Global food safety standards in a developing country context: the case of South African groundnuts

Achterbosch T.J.

in

Mattas K. (ed.), Tsakiridou E. (ed.).
Food quality products in the advent of the 21st century: production, demand and public policy

Chania : CIHEAM
Cahiers Options Méditerranéennes; n. 64

2005
pages 165-178

Global Food Safety Standards in a Developing Country Context: The Case of South African Groundnuts

Thom J. Achterbosch
Agricultural Economics Research Institute (LEI), part of Wageningen University and Research Centre, The Netherlands

Abstract: The present study demonstrates that food safety interventions must be aligned to the targeted producers and consumers, many of whom are resource-poor. A case of aflatoxin contamination in groundnut supply in South Africa is introduced, and the decisions that underlie the behaviour of targeted agents are examined. From such an evaluation follows an identification of the need for a related policy to support proper functioning of the process standard.

In this study, organic dried apricot has been studied. It was first produced organically in Turkey in 1985. This article discusses organic dried apricot production and its marketing methods.

Keywords: groundnuts, food safety, aflatoxin, Codex Alimentarius, information problems.

1. Introduction

In changing producer behaviour, little support can be expected from one-size-fits-all policies. Yet in safeguarding consumers from food borne risks, governments around the world make widespread use of standards and other policies that do not differentiate towards the targeted producers. There can be proper reasons not to differentiate in setting standards. When specifying a tolerance level for contaminants, for instance, it would be rather awkward to subject some consumers to more contaminants than others. A widely applied type of standard is a process standard, which specifies methods and practices for production. One example is a code of good hygienic practice that specifies sanitary handling of products.

What impact can one expect from a process standard on food safety? The present study demonstrates that in order to properly evaluate the effectiveness of a process standard, policy-makers need to acquire a conception of the decisions that underlie the behaviour of targeted producers. From such an evaluation follows an identification of the need for a related policy to buttress the process standard. Such a policy will often need to be differentiated towards groups of producers, for instance towards standard-setters, standard-takers and standard-escapists (Reardon et al., 2001).

Among the food safety risks in South Africa is that of aflatoxin contamination in peanuts (Smelt et al. 2003). This natural toxin associated with increased risk of liver cancer to consumers is produced by fungi is a major risk in peanut production in hot and humid climates. Farmers and processors that produced for export to EU and Asia managed in close co-operation with food and agriculture authorities to implement a legal control system for export peanuts in the mid-1990s. Because these producers acted on a firm price-incentive, the role of the South African government was merely to facilitate exports. A serious regulatory effort to reduce aflatoxin

levels in peanuts on domestic markets started only after several school children fell ill from consuming contaminated peanut butter in 2001.

The approach taken here is to discuss a proposed policy to address contamination in the South African groundnut supply. An assessment is made as to whether this policy is likely to reduce current uncertainties in groundnuts and peanut butter, if it were implemented under the market structures that currently prevail. The focus in assessing producer responses to the proposed policy lies on incentives and information issues, which have recently received more attention in the economics of food safety literature (see, for instance, Elbasha & Riggs, 2003, and Bureau et al., 1999). The present perspective is on single moral hazard in firm-to-firm transactions. The risk of moral hazard occurs when buyers cannot monitor the behaviour of the seller, and when the seller has an incentive to play make-belief on the buyer. In that situation, sourcing – the purchase of input – then becomes a tricky business in which purchasers seek signals for quality and safety. The present study finds that agents respond to the new policy with changed sourcing and signalling behaviour, but these changes are not necessarily for the better. Policy may work counterproductive for resource-poor agents, who should in fact be the prime target group of the proposed policy.

The paper is organised as follows. Section 2 discusses a food safety scare on aflatoxin contamination that provoked a new national food safety standard, which was designed by the South African food authorities in close coordination with the international regulatory body. Section 3 discusses how farmers and peanut butter manufacturers will respond to the proposed policy, along the lines of a simple two-choice model of sourcing and signalling behaviour. Section 4 assesses the need for side-policy if the proposed policy is to be effective, and precedes the concluding remarks.

