	France	Greece	Other EU countries
Total	656	63	48	25	144	236	33	49	58
China	208	8	38	21	21	27	33	33	27
Egypt	47	29	2			1		12	3
Argentina	94	2	7		2	79		3	1
Brazil	65	7		1		53			4
Sudan	27					27			0
S. Africa	14					13			1
Nicaragua	10				2	8			0
India	38				30	1		1	6
Malawi	7				5	2			0
Ghana	47			1	46				0

Source: The RASFF.

latest “Guidance Document for the Competent Authorities for the Control and Compliance with EU Legislation on Aflatoxins”—which provides guidance as to application of Regulation 2006/504/EC²²—the possibility for sorting and physical treatment, in case of noncompliance, is limited to consignments with levels above the EU standard, but below the highest worldwide level established for aflatoxin B1 (20 µg/kg) and total aflatoxins (35 µg/kg).²³ Consignments with levels above those cannot be re-dispatched without any control, and appropriate measures must be taken to protect human or animal health.²⁴ Although it is not clear how these recommendations will be enforced, the impact could be significant for certain suppliers, particularly if, in practice, the application of the regulation extends to cover exports from other destination countries, rather than groundnuts and groundnut products from China and Egypt only.²⁵ Theoretically, if such provisions had applied in 2004–2006, some 2,000 tons of product would not have been permitted to be physically treated and then sold for direct consumption. This represents 49 percent of the volume of product that was treated. African countries could well be affected, given the fact that a significant percentage of their notifications have been rendered for aflatoxin levels above 35 ppb (see below).

Adverse direct effects of the EU aflatoxin regulations also relate to the costs associated with the measures taken with consignments found to be in noncompliance.²⁶ In the case of physical treatment, for example, many factors influence these costs, including the size of the consignment, local costs of transportation, costs of laboratory analysis, and so on. An attempt to estimate these costs is presented in Table 2.11. Estimates for the years 2004 and 2005 suggest treatment costs of just under half a million dollars for product with a market value of some US\$2 million. Suppliers from certain countries—especially China and Egypt—also incur nontrivial transaction costs in relation to intercepted consignments that are either re-dispatched to third countries or returned to the country of origin. Extra shipping costs would always be incurred, and the values of subsequent transactions are most certainly lower than originally anticipated. Nevertheless, although treatment and transaction costs certainly have a bearing on the profitability of individual companies, these costs are very small in the context of the overall groundnut product trade, and are almost certainly much lower than the normal level of price discounts imposed by buyers in this trade for quality-related shortcomings.

2.3.3 Overall Direct Effects of EU Regulations on Intercepted Trade

Overall, the adverse *direct* effects of the aflatoxin regulations on developing-country exports to the EU—as measured by the proportion of the trade intercepted—have been very modest: about 0.5 percent of the total EU imports in 2004 and 2005. The lack of consistent data does not allow an extension of the estimate to cover the entire period during which the EU harmonized level has been in place. However, analysis of nearly 70 percent of the notifications indicates that just over 10,500 tons were involved in notifications during the period 2004–2006. By extrapolating, one could expect that the total trade intercepted during the period 1999–2006 would be approximately 13,000 to 15,000 tons, which is still relatively small, considering that the total EU imports during the period 1999–2005 (2006 data are incomplete) were

Item	Euro	Approx. US\$
Transport from port arrival to processing plant	34	47
Warehouse rent	4.5	6
Cost of electronic sorting only		
Big bags	90	124
25-kg bags	120	165
Cost of electronic sorting + blanching		
Big bags	105	144
25-kg bags	130	178
Estimated cost/ton of sorting big bags		
Big bags	129	176
25-kg bags	159	218
Estimated cost of blanching/sorting, 25-kg bags		
Big bags	144	197
25-kg bags	168.5	231
Additional costs:		
Custom clearance costs: €100 per consignment of approx. 20 Mt		
Laboratory analysis per consignment approx. US\$250		
<i>Source:</i> Calculations made on data provided by a company performing the treatment in the Netherlands (2007).		

estimated at 3 million tons of raw groundnuts and about 690,000 tons of prepared groundnuts.

If one uses as a reference the overall EU import value per ton in 2005, the estimated total value of intercepted trade would have been about US\$13–15 million, equivalent to less than 0.45 percent of the total value imported by the European Union during the period. In addition, given the fact that a significant percentage of intercepted trade can and has been sold in the EU market as edible groundnuts after undergoing physical treatment, or for other purposes (bird feed, crushing, etc.), or as edible groundnuts in non-EU markets, one could expect, after allowing for the transaction costs associated with the measures taken, that the overall economic losses would be much lower than the US\$15 million hypothetical figure estimated here.

For the SSA region, the apparent direct effects of the regulations are also small: only 1.3 percent of total EU imports during 2004–2005 were from this region. The analysis of 61 percent of the notifications on raw groundnuts concerning SSA product indicates that a little more than 949 tons was intercepted during the period 2004–2006. By extrapolation, the total volume affected during the period 1999–2006 may have been about 1,600 tons, with an estimated value of US\$1.2 to 1.5 million. Considering the region's aggregated sales to Europe over the 1999 to 2005 period—US\$163 million—the affected trade appears

SSA	Interceptions (Mt)	Value (\$US)
Volume intercepted	949.3	873,356
Physical treatment*	827.57	794,467
Cost of physical treatment (for 827.57 tons)		206,893
Value of treated groundnuts		587,575
Overall value re-dispatched or used for other purposes		285,781

Source: Calculations based on RASFF and COMTRADE data.
 * For these estimates, it was assumed that the reduction to accepted levels is achieved on 100 percent of the product treated.
^aThe overall EU import value for per ton in 2005 was used to calculate the value of the intercepted trade in 2006.

rather insignificant. Taking into account that a large percentage of the volume intercepted underwent physical treatment, the value of “lost” trade becomes even less significant. Table 2.12 presents a hypothetical estimation of the value of the SSA trade affected by notifications, after physical treatment has been applied.

This analysis suggests a direct loss of trade or financial cost associated with treatment amounting to a few hundred thousand dollars for SSA. Although there may certainly be some further reductions in revenue—for example, associated with African firms having to shift their commercial strategy from exports to domestic sales, because of concerns about inability to comply with EU standards—the magnitude of losses involved has certainly been a tiny fraction of those predicted or estimated in the gravity model of Otsuki et al. (2001a, 2001b). As will be highlighted later, African suppliers would have benefited little had the EU adopted the Codex standards for aflatoxin; in reality, the vast majority of rejected African consignments would also have been noncompliant with Codex (or any other prevailing) standards. Instead, Africa’s competitors seem to have been more adversely affected by the EU’s more stringent standard.

2.4 Would Exporting Countries Have Been Better Off if the EU Had Adopted Codex Standards?

Recall the argument made by Otsuki et al. (2001a, 2001b) that, all other things being equal, African (and other developing) countries would experience a considerable loss in groundnut trade to the European Union because of the Community’s adoption of very stringent standards for aflatoxin as its harmonized tolerance level. The argument is that the Codex standard adequately protects human health, and that application of the Codex standard by the European Union would enable a significant expansion of groundnut trade over and above that which would occur in the context of the more stringent standards.

To test this assertion an analysis was undertaken, based on the available data, of the aflatoxin levels found in the consignments that were subjected to EU notifications or interceptions during the period 2000–2006. The notified/intercepted consignments have been classified into various categories related to the measure of total aflatoxins in the tested samples: (1) above the EU standard of 4 ppb, yet below the Codex standard of 15 ppb; (2) between 15 ppb and 50 ppb; (3) between 50 ppb and 100 ppb; and (4) above 100 ppb.

The results of this analysis are striking (Table 2.13). For example:

- Over the 2000–2006 period, 52 percent of the notified/intercepted consignments of groundnuts/groundnut products had aflatoxin readings exceeding the Codex standard. Half of these—26 percent of all intercepted consignments—had total aflatoxin levels above 50 ppb.
- Enormous differences are observed between countries. The United States, Argentina, and Brazil seem to have been most adversely affected by the more stringent EU standards. Some 71 percent of U.S. consignment notifications and 63 percent of notifications involving the other two countries had aflatoxin levels in compliance with Codex standards. That is, some two-thirds of these interceptions would not have taken place had the EU enforced the Codex standard. Some considerable savings in product treatment costs could have been made by suppliers from these countries.
- For China, about half of its intercepted consignments over the 2000–2006 period would have been compliant with the Codex standard. For another set of countries—Egypt, Nicaragua, India, and South Africa—only about one-third of intercepted consignments would have been compliant with the Codex standard. For two countries (Egypt and India), more than half of the intercepted consignments had very high aflatoxin readings, above 50 ppb.
- Sub-Saharan Africa fares the worst in this analysis. Some 83 percent of the region's intercepted consignments over the 2000–2006 period would have been noncompliant with the Codex standard. None of the intercepted consignments from Malawi, Uganda, or Zimbabwe would have met the Codex standard, and the majority of intercepted Ghanaian consignments had aflatoxin levels above 50 ppb.

Ideally, an analysis of the expected trade benefits of application of the Codex standard by EU authorities should entail not only consideration of the aflatoxin tolerance level accepted by the international standard,²⁷ but also the approved Codex sampling procedures and analysis. For example, under Codex, compliance is achieved on the basis of the average results of the three subsamples analyzed. Unfortunately, the data reported by the RASFF system are incomplete, and therefore this approach could not be taken for the analysis of all notifications.²⁸ A summary of the analysis of the available data is provided in Box 3.