2. Aflatoxin contamination in groundnut

Aflatoxin is a naturally occurring carcinogen that was identified as a health risk to consumers in the 1960s. The name aflatoxin refers to four toxins designated as B1, B2, G1 and G2, of which B1 is the most commonly found in food and is the most toxic. The most important dietary sources of aflatoxin are maize and groundnuts and products made of these (Codex, 2002). Intake of contaminated food is associated with two medical conditions: intake of severely contaminated products could result in immediate aflatoxicosis, causing severe nausea without lasting effects; high daily intake over a longer period greatly increases the risk of liver cancer in the long term.

The international panel on contaminations in food products, the Joint Expert Committee on Food Additives and Contaminants (JECFA) of the Codex Alimentarius Commission has been advising since 1997 that regulatory efforts should reduce the intake of aflatoxin to levels as low as reasonably achievable. Even small amounts of contaminated material could have the most serious of consequences, because a cancer can start when one minor string attaches to the consumer's genes. In this respect, the governance of risks differs from other contaminants such as residues of veterinary medicines; tolerated daily intake levels govern these. As a benchmark for aflatoxin tolerance, JECFA advises a limit of 15 ppb (parts per billion, or microgram per kilogram). Linked to this tolerance is the accepted statistical risk of around 40 cancer deaths per billion people (Otsuki et al., 2001).

Food authorities in South Africa argue that health conditions in their country require a tolerance of 10 ppb. The main argument for a low tolerance was the high incidence of Hepatitis B in the country when compared to the European population in JECFA's risk analysis. Food authorities' concerns focus on large populations of vulnerable consumers. The poor, especially

the young and old-aged, are at double risk. Malnutrition in combination with underdeveloped liver functions increases cancer risk. Moreover, for many poor consumers groundnuts are an affordable source of protein, and daily intakes are large. Poor consumers consume groundnuts mainly as peanut butter. There is, as will be explained below, good reason to link peanut butter with higher aflatoxin risk than fresh nuts, because low-grade groundnuts are used as input for production. Indeed, there have been reports of contaminated peanut butter that have sparked the current efforts by the food authorities to address the aflatoxin issue in the groundnut market.

In 2001, allegations were made that much of the peanut butter supplied by local manufacturers would substantially exceed regulatory tolerance levels on aflatoxin. The South African media picked up on the allegations as a major health threat to millions of vulnerable consumers, because since 1994 peanut butter has been distributed to undernourished school children nation wide as part of their school feeding programmes. Supposedly, in those years a major manufacturing industry evolved around the supply of peanut butter to schools, hospitals and prisons (Medical Research Council, 2002). After inspections, the national Department of Health confirmed that peanut butter supplies for schools in at least four provinces contained high aflatoxin levels, up to thirty times the legal tolerance in the province of the Eastern Cape. The inspections resulted in the prosecution of several suppliers, and, in some provinces, in the replacement of peanut butter by alternative products.

Out of concern that consumer risk stretched beyond schools and prisons to other segments of the South African groundnut market, the health and agriculture departments embarked on a policy process in co-operation with representatives of groundnut farmers, manufacturers and traders. Three observations contributed to the need to address the aflatoxin issue sector-wide. (Table 1 provides a balance sheet of the groundnut sector.) First, inspections of peanut butter sold by commercial brands in supermarkets revealed that about one-third of sampled jars contained aflatoxin levels above 10 ppb; many samples that did comply contained levels in the range of 5 to 10 ppb. This implied that contamination did not occur merely in the realm of small-scale manufacturers as the industry suggested. Second, an estimated share of between 5 and 20 percent of domestic groundnut supply is grown, processed and traded beyond the reach of the food authorities. In what follows, this supply is occasionally referred to as the "informal market" that is supplied by large numbers of agents including small(holder) farmers and small(-scale) manufacturers that undertake basic peanut processing for supply to local markets and schools. Third, at the other end of the market, food authorities in the European Union (EU) regarded South African groundnut supplies as high-risk products with regard to aflatoxin contamination. Of over 4800 lots presented to PPECB's export test facility in the marketing year 2001-02, 30 percent exceeded the EU's regulatory tolerance of 4 ppb (at a limit of 2 ppb for aflatoxin B1). Half of this share concerned levels exceeding 15 ppb, the tolerance at USA borders. In 2001, at least 450 tons of groundnut exports were refused entry into the EU (European Commission, 2002), at substantial costs to the traders involved. While the aflatoxin risk status of South African groundnuts was upgraded from "high-risk" in the years 2000-2001 to "normal" in 2002, the current drought conditions in the region renewed concerns for the current year with some EU inspectors of groundnut imports (Jeuring, 2003).