Conclusively, the analysis of the levels of total aflatoxins recorded by the notifications indicates that, overall, exporting countries would face difficulties in providing safety assurance even if the Codex standard were to be applied. Though there could be reduction of intercepted product and associated transaction costs, application of the less stringent Codex standard would primarily benefit those

Table 2.13 Notifications on Groundnut and Groundnut Products Reporting Levels above the Codex Standard (2000–2006)^a

<i>Countries with less than 50 percent of the notifications reporting levels above those established by Codex</i>									
	Total notifications	% above Codex (<15 ppb)	>15 but <50 ppb (%)	>50 but <100 ppb (%)	>100 but <300 ppb (%)	>300 ppb (%)			
USA	38	28.9	100.0						
Argentina	141	36.2	90.2	3.9	5.9				
Brazil	75	37.2	78.6	14.3	3.6	3.6			
<i>Countries with 50–70 percent of the notifications reporting levels above those established by Codex</i>									
	Total notifications	% above Codex	>15 but <50 ppb (%)	>50 but <100 ppb (%)	>100 but <300 ppb (%)	>300 ppb (%)			
China	306	50.7	65.8	22.6	9.0	2.6			
Egypt	82	63.4	44.2	30.8	17.3	9.6			
Nicaragua	13	69.2	77.8	22.2					
India	38	68.4	42.3	26.9	19.2	11.5			
South Africa	41	65.9	85.2	14.8					
<i>Countries with more than 70 percent of the notifications reporting levels above those established by Codex</i>									
	Total notifications	% above Codex	>15 but <50 ppb (%)	>50 but <100 ppb (%)	>100 but <300 ppb (%)	>300 ppb (%)			
Ghana	51	74.5	28.9	34.2	34.2	2.6			
Sudan	28	78.6	63.6	36.4					
Malawi	7	100.0	83.3	33.3					
Uganda	2	100.0			100.0				
Zimbabwe	3	100.0	33.3	33.3	33.3				

Source: The RASFF.

Ghana notifications concerned mainly peanut butter and preparations.

^aThe lack of consistency in the way the product category is recorded in the notifications makes it difficult to understand whether the product is intended for further processing or for direct consumption, and, therefore, the maximum levels applied. For example, product is reported as: "in peanuts," "in groundnuts," "in shell peanuts," "shelled peanuts," "in groundnut kernels," "kernels," etc. The review of the notifications for 2004–2006 indicated that the lowest maximum levels were applied in most of the cases (2 ppb for B1 and 4 ppb for total aflatoxins). Therefore, it would appear that the product rejected was intended for direct human consumption. However, in some cases they include raw product as well as prepared groundnuts and butter. Thus, it is not clear from the data under what circumstances the EU authorities applied the upper levels for product intended for further processing before human consumption. These circumstances led to complaints being filed by exporters against the European Union, but there has yet to be any resolution of these cases.

countries and suppliers that have effectively implemented systems to prevent and control aflatoxin along the supply chain and that have developed other competitive advantages in the groundnut product trade.

Box 3. Compliance Based on the Averaged Results of the Three Subsamples Analyzed

Some of the preliminary predictions forecast that, under the EU sampling plan, up to 75 percent of the lots rejected would be “good lots.”²⁹ Although the lack of data does not allow one to draw generalized conclusions, the analysis of the maximum limits resulting from the average of the subsamples taken indicates that about 42 percent of the notifications recorded average levels of aflatoxin above the Codex limit, with notifications from SSA countries consistently recording average levels above the Codex limit (see Table 2.14).

It is apparent that several countries, including Egypt, China, and South Africa, would benefit the most if EU authorities would apply the Codex limit based on the average results of the three subsamples taken. In the case of Egypt, only 32 percent of its intercepted consignments would have been noncompliant with the Codex standard if average readings were taken from multiple samples. In contrast, 63 percent of its notified consignments had single readings above the Codex standard. For China, the respective figures are 34 percent and 51 percent. For SSA countries other than South Africa, it appears that the standard applied would not make much difference. Whether on the basis of single or multiple samples, their typical levels of aflatoxin generally far exceed the Codex standard. Although certain countries can accurately claim that they face a compliance problem with regard to the EU standards, several African industries simply face a major challenge in managing aflatoxin contamination in their supply chains.

Table 2.14 Notifications on Groundnuts and Groundnut Products Presenting Average Levels of Aflatoxins above the Codex Levels (2000–2006)

Notified country	Total notifications	% of notifications reporting results for more than 1 sample	% of notifications above Codex level (average of samples)
Total notifications	924	35	42.5
China	306	44	34.1
Argentina	141	16	56.5
India	38	37	64.3
Egypt	82	45	32.4
Brazil	75	35	34.6
South Africa	41	10	25.0
Ghana	51	10	80.0
Sudan	28	61	82.4
Malawi	7	43	66.7
Uganda	2	50	100.0

Source: The RASFF³⁰.

2.5 Indirect Effects of the EU Regulation: Trade Intercepted in the Exporting Country

Overall estimates of the proportion of global and country trade intercepted by regulatory authorities are possible, to some extent, because of the availability of RASFF data. Still, it may also be that a sizable amount of trade does not occur because shipments are withheld before leaving the exporting country, when tested samples reveal violative levels of aflatoxins. Quantifying these interceptions is difficult because of the lack of official controls in several exporting countries, poor monitoring and reporting systems, and the confidentiality of the results of laboratory analyses performed by the certifying bodies.

Some indication of this halted or redirected trade can be gleaned from data available from a few countries. In Argentina, for example, some 8 percent of the samples analyzed by authorized laboratories during the period April 1, 2004 to March 31, 2005, were found to be noncompliant with the EU standards (European Commission 2005). Considering the overall quantity of Argentina's groundnut trade, these "failed tests" might relate to some 15,000 tons of saleable product. Still, product could have been re-directed to alternative markets that apply less strict levels, such as the United States and MERCOSUR country markets.³¹ Although the European Union is the most important destination for Argentine exports, accounting for some 70 percent of sales in recent years, Argentina's trade features remarkable market penetration, supplying some 67 different countries in 2006. The Argentine laboratory data suggest that the country's export control systems are working quite effectively, as only 0.5 percent of EU imports from Argentina are deemed to be noncompliant with EU requirements.

Table 2.15 presents the data reported by three laboratories providing services for aflatoxin analysis in China. Variations among percentages of compliance are apparent, perhaps reflecting variations in weather conditions within the regions/provinces and/or in the measures applied to prevent aflatoxin contamination during production and processing. The relatively low aggregate percentages found noncompliant may be the result of the recent regulatory developments to control aflatoxin levels in exports (discussed in Section 3). As with Argentina, China's groundnut trade has been successfully developed

Table 2.15 Percentage of Groundnut Samples Found in Noncompliance Analyzed by Different Labs in China

Testing Lab	Period	Total samples analyzed	# samples found in noncompliance	% found in noncompliance
Lab 1	2005	2124	25	1.2
	2006-Jan/June	152	12	7.9
Lab 2	2006	2012	37	1.8
Lab 3	2005	480	24	5.0
	2006-Jan/June	220	10	4.5

Source: European Commission 2006.

with numerous markets. In recent years, particular gains have been made in supplying the Russian market.

Some laboratory testing results are also available from Africa. According to the South African Department of Agriculture's Perishable Products Export Control Board (PPECB), during the period 1997 to 2006, the proportion of groundnut samples tested that exceeded the maximum EU limit fluctuated annually between 5 and 17 percent. Taking into account the volume of South Africa's trade over this period, perhaps 750 to 1,000 Mt of product per year would have been deemed unacceptable for export to the European Union. According to PPECB, unpredictable weather (mainly drought stress) has been the main factor causing higher aflatoxin levels in any given year.

In contrast, test results from Ghana show much higher rates of noncompliance. Of the 108 samples tested by the Food Research Institute of the Council for Scientific and Industrial Research (CSIR) during January 2005 to March 2007, nearly 29 percent did not comply with the EU requirements, with a large majority of the violative samples having very high aflatoxin levels (see Table 2.16).

Although the lack of systematic data does not allow broad conclusions, the high percentages of analyzed samples showing levels above the EU limits, reported by Ghana and to some extent also by South Africa, seem to highlight the comparative disadvantage of SSA producers/exporters in dealing with aflatoxin contamination. Constraints include severe weather conditions, shortcomings in input supply arrangements, poor cultivation practices, insufficient operations for crop storage and logistics, and lack of quality management practices.

Interviews with some importers in the Netherlands and the United Kingdom suggest that the EU aflatoxin regulations have brought important structural changes to the companies' procurement systems and relations with suppliers, as a way to mitigate commercial risk and reduce transaction costs. Hence, the capacities of countries/exporters to build reputation on the basis of compliance has become a key competitive factor in gaining access to and participation in this market. Once again, this factor contributes heavily to the marginalization of SSA exporters in relation to the EU market.

Table 2.16 Ghana: Percentage of Laboratory Groundnut Samples Reporting Levels above EU Standards

Year	None Detected (detection limit = 0.06 ppb)	Less than 4 ppb	5–15 ppb	16–30 ppb	More than 30 ppb	Total no. of samples
2005	14	27	3	1	18	63
2006	27	2	0	1	7	37
2007 (January– March)	6	1	0	1	0	8

Source: CSIR 2007 (according to information provided to the authors by the Council for Scientific and Industrial Research in 2007, the CSIR lab is not yet accredited to ISO 17025).