Thus, the alleged consumer risks in one specific segment of the groundnut market sparked a sector-wide effort to address contamination in order to prevent economic losses and safeguard public health. Several areas of intervention were identified (Department of Health, 2002). One is to alter the procurement practice for the school feeding programme. Another aims to address contamination through standardised practices at the stages of groundnut farming and processing. The following paragraphs discuss this preventive strategy and the results that can be expected from its implementation. The analysis acknowledges that prevention of

contamination is the basic strategy to protect consumer interests and that process standards are sound starting points for action – but such a strategy overlooks unfavourable features in the groundnut market that require dire attention if intervention is to reach its objectives.

Table 1. Groundnut production and use in South Africa, 1998 and 2002 (1 000 tons)

		1998	2002
Supply	Produced	100	140
	Imported	7	5
Use	Whole nuts, etc.	30	44
	Peanut butter	24	28
	Animal feed	0	2
	Crushed	13	18
	Informal trading	8	18
	Exports	32	35
Total		107	145

Note: all data are estimates. Source: Triotrade, Pretoria

Prevention of contamination: the JECFA paper

Aflatoxin is produced by fungal growth in various crops and tree fruits, which may develop before or after harvesting and under poor storage conditions (European Mycotoxin Awareness Network, 2002). Prevention of contamination starts with sound practices at the stages of groundnut farming and processing. As part of the policy process described above, the food authorities in South Africa developed a standard code of practice for these activities, which they submitted to JECFA.

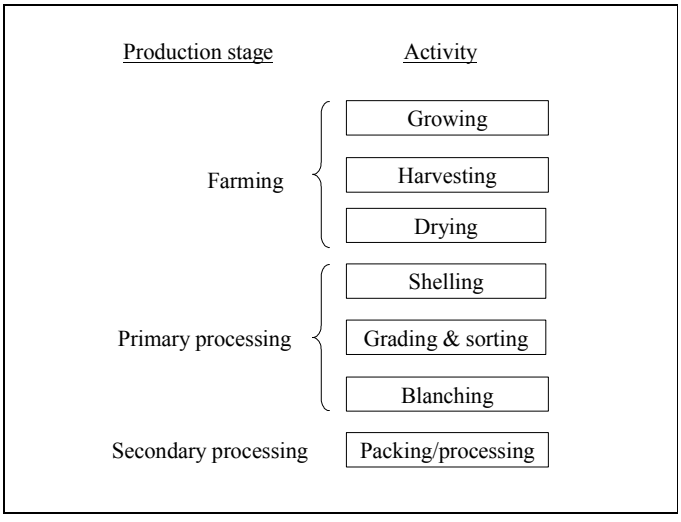

Figure 1. Groundnut production, stages and activities

While JECFA advises an aflatoxin tolerance of 15 ppb, it provides little guidance on how to prevent contamination, let alone on how to balance a substantial reduction of consumer health hazards and the costs for consumers and firms to achieve this goal. Peer peanut producing

countries such as Australia, Brazil, India, Thailand, UK and US struggled with similar questions. Consensus in JECFA evolved around the need for a code of practice for management of risk at the pre-harvest, harvest and post-harvest stages. South Africans proceeded to take the lead in the preparation of a discussion paper on a code of practice (Codex 2002), which was discussed at the March 2003 meeting of JECFA, and forwarded to the next implementation stage with just minor amendments. The remainder of this paper refers to the codes of practice proposed for the South African farming and groundnut processing activities as the JECFA policy, outlined next. See figure 1 for an overview of the stages and activities of groundnut production.

Farming practices. Proper farming practices are the "primary line of defence" against consumer health hazards from aflatoxin. Farming can have a substantial positive impact on the susceptibility of nuts to invasion of the plant by the fungi that produce the aflatoxin, *Aspergillus flavus* and *Aspergillus parasiticus*. The JECFA paper suggests several elements of a good agricultural practice (GAP) code. Crop rotation could prevent the build-up of a high population of these fungi in the soil; groundnut farming on semi-arid grounds where fungi accumulate easily avoids a high risk of infection. Prevention of plant stress from heat and drought is a very effective method to reduce contamination, especially in the last 4 to 6 weeks before harvest. Pest management indirectly reduces risk, as fungi have less chance to invade undamaged seeds and pods. One important element of pest management is the selection of a variety well adapted to soil and climate conditions and pest threats. Another is to leave ample space between plants. Sowing should follow climatic seasons, thus enabling post harvest field drying under favourable conditions. Having harvested the nuts at full maturity, the nuts are dried while still on the branch. Disease-infected plants are harvested separately in a first attempt to filter out high-risk nuts. A common field-drying practice is to pile plants in pyramid stacks, thus allowing proper exposure to sun and wind. To prevent fungus growth during storage and transport, it is essential to bring moist levels of nuts below critical levels. Much of aflatoxin contamination occurs when moisture and temperature levels are too high, regardless of dry and ventilated storage conditions.