Notes

1. In 2003, 76 countries applied regulatory levels based on total aflatoxins. About 17 countries used 17 ppb, whereas the United States, for example, used a 20 ppb limit.
2. Codex Standard 209/1999, setting levels for aflatoxin in groundnuts, was revoked, but the contents of the standard itself appear in the Codex General Standard for Contaminants and Toxins in Foods (GSCTF), rev. 3, 2007. The sampling plan for aflatoxins in peanuts intended for further processing is also contained in the GSCTF. See http://www.codexalimentarius.net/download/standards/17/CXS_193e.pdf
3. The regulation entered into force on January 1, 1999.
4. The report is available at http://whqlibdoc.who.int/trs/WHO_TRS_884.pdf
5. The JECFA assessment estimated that where incidence of hepatitis B and C is low, reducing aflatoxin in food from 20 ppb to 10 ppb would reduce the risk of mortality by 2 deaths per 1 billion annually. Net importing nations have lower incidences of both diseases; thus, a strict standard would yield very little improvement in health outcomes.
6. Personal communications with exporters indicated that Malawian peanuts were subject to significant rejections at the beginning of the 1990s, which considerably affected the reputation of Malawian peanuts in the EU market.
7. Argentina, Australia, Brazil, The Gambia, India, Iran, Malaysia, New Zealand, Peru, Philippines, Senegal, South Africa, Thailand, Turkey, and the United States of America.
8. "Most countries felt that the timing of the EC's proposed regulations, coming just before the Codex Committee meeting, was inappropriate and that the European Commission should wait for Codex to set the requisite international standards. Many queried the scientific justification for the proposed measures, suggesting they were unduly harsh. Members suggested that the proposed sampling procedure was 'unduly costly,' 'burdensome' and 'unjust,' and would render the measure even more trade restrictive" (Henson et al. 2000).
9. The proposed levels for groundnuts subject to further treatment were 5 ppb for aflatoxin B1 and 10 ppb for total aflatoxin, but were adjusted to 8 ppb and 15 ppb, respectively.
10. Aggregate samples of 30 kg must be mixed and then divided into three equal subsamples of 10 kg each before grinding. Under Codex, only samples of 20 kg are required.
11. Some of the critics argued that the calculations in these studies were not based on actual aflatoxin concentrations in African crops nor volume of trade. Rather, it was assumed that African exports would decrease in log-linear form with tighter aflatoxin standards (Wu 2004). Similarly, the calculations were based on incorrect data. For example, the 1998 value of France's imports from Africa of dried fruit and nuts was recorded as US\$361.5 million, yet COMTRADE data indicate that raw groundnut total imports by France in that year reached only about US\$41 million, only US\$10 million of which was from the SSA region. Additionally, according to representatives of the EU Commission, before the EU legislation entered into force, France applied a limit of 1 ppb for aflatoxin B1 for groundnuts intended for direct human consumption, a level even lower than that set by the harmonized regulation (Moonen 2004). Beghin and Bureau (2001) also highlighted the limitations of the method used by Otsuki et al. and the sensitivity of the predictions to the assumptions of the model.

12. Regulation EC/178/2002 lays down the general principles and requirements of food law, establishing the European Food Safety Authority and setting procedures in matters of food safety. Articles 50, 51, and 52 define the scope and procedures of the RASFF.
13. Notifications prior to 2004 do not consistently report the volume involved in the notification.
14. For this analysis, the category “raw groundnuts” includes all notifications not specifically indicating prepared products under the product description. Thus, “raw groundnuts” includes notifications related to “in peanuts,” “in groundnuts,” “in shell peanuts,” “shelled peanuts,” and the like. Notifications related to prepared products included peanut butter, peanut balls, paste, salted and roasted groundnuts, and other clearly processed products.
15. This is consistent with the increasing EU imports of groundnuts during 2004 and 2005; 2006 data are preliminary and cannot be considered in the analysis.
16. Estimations of the value of the volume rejected in 2006 were not possible due to the lack of complete trade data for that year.
17. *Re-dispatch* means the return of a consignment, which has not been imported into EU territory, to the country of origin or to another (third) country that has agreed to accept it. It is permitted under various conditions specified in the regulations.
18. This option includes use under official control for oil extraction, provided that the resulting oil is refined to reduce any aflatoxin present to acceptable levels, and for cake/meal for animal feeding after detoxification.
19. Change of destination is to be understood as a redirection of the destined use. According to personal communications with EU authorities, groundnuts have several times been redirected for use as bird feed, provided that the observed levels are compliant with the EU maximum levels for bird feed (20 ppb aflatoxin B1).
20. Blanching, used in conjunction with gravity tables and manual or electronic sorting, is very efficient in removing aflatoxin-contaminated kernels. Color sorting, combined with blanching, has been shown to reduce aflatoxin contamination by as much as 90% (Codex Alimentarius 2004).
21. The EC has entered into special agreements with Egypt and China concerning pre-export testing of consignments and certification of the test results. A correctly completed certificate, signed by the designated authority, is a prerequisite for compliance, and consignments can be deemed noncompliant solely on the basis that they lack a correct health certificate.
22. The guidance document focuses mainly on the official control of aflatoxin contamination in food products that are subject to Commission Decision 2006/504/EC. Nevertheless, the provisions in this guidance document are also applicable, *where relevant*, to the control of aflatoxins in food products not subject to Commission Decision 2006/504/EC. (Version available at the European Commission’s Website, August 2007.)
23. The EU has taken, as reference for this, the highest levels reported in the FAO document “Worldwide Regulations for Mycotoxins in Food and Feed in 2003.”
24. The appropriate measures could be destruction, use for industrial purposes, use for oil extraction, or re-dispatch to the country of origin under strict conditions. In the latter cases, specific information about the destination, the intended treatment,

and the intended sampling and analysis to be performed must be provided by the competent authority of the country of origin.

25. Currently the EU authorities are preparing a new version of the guidance document, which will include a footnote allowing physical treatment in consignments reporting levels above these limits when it can be demonstrated that, because of the specific sorting and physical treatment used, the aflatoxin levels can reliably be brought into compliance with EU maximum levels.
26. According to EU legislation, the costs associated with physical treatment and of any additional measures taken as a result of noncompliance must be borne by the business operator.
27. Notice, however, that the Codex international standard has been established for peanuts for further processing.
28. Only 35 percent of the aflatoxin-related notifications include the test results for all subsamples.
29. Reported by Otsuki 2001a, 2001b; WTO G/SPS./GEN/61 (1998).
30. Notifications reporting the results of aflatoxin analysis for more than a subsample represented only 35 percent of the total notifications. A small number of notifications recorded levels for aflatoxin B1 only. In these cases, the total aflatoxin level was based on the assumption that 50–70 percent of the total aflatoxin level is usually accounted for by contamination with aflatoxin B1.
31. Both MERCOSUR and the United States permit total aflatoxin levels of 20 ppb.

Section 3 Strategic Approaches to Managing Aflatoxin Contamination Risks

3.1 Strategic Approaches Adopted by EU Importers to Exercise “Due Diligence” and Mitigate Commercial Risk

Under EU law, the legal responsibility to supply safe food lies with the business operator. In the case of imported products, the business operator (usually the importer) must verify that this responsibility has been exercised. Interviews with selected European importers/distributors show that they have adopted a range of complementary strategies to meet their legal responsibilities and to ensure the continued functioning of their supply chains. These strategies have included:

- *Shortening their supply chains*, with larger EU manufacturers sourcing directly from “preferred” overseas suppliers and eliminating several former intermediaries or brokers. Some peanut butter processors will only source raw nuts from the United States. Other suppliers prefer Argentinean peanuts, as they are well recognized for their high-quality characteristics (taste, flavor). Peanuts from China, SSA, and India are grown by small farmers and, consequently, traceability becomes a difficult task.
- *Tightening supplier oversight and insisting on good practices implementation*. Importers carry out more careful screening and selection of suppliers. Some companies request guarantees of compliance from suppliers, demonstrated through the results of laboratory analysis and sometimes certification that good manufacturing practices and HACCP systems are in place. More frequent visits are made to inspect production areas, packhouses, and the like.
- *Increasing product testing to ensure compliance*. Many companies have developed testing programs at EU import borders on a risk basis. Companies test regularly according to country of origin and a firm’s history of compliance. New suppliers present a higher risk, so the testing frequency is initially high, but is gradually reduced as better levels of compliance are achieved. Thus, long-term relations with a few suppliers, in different countries, helps to minimize both the risks associated with unfavorable weather conditions and the cost of testing.
- *Shifting the locus of processing functions*. As a way to mitigate risk, traditional importing companies have stopped blanching operations in importing countries and are encouraging suppliers to invest in blanching facilities (for example, through price incentives). To satisfy the increasing demands for blanched groundnuts, Argentine and Nicaraguan suppliers have built local infrastructure to carry out the blanching process.

3.2 Progress by Exporting Countries in Providing Food Safety Assurance for Groundnuts

The stringency and complexity of the EU regulatory requirements, in terms of maximum aflatoxin levels, but also quality and traceability requirements,¹ have imposed significant challenges and opportunities for exporting countries supplying or willing to participate in the EU market. Thus, compliance with standards has served as a catalyst for supply-chain improvements, as many exporting countries are effectively responding to the prevailing commercial and regulatory environment and thereby consolidating or improving their market position. In some countries, the response has involved a proactive, forward-looking strategy that seeks to reinforce competitive advantage; elsewhere, the response has been essentially reactive (and defensive), seeking to adjust in the face of adverse trade events.²

Mini-Case: Argentina's Strategic Approach to Continuous Compliance

Argentina has implemented strategic approaches to develop competitive advantages that extend beyond mere compliance with regulatory requirements in market destinations. In terms of compliance with EU requirements, the efforts have included regulatory measures; technical and scientific research to prevent and control aflatoxin contamination; improvements in production, postharvest, and processing technologies; investments in physical infrastructure; and strengthening of accreditation and certification systems.

At the regulatory level, responsibility for the control of agricultural products exported from Argentina (including groundnuts) lies with the National Service for Health and Quality of Agri-Foodstuffs (SENASA). Argentine authorities have issued official measures regarding the certification and control of exports, including peanuts, since the mid-1990s,³ yet it was not until the beginning of this decade that SENASA established the procedure and requirements with regard to the certification of peanut exports to the European Union (Resolution 436/2002). Although official supervision of aflatoxin is oriented toward end-product control, the private sector has implemented preventive measures to reduce aflatoxin contamination along the supply chain. Groundnut cultivation in Argentina is based on modern agricultural technology, including incorporation of good agricultural practices (GAP).

The same applies to the processing area, in which companies have been applying good manufacturing practices and the principles of the Hazard Analysis and Critical Control Point system. Conformity assessment of product intended for export is the responsibility of two private authorized certification bodies, which carry out official sampling and analysis of groundnut consignments and issue lot-specific health certificates. Local infrastructure for conformity assessment includes seven private laboratories (six of them authorized by the authorities to perform analyses, as of April 2006) and one national reference laboratory. Official efforts have been focused on generating opportunities for private operators to perform conformity assessment services.

In May 2005, the European authorities carried out the first mission to Argentina since the implementation of the EU harmonized levels, to assess the control system in place for aflatoxins. Argentina's reputation as a reliable supplier of quality

Mini-Case (Continued)

product, as well as the low number of notifications during the years prior to and after implementation of the EU harmonized levels, may have given Argentina the time needed to make the necessary adjustments to strengthen the local official control systems. Overall results of the EU authorities' assessment indicated that Argentina has a good system in place and that official supervision is very well elaborated and managed. The government and the industry have moved forward with implementation of the recommendations resulting from the mission. Similarly, industry initiatives are in place to anticipate compliance with expected EU regulatory developments in terms of approved pesticides.

Sources: Personal communications with SENASA authorities; European Commission 2005.

In the cases of China and Egypt, significant reactive measures have been taken in the aftermath of groundnut trade interceptions (and a temporary ban in the case of Egypt) and critical inspection missions by EU authorities. Significant regulatory changes have been made in China, as the following mini-case study highlights.

Mini-Case: China's Reactive Approach: Implementation of a "Shock Tactic Policy" to Promote Safety Improvements along the Supply Chain

In contrast to the situation in Argentina, China's production of groundnuts is highly fragmented. Limited availability of arable land and a large rural population restrict large-scale peanut cultivation. Despite this, according to EU buyers, Chinese peanuts have come a very long way in terms of quality, with remarkable improvements in the control systems, implemented by both by the private and public sectors, to assure compliance. However, for China, the delay in compliance has had considerable consequences. As a result of the mission carried out by the EU authorities to assess the systems in place for aflatoxin control in 2001, specific provisions were set for peanuts consigned from or originating in China. A second mission, carried out in December 2006, indicated that China had made great progress during the ensuing five years to improve the system to certify compliance, including significant changes in the regulatory framework in terms of registering establishments, sampling and analyzing peanuts for export, setting domestic standards for aflatoxin (aflatoxin B1 at 20 ppb), and improving public and private infrastructure for conformity assessment. In 2006, more than a dozen accredited official laboratories and two private laboratories carried out official analysis for aflatoxins on product intended for export. At the time of the first EU assessment mission, the General Administration of Quality and Supervision, Inspection and Quarantine (AQSIQ), responsible for the control of peanut exports, had only recently been established. Since then, the capacities of AQSIQ have considerably been strengthened.

China has undertaken a "shock tactic policy" to promote approaches to aflatoxin reduction among farm and exporter operations. This policy includes:

- **Enforcing requirements related to the application of GAPs, GMPs, and HACCP** during cultivation and processing of peanuts for export, based on the instructions in the "Control Requirements for the Safety of Peanuts for Export." Exporters are required to undertake a survey concerning the aflatoxin

Mini-Case (Continued)

contamination of supplying areas, to have in-house aflatoxin laboratories in place, and to undertake aflatoxin analysis on incoming and outgoing peanuts.

- **Application of aflatoxin levels stricter than the ones set by the EU.** In products intended for export, nonconforming products are defined as containing more than 1 ppb of aflatoxin B1.
- **Suspension of sanitary registration.** Companies that are involved in a RASFF notification are suspended from EU exports until corrective measures have been taken and verification is carried out. When a company is involved in three RASFF notifications within three months, EU-bound exports will be suspended by withdrawing the sanitary registration; exports can be resumed only after passing another full and strict inspection.

The effect that these measures will have in constraining exports remains to be seen. However, according to EU buyers, their immediate effect has been to improve the reputation of Chinese peanuts in the EU market. By April 2007, the prices of Chinese peanuts were, for the first time ever, higher than the prices for Argentine peanuts. This rise in price may be due to improved quality, or to constraints imposed by increasing domestic demands/domestic prices or restrictions on exports.

Sources: Personal communications with buyers in Europe; European Commission 2001; European Commission 2006.

Reactive measures to prevent aflatoxin contamination, though not yet generalized, have also been taken in some SSA countries. Examples from Ghana and Malawi are briefly highlighted here.

Mini Case: Ghana: Moving Forward in the Implementation of GMPs and HACCP Principles

Ghana's exports of peanut butter and prepared groundnuts have been subject to several notifications, mainly issued by the United Kingdom. According to official authorities, the problem is associated mostly with small and medium enterprises (SMEs). Ghana has a very sizeable number of SMEs, with a large proportion operating on an informal basis. Institutional efforts, led by the Ghana Export Promotion Council (GEPC) and the Food and Drug Board, are under way to put in place new export procedures, including mandatory inspection and certification of all exporting facilities. Under the new scheme, each company wishing to export peanut butter must be registered as an exporter and pass the inspections regarding implementation of GMPs and HACCP principles; these inspections are to be carried out by the Food Standard Board (FSB). Funds to support this initiative are coming from the World Bank. Capacity building and provision of testing services are also components of the scheme.

In Ghana, analysis for aflatoxin is commercially done by the Food Research Institute (FRI). Although sophisticated methods for the analysis of aflatoxins are used, accreditation of the laboratory is the biggest challenge, as the method used has not yet been validated. Sustainability is also an issue, as demand for aflatoxin analysis in peanuts and other crops is not enough to cover recurrent costs. Yet, given the recent expansion of the country's horticultural exports, a market for

Mini-Case (Continued)

third-party certification is emerging, and it is possible that upcoming regulatory changes (such as the introduction by FSB of HACCP for manufacturers and food retailers domestically) will further push development of conformity assessment services to cover the needs of different industries, including the groundnut sector. Regarding prevention of aflatoxin contamination at the farm level, the Plant Protection and Regulatory Services Directorate (PPRS) organized sensitization workshops for stakeholders and is currently working on the elaboration of good agricultural practices guidelines for the sector.

Source: Personal communications with authorities in FRI, GEPC, FDB, and MOHA.

Mini-Case: Development of Cost-Effective Methods for Aflatoxin Detection in Malawi

As part of its strategy to promote effective aflatoxin management in developing countries, ICRISAT developed a low-cost screening method for aflatoxin detection using the ELISA technique. With this technique, it is possible to screen out contaminated lots; for final analysis of product to be exported, exporters use an accredited laboratory that applies techniques recognized by the importing country (e.g., high-performance liquid chromatography [HPLC]). Preliminary screening of groundnuts is the core of the activities undertaken within the collaborative effort to revive groundnut exports established between ICRISAT and the National Smallholder Farmers Association of Malawi (NASFAM), with the support of USAID, which also covers awareness creation and farmers' training activities. Other export crops, such as soy, chilies, and paprika, are also benefiting from this effort. The facilities for aflatoxin testing are located at ICRISAT's center at Chitedze. NASFAM pays the costs associated with training lab personnel. In 2005–2006, more than 11,000 samples were analyzed.

Although testing is done mainly on NASFAM's own crops, third-party testing is also provided to other companies within the country and to operators in Zambia. Thus, there is an interesting potential for expanding third-party testing services on a national and regional basis. Challenges in responding to increased demands for aflatoxin testing under the program include the upgrading of current equipment and acquisition of new equipment to expand testing capacity. However, because the importer markets do not recognize the ELISA test, final testing for exports is largely done in South Africa. The costs associated with transportation of such samples are very high. (The sample size is 30 kg each, and the analysis could cost about US\$230 per sample, inclusive of sampling and testing.) According to NASFAM leaders, it would be highly desirable to establish an in-country HPLC testing facility. However, the weakness of the local transportation infrastructure may jeopardize the benefits a local laboratory could provide in terms of cost reduction.

Source: Personal communications with Dr. Farid Waliyar, ICRISAT India. A description of the current situation of the NASFAM/ICRISAT aflatoxin testing program in Malawi is included in Gordon 2007.