Primary processing. The primary stages of processing include the sorting and grading, and the blanching of nuts. These activities often take place at cooperative plants, where supply from various farmers is collected and mixed. The proposed code of good manufacturing practices (GMP) pays a great deal of attention to the separation of high-risk nuts at these stages. High-risk nuts are recognised by reduced size, damage from pest infection or moulds, or otherwise irregular attributes. Size is an especially important signal for risk, as all nuts are sorted by size to determine their grade. The code of practice advises precise sorting, either hand sorting on a slow-moving well-lit belt, or machine-sorting in well-adjusted machines. Sorting results in various groundnut stocks, graded by size and suitability for human or animal consumption. After removing the brown skins (so-called blanching), a colour check is applied to separate possibly contaminated nuts. Darkish nuts are high-risk nuts.

At the end of the sorting stage, stocks are graded according to size and physical state. Grade and likelihood of aflatoxin contamination are inversely related. The proposed GMP advises conducting a laboratory test on aflatoxin as it is a necessary requirement of the primary processing stage. This should prevent contaminated groundnuts packaged as end products, or contaminated input into further processing activities. The GMP is likely to be implemented as a mandatory requirement.

Further groundnut processing. Further processing of raw groundnuts results in products for human consumption including peanut butter, and in feed products based on crushed nuts. The draft code of practice does not address further processing activities. Few hazards arise with

regard to aflatoxin contamination in the further processing of groundnuts; just the blanching of nuts could somewhat reduce aflatoxin levels.

3. How will farmers and peanut butter manufacturers respond to the JECFA policy?

3.1 Two-choice framework: purchasing input and reporting on output

For the purpose of the present study it is taken that the JECFA paper encompasses a range of measures that will have the desired effect of largely preventing aflatoxin contamination, under just one condition: that the policy is properly embedded in the market structure. Interest goes out to this condition and to possible government policies that facilitate the benign forces of competition. This section assesses the expected response by farmers and manufacturers to the JECFA policy by means of a simple model of the behaviour of the agents in the groundnut sector. Agents represent either a farming or a food-processing firm. This framework presents a firm as an agent that uses certain intermediate inputs to produce certain outputs.

By assumption, the characteristics of output are directly related to the characteristics of input. The agent has only two decisions to make, one in purchasing input and one in marketing output: (1) to buy inputs of trustworthy safety and quality or other, hazardous inputs; (2) to accurately or not accurately report on the inputs used in production. Because the input choice fully determines the safety and quality of output, in the model it is impossible for an agent to generate a safe output from hazardous input. There are several motivations for this rather restrictive assumption. Primarily, it captures the opinion that acceptable levels of low fungus growth and aflatoxin contamination in the pre-harvest stages can be achieved with straightforward measures such as those proposed under the JECFA policy. Alternatively, the assumption reflects the notion that once aflatoxin levels accumulate in groundnuts, they are unlikely to reduce during processing activities. The reporting choice determines the opportunities for the buyer to buy trustworthy input. Before the mechanisms that facilitate true reporting are discussed, it is useful to consider the four possible combinations of choices for an agent.

First, if an agent should choose to buy trustworthy input and report truly on the characteristics of output, it is assumed that the agent completes a small cycle of purchase and outlet under full (or "perfect") information regarding product characteristics. Full information in the present study refers to the case where there is available at the time of transaction a reliable laboratory test of aflatoxin levels, and information on producer precautions. The analysis does not cover supplier risks that arise from unobserved consumer practices regarding the handling and preparation of groundnuts. See Elbasha and Riggs (2003) for a recent account of consumer issues that complete the *double* moral hazard. They are not discussed here because the interest goes out to firm-to-firm transactions. Second, an agent can choose to buy trustworthy input, and not provide an accurate report on the specifications of its output. There is no positive incentive for this combination of choices. Buyers in the market will assume that products offered without a reliable signal are hazardous. Third, an agent can choose to buy hazardous input, and report honestly on the specifications of output. This is the likely scenario where buyers in "informal markets" seek the lowest price, and care less for quality and safety of the product. The buyer can even interpret the lack of producer precautions as a positive signal for low production costs. This gives producers an incentive to disclose on their practice. In practice, buyers of groundnuts in informal markets will select nuts by their physical appearance. Because the fungus that produces aflatoxin affects the appearance of the nut, a visual check allows for