Recently, the SSA region has benefited from collaborative research efforts focused on finding technological and integrated solutions to effective aflatoxin management along the supply chain. Significant efforts have been devoted to research related to resistant varieties, biological controls, and good practices

during the production, harvest, and postharvest stages. Annex 7 lists some recent technical initiatives supported by the donor community. As the following example illustrates, these interventions are gradually yielding results.

Mini-Case: Collaborative Research Efforts to Promote Effective Aflatoxin Management along the Supply Chain

Collaborative efforts among several research institutions in the region, ongoing since 1996, are producing very promising results for improving the quality and safety of groundnuts in SSA. The success of these collaborative efforts relies on many factors, one of which is the continuity of the research initiatives undertaken. In 1996, CIRAD led the implementation of the Groundnut Germplasm Project (GGP), funded by the Common Fund of Commodities. A second phase of the project, the Groundnut Seed Project (GSP), followed; this phase aimed to facilitate transfer of knowledge through the evaluation and implementation of seeding operations. A third project—the Groundnut Aflatoxin Project—was implemented between 2001 and 2006 and funded by the EU’s Specific International Cooperation Activities program. Some of the main outcomes of these coordinated research initiatives are:

- Varieties with improved drought resistance have been developed from an aflatoxin-resistant parent and have been disseminated to farmers through several pilot trials in Mali, Niger, Nigeria, and Senegal.
- Agronomic practices to mitigate the effect of drought have been developed. Application of lime and use of crop residues and farmyard manure in the fields can reduce aflatoxin contamination.
- Improved techniques for harvesting and drying have been developed.
- A contamination risk analysis system, based on the “farm to fork” concept, has been adopted. In particular, the system considers the choice of variety, treatment of crop storage facilities against infestation, and the effect of using quicklime or manure to control infestation.

The results of this work are already being applied through a program intended to promote higher-quality groundnut production in Senegal. The “Edible Groundnut Program,” which aims at ensuring seed quality, relies on two strategies: (1) individual or community seed production that can better meet the needs of some producers (low level of investment, loss of stock, need for collective stocking, etc.) while meeting recommendations for good agricultural practices; and (2) the production of certified seed by producers that meet detailed specifications. The project also involves market linkage efforts among the actors. One of the goals is to implement a system of more equitable and incentive-laden contracts between producers’ organizations and the private sector. The operation is coordinated by CNIA⁴ and is being implemented by CIRAD, in partnership with the main Senegalese producers’ organization (ASPRODEB), with funds from the European Union and the World Bank. During May through September of 2007, about 946 producers received certified seed, representing about 815 hectares planted, and about 30 hectares were established for the production of certified seeds. The program expects to produce about 25,000 tons of certified seed in 2011. Price incentives for high-quality groundnuts, access to credit, and technical support are provided to the small farmers who participate in the program. Good agricultural practice and traceability manuals have been produced. The results of the harvests

Mini-Case (Continued)

in 2004, 2005, and 2006 have demonstrated that it is possible to increase productivity and produce the quality required by the international market, if an integrated approach to management of safety and quality risks is followed. For the 2007 season, ASPRODEB has already established a contract with a European buyer to supply about 10,000 tons of edible groundnuts and 5,000 tons of raw groundnuts to be used as bird feed.

Sources: www.aflatoxin.info; CIRAD 2007; Waliyar 2006; Fabre and Mayeux 2006.

Hence, in most of the leading and emerging exporting countries, public and private collaboration has been fundamental in the promotion of measures to prevent and reduce aflatoxin contamination along the supply chain and to improve the capacities to demonstrate compliance. In Argentina, and also in Nicaragua⁵ and Brazil,⁶ leadership for these initiatives has come from the private sector. Elsewhere, including in China and very recently Ghana and Senegal, the lead roles have been taken by government and the donor community. In terms of conformity assessment, the approaches taken also vary among countries. In China, the government performs inspection functions, and testing is carried out mainly by official laboratories (although recently some private labs have also been authorized by the government to provide these services). In Argentina, regulatory initiatives have favored the development of private infrastructure for conformity assessment. In South Africa, conformity assessment activities (inspection, analysis, and certification) are performed by the Perishable Products Export Control Board (PPECB), a semi-governmental organization assigned by the Department of Agriculture to ensure compliance with quality, food hygiene, and safety standards.⁷ In SSA, donors have been supporting the acquisition of laboratory equipment and the training of staff on methods of analysis for mycotoxins (including aflatoxins); this is the case with the Food Research Institute (FRI) in Ghana and the Food Technology Institute (Institut de Technologie Alimentaire or ITA) in Senegal.

The focus in this paper has been the trade dimensions of aflatoxin contamination in African food products (in this case, edible groundnuts). However, aflatoxin contamination is also a domestic public health issue in Africa, as highlighted in Box 4. As improved methods to prevent, reduce, and detect aflatoxin contamination become available, the opportunities to capture health benefits for local populations are very significant. For example, the ELISA kit developed by ICRISAT is proving to be an interesting tool for alleviating basic constraints, in terms of testing infrastructure, in groundnut-producing SSA and other developing countries.⁸

Although some governments in Africa and Asia have demonstrated interest in applying the technology with a domestic focus, the progress in SSA has been slowed by lack of funds. A testing facility was recently established by ICRISAT in Kenya, and discussions with the governments of Tanzania and Zambia are under way. For ICRISAT, although cooperation with farmers and the

Box 4. Aflatoxins as a Public Health Concern in SSA

Acute exposure to mycotoxins at high levels can be lethal, as exemplified by more than 150 deaths due to aflatoxin poisoning in Kenya in 2004 and 2005. These deaths were associated with the consumption of contaminated maize. Chronic exposure is more pervasive: epidemiological studies carried out in China, Kenya, Mozambique, the Philippines, Swaziland, Thailand, and South Africa have shown a strong positive correlation between aflatoxin levels in the diet and the development of cancer. The synergy between exposure to aflatoxins and infection with hepatitis B substantially increases the risk of carcinoma. Aflatoxins are also associated with growth retardation and immunosuppression. In Benin and Togo, children in high aflatoxin exposure zones were found to gain 22 percent less height than children in low-exposure zones. Childhood exposure to aflatoxin in The Gambia was also associated with immune suppression. Growth and immune impairment are critical in predisposing children to the infections that result in the high morbidity and mortality in African populations. The animal health implications of aflatoxins are also very significant: these contaminants result in reduced productivity and fertility, higher susceptibility to infectious diseases, and increased costs of health management.

In Kenya, a survey undertaken after the 2004 outbreak found that 55 percent of maize products had aflatoxin levels higher than the Kenyan regulatory limit of 20 ppb: 35 percent were more than 100 ppb and 7 percent were more than 1,000 ppb. Some samples measured more than 10,000 ppb. In West Africa, studies indicated a high prevalence of dietary exposure to aflatoxin, with more than 90 percent of the individuals having detectable blood aflatoxin levels.

Aflatoxin contamination can occur along the food chain; thus, a multidisciplinary approach for analysis, planning, and implementation is required. The starting point for these efforts must be the building of awareness in the SSA region about the public (and animal) health problems associated with exposure to aflatoxins.

Sources: WHO 2005; Myco-Globe 2005.

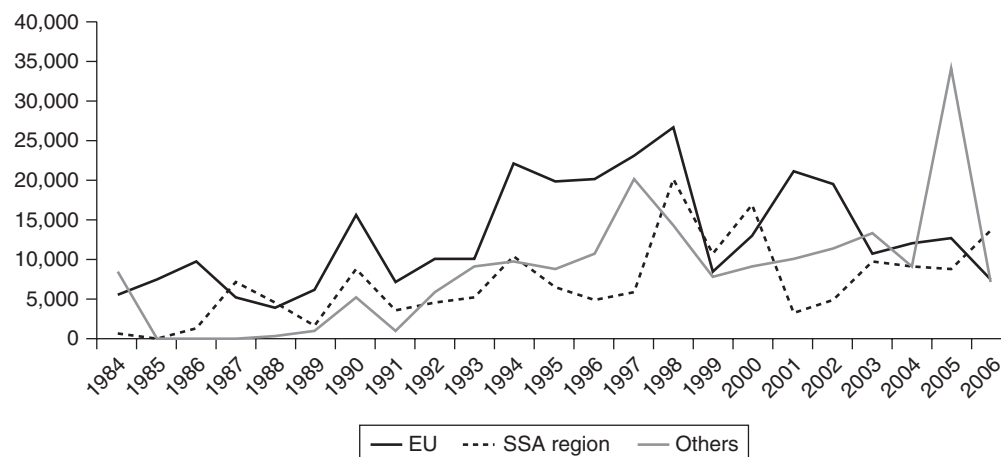
government is yielding positive results, the establishment of links with private companies is crucial to facilitate access to the technology by a wider number of stakeholders.⁹

3.3 Redirecting Trade and/or Shifting Product Foci

In the face of challenging regulatory requirements and changing market circumstances, firms involved in groundnut trading and processing may shift their commercial orientation toward markets where less stringent standards apply. They may also shift their product mix, again due to considerations of (ease of) standards compliance and/or broader commercial considerations. Both anecdotal evidence, drawn from interviews with exporters from the SSA region, and broader statistical trends point to shifts in commercial strategies, some of which can be regarded as defensive.

In terms of redirection of trade to less strict markets, the data suggest that a significant proportion of the growth in exports experienced by the region since the mid-1980s has come from satisfying demands in alternative markets (see Figure 3.1). Since the mid-1980s, exports from the region have reached more than 50 countries, although the trend lines clearly

Figure 3.1 Destination of SSA Exports of Raw Groundnuts (in US\$ 000)



Source: FAO data.

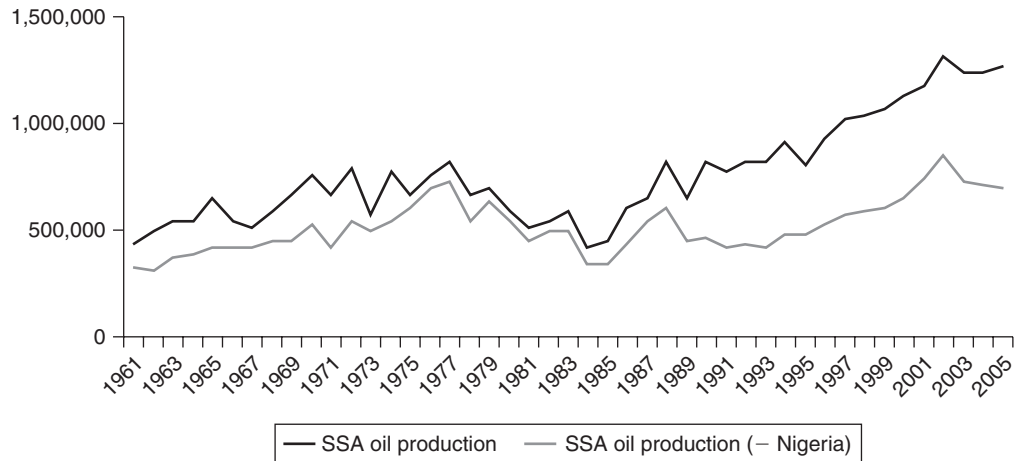
illustrate the high variability of both intraregional and extraregional Africa groundnut trade. Within the region, the main importers of groundnuts from other African countries have been South Africa and Senegal. Export companies in Malawi have recently targeted the South African and Zimbabwean markets.

Both at the individual company level and (as illustrated by broader statistics) the industry level, more and more commercial activity is now centered on groundnut oil crushing for the domestic market. Earlier, the experience of Senegal's NOVASEN was noted. After experiencing several failed attempts to revitalize exports of edible groundnuts, the company seems to be moving towards increasing its participation in the crushing sector (Mbaye 2004). In The Gambia, the GGC, a company sharing 95 percent of the country's edible groundnut export, is planning to concentrate on adding value through crushing for oil, rather than exporting raw product, given the low margins generated by edible groundnut exports to the United Kingdom, where a significant percentage of the product is sold as bird feed.

SSA production of groundnut oil has increased sharply over the past two decades, rising from just over 400,000 Mt in 1985 to about 1.2 million Mt in 2005. Nigeria is by far the largest producer, accounting for slightly less than 47 percent of the region's groundnut oil output in 2006. As Figure 3.2 illustrates, Nigeria has accounted for the bulk of the region's expanded groundnut oil output since about 1990. Figure 3.3 illustrates the expanding domestic utilization of oil in comparison with contracting exports of raw and oil.

Clearly, multiple factors have contributed to these shifts in market orientation and product line. These structural and commercial changes have been taking place over many years. While there is no doubt that the EU aflatoxin

Figure 3.2 Production of Groundnut Oil in the SSA Region (Mt)



Source: FAO data.

Figure 3.3 Utilization of Groundnut Production in the SSA Region (in percentage)



Source: FAO data.

The calculations were based on the following assumptions:

- 1 ton of unshelled groundnuts yields 35 percent oil and 42 percent press cake (Mbaye 2004)
- The hull in a ton of in-shell groundnuts represents 1/3 of the weight (Mbaye 2004)

Data on the utilization of groundnut production for domestic consumption other than oil are not included. Estimations for utilization of groundnut production for cake are not considered, as pressing for cake is a residual of the crushing industry.

regulatory developments have affected the commercial strategy and investment patterns of certain firms, the more general patterns of groundnut sector restructuring and performance in SSA have been affected only modestly. Certainly, these regulatory developments have not determined the industry direction or strategies.

Notes

1. As highlighted in Regulation EC/178/2002, which lays down the general principles and requirements of food law, establishes the European Food Safety Authority, and sets out procedures in matters of food safety.
2. See World Bank 2005, chapter 3, for a discussion of alternative strategic responses to standards.
3. In the mid-1990s, Argentine authorities established the legal framework for certifying bodies and/or private companies regarding certification of grains and byproducts for exports. Also in the mid-1990s, Resolution No 1075/1994 of SAGPyA was amended to describes the commercial classification system for peanuts based on certain quality parameters such as size, moisture levels, foreign materials, and the like.
4. CNIA is the Comité National Interprofessionnel de l'Arachide, which was established in 1995 as a trade association. Its origin goes back to 1989–1990 and the former rural development ministry, which wanted to foster more interplay among participants in the industry (Mbaye 2004).
5. In Nicaragua, the groundnut confectionery supply chain has developed mainly from the efforts of two leading companies that have invested heavily in improved production technologies and in overall supply-side developments to improve competitiveness and achieve compliance with market requirements.
6. The Brazilian association of industries of chocolate, cocoa, peanut, and sweet products is implementing the program “Pro Amendoim” (Pro-Peanuts) to reduce the incidence of aflatoxins. This program includes: (a) site selection (adequate and suitable sampling procedure); (b) sample preparation; (c) laboratory methodology, and (d) appropriate follow-up action to reduce and/or eliminate mycotoxin (aflatoxin) contamination (Sabino 2006).
7. The PPECB has been implementing the Mycotoxins Analytical Programme (MAP), and has broad experience in the area, as it has been testing mycotoxins for approximately 30 years. One of the largest mycotoxin testing laboratories in the world, PPECB has the capacity to analyze 200 samples per day (see the PPECB website). Other private operators are also providing aflatoxin testing services in South Africa.
8. In India, for example, the aflatoxin detection service is provided at a cost of US\$1 per sample, whereas in Africa the cost is slightly higher—between US\$3 and \$5—because in some countries, some of the inputs required to perform the test must be imported. The costs of establishing a laboratory could be approximately US\$50,000–60,000. The technology also allows the detection of aflatoxin levels in human blood, and therefore offers interesting possibilities to support the development of surveillance systems to monitor human health effects (personal communication with Dr. Farid Waliya, 2007).
9. Personal communication with Dr. Farid Waliya, 2007.

Section 4 Conclusions

Many factors influence international market access and the competitiveness of developing-country agricultural supply chains. Nevertheless, many stakeholders are concerned that increasingly stringent food safety, agricultural health, and other standards are creating barriers to trade and having adverse effects on the costs to and competitiveness of developing-country suppliers. Recent research examining the impact of standards highlights an “attribution problem,” in which the role played by standards in explaining trade flows and performance is distinguished from other factors and deemed overriding. There are certainly cases in agriculture in which regulatory stipulations constitute an absolute barrier to trade, especially in relation to the presence and spread of animal diseases and plant pests. In relation to food safety, though, such absolute barriers to trade are rare. Instead, food safety requirements tend to exacerbate the underlying strengths and weaknesses of production and distribution systems, posing greater or lesser challenges to different market participants.

New or more stringent requirements may pose compliance problems for firms and farms operating under less favorable agro-climatic conditions, with weaker management systems, or where institutional arrangements for collective action are less well developed. An underlying weak or fragile competitive position can be made worse by demands for better compliance with increasingly stringent standards. However, new or more stringent standards can also catalyze supply-chain participants (and governments) into making investments and taking other measures to improve their capacities and performance and demonstrate compliance; over time, these actions may yield considerable benefits. The changes in technologies, management practices, and intra-supply-chain relationships induced by standards can contribute to improved productivity, reduced costs, and improved risk management.

This paper has argued that the poor performance of Africa’s trade in groundnuts (and groundnut products) cannot be attributed to the adverse impact of the European Union’s strict harmonized standard on aflatoxins. The SSA edible groundnut export sector had been gradually losing its competitiveness for decades before the implementation of these stringent standards in the late 1990s. Nigeria practically withdrew from the export market in the mid-1970s, and other key exporting countries, such as Senegal, Sudan, and Malawi, experienced a sharp contraction of their groundnut trade in the subsequent decade. Macroeconomic conditions, sectoral policies, and agro-climatic shocks played important contributory roles. African suppliers were unable to meet emerging demand for consistent volumes and quality of product and thus were overtaken by competitors from Latin America and Asia. All this predated the effective enforcement of aflatoxin requirements and their subsequent harmonization at the EU level.

How much the EU standards subsequently affected the already marginalized African groundnut export trade is difficult to determine precisely. Previous estimates greatly exaggerated these impacts, and some stakeholders have been distracted by the “trade barrier” contention, at a time when attention and resources would have been better directed at addressing the fundamental constraints on African groundnut productivity and quality. The widely referenced work of Otsuki et al. (2001a, 200b) suggested that Africa would “lose” hundreds of millions of dollars in nut, cereals, and dried fruit trade because the EU aflatoxin (and other mycotoxin) tolerance levels were set at a more stringent level than those established by Codex. In contrast, the evidence presented in this paper suggests much more modest impacts. At least from the point of view of trade intercepted, the direct adverse effects in recent years have totaled a few hundred thousand dollars. The indirect effects—including the deterrent effect on stakeholder investments in groundnut-related activity and changes in the commercial orientations of groundnut processors and traders—are more difficult to estimate, yet the “lost” trade that can be confidently attributed to the EU standards has been extremely low, given the multitude of other technical, institutional, and other problems reducing the competitiveness of African groundnut supply chains seeking to participate in *any* international markets—let alone the more discerning one in the EU. Although the overall, direct, aggregate effects of the EU regulation for the region, in terms of intercepted trade, are small, for the companies involved in the notifications, the EU regulations have had more profound effects, as the economic implications of returned consignments or discounted product may be significant.

Had the European Union adopted the less stringent Codex standards, would Africa’s groundnut exports to the EU have shown a dramatically different (and more positive) trend? The evidence presented in this paper indicates that this is most unlikely. Nearly 80 percent of the consignments from Africa that were intercepted by EU authorities over the period from 2004 to 2006 would have failed even the less strict Codex standard. Many of the failed consignments (and many other consignments that were not permitted by African regulatory authorities to be shipped in the first place) had extremely high levels of aflatoxin contamination. Due to an array of issues—associated with climate, seed quality, crop husbandry, postharvest and storage practices, regulatory oversight, and other matters—SSA suppliers continue to face major problems in managing aflatoxin contamination.

Had the European Union adopted the Codex standards, the primary beneficiaries would have been Africa’s main competitors (in the EU market), especially Argentina, the United States, Brazil, China, and Egypt. These leading and emerging suppliers of edible groundnuts have made considerable investments to upgrade their production systems, initially as a way to improve basic quality characteristics and increase production, and later as a way to achieve safety objectives by preventing and reducing aflatoxin contamination. With regard to several of these supply sources, one-half or more of the consignments intercepted by the EU authorities for violative levels of aflatoxin would have passed and not been subject to further treatment or rerouting had the Codex standards been applied in Europe. Hence, suppliers

from these countries could, arguably, complain that they face compliance problems with regard to an (overly) stringent standard.

For most African supply chains, it is more accurate to refer to an aflatoxin management problem than to a compliance problem. The focus of policy-maker attention on the alleged trade barrier aspect of the EU's aflatoxin standards has contributed little to exports or public health improvements in SSA, and does not provide a basis for improved strategy development and investment. Although developing countries can and should articulate their concerns about unscientific or otherwise questionable standards (and the enforcement of those standards), the effectiveness of such communications and negotiations is often linked to the past experiences and underlying reputation of the negotiating party in terms of standards and quality management, the transparency and effectiveness of regulatory systems, and the like. That is, countries or industries that are known or perceived as having their "house in order" are much more effective in carrying out SPS-related diplomacy than countries/industries known for problematic systems and past deficiencies in compliance.

Thus, for some countries supplying edible groundnuts to the EU market (such as Egypt and China), the stringency of the EU aflatoxin standards did act as a temporary barrier to trade, and subsequently (in a reactive way) as a catalyst for the modernization of the supply chain and for improved collaboration between the public and private sectors. The catalytic role of the EU standards enforcement is more clearly seen in the case of the Argentine industry; which has used compliance with standards as a means to improve the industry's competitive position and gain market participation. In contrast, for most of the SSA countries in general, the stringency of the EU standards has served neither as a significant barrier to trade nor as a significant catalyst for proactive action. Preexisting technological gaps and weak supply-chain organization (with a heavy public sector role, depriving the industry of the fundamental role of the private sector in driving supply-chain developments and innovations) constrained the ability of SSA countries to respond to market signals, increased competition, and emerging standards.

The inability of SSA suppliers to build their reputation on the basis of a reliable supply of consistent quality and safe product is contributing to their marginalization in international groundnut products trade. Upgrades at the production and harvest levels, to improve basic quality characteristics and ensure consistency, are needed, along with safety improvements. In the end, managing aflatoxin is an important part of achieving sustained competitiveness in the groundnut trade, whether the orientation is the European market or less strict markets; this is true for leading and emerging exporting countries, and it is true for SSA exporters as well.

Research efforts undertaken by several organizations in the SSA region are progressively making available appropriate and cost-effective measures for aflatoxin prevention along the supply chain. The challenges for the private and public sectors, and the donor community, are to facilitate the adoption of these technologies and approaches so as to achieve desired trade, domestic commercial, and public health objectives.

Annexes

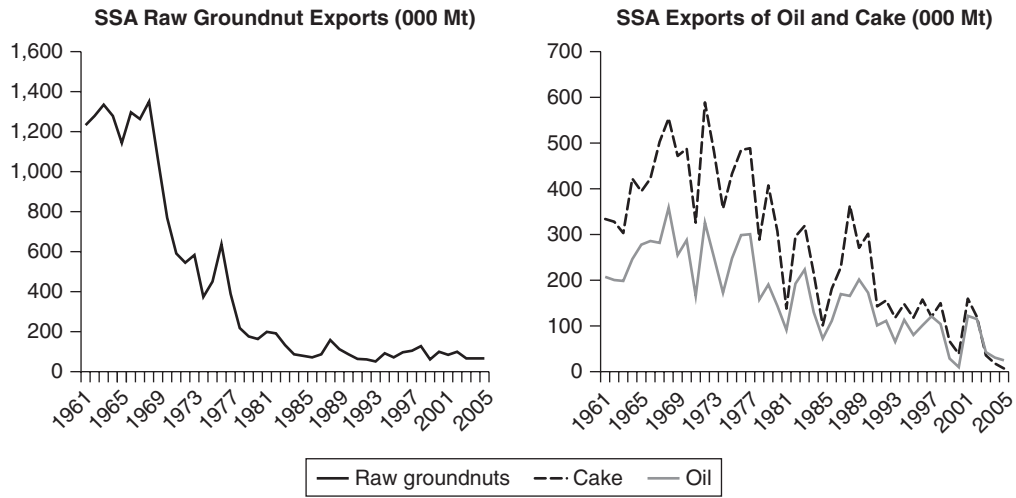
- Annex 1. Share of Groundnut and Groundnut Products within Total Groundnut Exports (Mt)
- Annex 2. SSA Exports of Groundnuts and Groundnut Products
- Annex 3. EU Imports of Raw and Prepared Groundnuts (in US\$000)
- Annex 4. Main Constraints on Groundnut Production in Malawi and Tanzania—Farmers' Survey (ICRISAT, March 2007)
- Annex 5. Possible Sources of Aflatoxin Contamination along the Supply Chain—Example from The Gambia
- Annex 6. Number of EU Notifications Concerning Mycotoxin and Aflatoxin Contamination
- Annex 7. Some Projects and Research Initiatives on Aflatoxin Reduction in Groundnuts in SSA and Other Regions

Annex 1. Share of Groundnut and Groundnut Products within Total Groundnut Exports (Mt)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
In shell	136,609	139,154	150,201	150,345	168,762	192,596	212,117	215,018	210,126	215,426	235,003
% in quantity	6	6	7	7	8	9	9	9	9	10	9
Shelled	1,269,298	1,179,761	1,035,335	963,797	998,954	1,145,180	1,056,480	1,088,729	1,031,395	1,016,363	1,107,335
% in quantity	48	42	42	48	57	50	47	44	45	49	44
Prepared groundnuts	235,522	192,999	270,005	252,750	279,743	336,207	417,099	475,267	501,401	539,233	662,315
% in quantity	9	8	12	12	14	16	18	20	22	24	27
Groundnut cake	529,449	619,456	461,182	385,708	249,925	223,901	310,037	231,998	233,658	216,957	234,457
% in quantity	21	25	20	18	12	11	13	10	10	10	9
Groundnut oil	271,577	247,898	303,409	291,012	209,542	159,985	259,537	268,700	238,831	197,470	191,511
% in quantity	11	10	13	14	10	8	11	12	11	9	8
Groundnut butter	39,326	104,897	48,271	43,841	47,681	48,869	52,164	54,438	49,669	56,254	62,721
% in quantity	2	4	2	2	2	2	2	2	2	3	3
Total Exports (000 Mt)	2,482	2,484	2,268	2,087	2,024	2,107	2,307	2,334	2,265	2,242	2,493

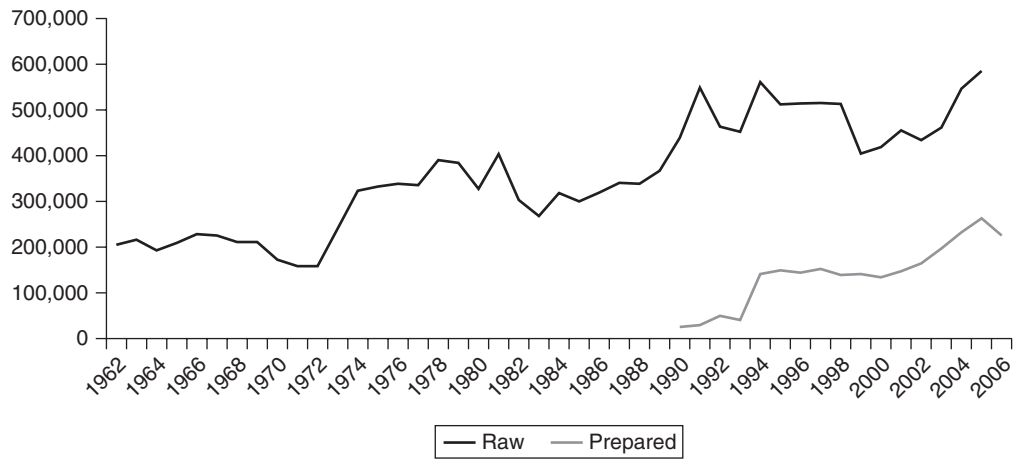
Source: FAO data.

Annex 2. SSA Exports of Groundnuts and Groundnut Products



Source: COMTRADE data.

Annex 3. EU Imports of Raw and Prepared Groundnuts (in US\$000)



Source: COMTRADE data.

Annex 4. Main Constraints on Groundnut Production in Malawi and Tanzania—Farmers' Survey (ICRISAT, March 2007)

Tanzania—Percentage of respondents			
Constraints	Massasi	Dodoma	Total Mean
Unfavorable weather	12.6	13.8	13.3
Poor soils	8.2	6.7	7.4
Seed availability	30.8	27.6	29.1
Low cash price	17	14.8	15.8
Poor management	39.64	38.67	39
Lack of capital	34.6	31.4	32.9
Labor	13.7	12.4	13
Pest and diseases	53.8	54.8	54.3

Source: ICRISAT, 2007.

Malawi		
Constraints	Frequency	Percent (%)
Inadequate finance for inputs	199	32.5
Climate unfavorable for the crops	168	27.4
Unavailability of seed for the crops	79	12.9
Lack of management skills	47	7.7
Low food/cash value for the crops	34	5.5
Unavailability of labor	32	5.2
Soil unfavorable for the crops	28	4.6
Don't know	26	4.2
Pest and diseases	18	2.9
Lack of market	17	2.8
Lack of fertilizer/unavailability of fertilizer	6	1
Unavailability of land	2	0.3
Lack of extension services	2	0.3
Low-yielding varieties	1	0.2
Late planting	1	0.2

Source: ICRISAT, 2007.

Annex 5. Possible Sources of Aflatoxin Contamination along the Supply Chain— Example from The Gambia

According to ICRISAT, several factors predispose a crop to aflatoxin contamination. These include: drought stress, weather conditions during pod maturation and during drying, time of harvest, method of harvest/drying, time of pod removal, insect damage, and storage conditions. Consequently, aflatoxin contamination is an endemic problem, particularly in SSA, due to frequent droughts and cultivation by subsistence methods. This table presents an example of the current on-farm activities that are likely to favor aflatoxin infection along the groundnut supply chain in The Gambia. The implementation of on-farm good practices in production—starting with the use of good-quality seeds—and in subsequent stages of harvesting and postharvest, is fundamental to ensure the quality and safety of the final product.

Steps	Description of the activity	Possible risk of contamination with aflatoxin
1. Planting	<p>Farmers store about 10% of the harvested groundnut to be used as seed in the next season. Seed is treated with fungicides and planted during June–July after the first rains. The varieties most commonly used are the Senegal 73/33 (standard seedoil) and the Philippines Pink (confectionery), which is resistant to rosette disease and selected from a ton of “Tennessee Red” imported from the Philippines in 1924.</p>	<p>The use of poor-quality seed increases pest and disease susceptibility, facilitating infection by <i>Aspergillus spp.</i></p>

2. Crop husbandry		Crop Development		Drought stress at the time of pod development facilitates colonization of pods by <i>Aspergillus spp.</i> Drought stress in combination with soil temperatures between 25–31°C is needed for aflatoxin production.
Manure and fertilizers	Manure is applied before planting; if available, NPK 15-15-15 is applied two weeks after planting. Phosphorus deficiencies seem to be the major nutritional constraint of Gambian soils. In September drought may occur. No irrigation is used.	Poor nutrition increases susceptibility to pest and disease damage, facilitating infection by <i>Aspergillus spp.</i>		
Weed control	Done using animal-drawn appliances and by hoeing and manual weeding.	Damage of pods during weeding can facilitate future development of <i>Aspergillus spp.</i>		
3. Crop protection	Generally, plant diseases are not controlled. Leafspot diseases seem to occur often and damage population density. Sooty molds also occur. In terms of pests, during storage <i>Elasmolomus</i> can infect the crop in the field after lifting, during field drying.	Physical damage of the pods during harvest, or by insects such as arthropods, millipedes, and termites, or weakening of pods by diseases such as white mold and others, makes pods easily invaded by <i>Aspergillus spp.</i>		
4. Harvest	The decision to harvest is based on visual observation. The color of foliage may become dull, but there is a general misconception that leafspot is not a disease but a sign of approaching maturity. There is no assessment of the maturity of the crop by looking at the percentage of fully developed pods with dark spots on the inside of the pod shell. Harvest is sometime in October–November. The harvest is done manually and plants are windrowed and threshed in the field to allow them to dry. The moisture content should be around 10%.	The fungi invade large, mature kernels less easily than small and immature kernels. Overmature kernels are more susceptible to fungi invasion. Mixing damaged and infected kernels with good kernels increases aflatoxin problems. Harvesting pods with high moisture leads to high risk of invasion, during curing and drying, by fungi that are already established in the shell. Fungal growth is facilitated if drying is slow and kernels remain in the danger zone of moisture content between 20% and 12% for extended periods. Rain on partially dry groundnut is likely to result in aflatoxin contamination.		

(Continued)

Annex 5 (Continued)

Steps	Description of the activity	Possible risk of contamination with aflatoxin
5. Farm Storage	Usually dried pods are stored in or near the farmhouse, to be used for seed in the next season and for direct consumption.	Improper storage can facilitate insect damage and high moisture content and consequently fungal infections.
6. Transportation	Transport to the secos and later on to the processing plant is done by barges.	With improper handling, there is a risk of water coming in contact with the product, facilitating infection.
Postharvest operations		
Reception of the product	The product is weighed. Acceptance/rejection is done on the basis of appropriate moisture and avoidance of foreign materials. The product can be returned to the farmer for further drying and/or cleaning. The price is established independent of the quality or variety. No distinction is made between confectionery and oil stock. The bulk from an individual farmer is mixed with the rest of the received stock in open-air enclosures, which do not always have a concrete floor.	Poor infrastructure could facilitate infestation by fungi. Clean pods may be contaminated by being mixed with infected ones.
Storage at the depots	A depot is mainly a temporary storage facility. Produce is taken in from secos or from local traders and stored in bins that are built on concrete block.	Moisture content should be kept below 10%. Storage pests may open the pods to easy access by fungi. During storage, damage of pods by <i>Caryedon serratus</i> may occur. Farm animals, birds, etc. can also damage the pods. Improved infrastructure is needed to facilitate hygiene practices.
Source: Adapted from Lojpur & Neering, 2006.		

Annex 6. Number of EU Notifications Concerning Mycotoxin and Aflatoxin Contamination

	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Total EU notifications	2874	3158	2588	2310	1514	704	474	360	230	81
Total notifications for mycotoxins	874	992	876	803	302	188	135	96	45	8
Notifications related to mycotoxins (%)	30.4	31.4	33.8	34.8	21.4	26.7	28.5	26.7	19.6	9.9
Notifications for aflatoxins	802	946	844	762	288	177	117	92	44	8
Notifications related to aflatoxins (%)	91.8	95.4	96.3	94.9	95.4	94.1	86.7	95.8	97.8	9.9

Source: The RASFF.

Annex 7. Some Projects and Research Initiatives on Aflatoxin Reduction in Groundnuts in SSA and Other Regions

Donor	Implementing agency	Country	Title	Period
Peanut Collaborative Research Support Program (Peanut CRSP)	University of Georgia	The program involves 10 U.S. states, 13 universities, and 16 nations from 4 continents	Gender/Aflatoxin and impacts of policies and research on peanut production in West Africa	1998–2007
IAEA	IAEA/National counterparts	Benin	Regulatory control and monitoring of mycotoxins to facility trade	2007
FAO	FAO/National counterparts	South Africa	Assistance in the definition of a monitoring program and assessment of mycotoxins in agricultural food commodities	2005–2006
Australian Government-Australian Centre for International Agricultural Research	Australian Government-Australian Centre for International Agricultural Research/National counterparts	Australia/Indonesia	Reducing aflatoxin in peanuts using agronomic management and biocontrol strategies in Indonesia and Australia	2004–2006
DFID	ICRISAT	Global application	Development of an ELISA kit for aflatoxin screening	
European Union	EU	The Gambia	Assessment of aflatoxin problem in groundnuts in The Gambia	2006

European Union	CIRAD and several other organizations	Sahel Africa (Senegal, Mali, Niger, Nigeria)	New tools for groundnut aflatoxin control in the Sahel regions of Africa	2001–2006
USAID	NASFAM	Malawi	Strengthening produce organization	
European Union	Institut Sénégalais de Recherches Agricoles	Senegal	Genetic improvement of drought-resistant groundnut	1987
European Union	National Research Council Institute of Sciences of Food Production-ISPA	Global	Integration of Mycotoxin and Toxigenic Fungi—MYCO-GLOBE. Research for Food Safety in Global System.	2004–2007
STDF	WTO	Malawi	Malawi SPS compliance and diversification in groundnut and paprika production	2007

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European Commission Website: http://ec.europa.eu/food/food/chemicalsafety/contaminants/aflatoxins_en.htm

FAOSTAT (production, trade and consumption data):

<http://faostat.fao.org/default.aspx>

PPECB Website: <http://www.ppecb.com/ppecbcms/>

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