some but not for total reduction of the likelihood of aflatoxin intake. Fourth, an agent may choose to cheat by marketing hazardous output as safe products.

At the heart of both the input and the reporting choice lie issues of information and co-ordination. As Bureau et al. (1999) argue with respect to the provision of safe food, the one issue relates to the other such that the availability of reliable information in goods exchange would solve many of the coordination problems typical to food safety issues. Trustworthy input is that which carries a reliable signal of quality and safety. Stiglitz (1989) describes several mechanisms that may generate a reliable signal, three of which are relevant to the present case. First, a supplier may have gained a certain reputation from transactions in the past or from experiences by other buyers. In the case of groundnuts, the notion of experience is restricted to laboratory tests on aflatoxin levels. Second, the strength of quality and safety signals is likely to be enhanced when a respected third party provides the signal. This is the concept of certification. Third, suppliers and buyers may seek forms of contractual relations that will allow disclosure of information between both agents on production practices and costs of precautionary measures. Food authorities in countries where the realm of government is small, and where resources for monitoring and control of food safety are limited should consider enhancing the function of the signalling mechanisms as an effective way to support food safety objectives.

The next section provides an assessment of how agents representing farmers or peanut butter manufacturing firms handle both input and output. It anticipates possible changes in market behaviour that can be expected when the JECFA policy is actually implemented. To a farmer, inputs include seed and soil; outputs are field-dried nuts. A peanut butter manufacturer uses these as input for various selection and processing operations. Input purchase and output reporting choices by agents are discussed in the order that follows the various production stages of peanut butter.

3.2 Purchase of seeds by groundnut farmers

The proposed policy leaves an important fallacy in the seeds market untouched. The Agricultural Research Council ARC-CGI is the government-designated monopoly supplier of certified seeds in South Africa. Resource-poor farmers cannot afford high-priced certified seed, and instead plant the smaller kernels of last years' crop. Since aflatoxin is genotoxic, it attaches itself to the DNA of a kernel and is reproduced when used as seed. By consequence, the likelihood of aflatoxin contamination is higher in resource-poor farming than in commercial farming. The build-up of aflatoxin-producing fungi in the soil enhances the problem. It follows that increasing the access of resource-poor farmers to uncontaminated seed and the resources required for production change are important parts of a strategy to reduce the uncertainty in the supply of field-dried groundnuts.

Incentive structure. The JECFA strategy outlines farming practices that prevent to a large extent the growth of the fungi that cause aflatoxin contamination. If implemented as a policy it forms a good start of an effort to reduce the uncertainties on aflatoxin levels in the domestic supply of field-dried groundnuts. Related efforts will have to address farmers that lack a positive incentive or the resources to implement the policy. Regarding the incentive structure, most farmers should have a positive incentive to implement the proposed GAP. Fundamentally, the code aims to improve plant protection that will result in both reduced invasion of aflatoxin-producing fungi and increased yield (in the form of return to land under cultivation). The yield increase will in the favourable case cover the costs of implementing integrated pest management and other investments.

3.3 Reporting on field-dried groundnuts

Among the farmers, some agents are more likely to report truly on the characteristics of their output, while others may cheat. More specifically, the introduction of the code of agricultural practice is likely to induce more disclosure on farming practices. The standard, if properly designed and implemented on the farm, reduces the incidence of severe aflatoxin contamination and ensures less differentiation in the aflatoxin levels of the output. Even more important to the farmer is that the standard allows a public reference to distinguish its practice from non-complying farmers. The publicly introduced GAP will serve the modern function of a standard, that of the differentiator of goods or agents in the market (Reardon et al., 2001). However, it is not only those farmers who actually comply with the standard who will seek to demonstrate their implementation of the GAP to the purchasers of their output. Also, the non-compliant farmers have an incentive to do so, and to operate as free-riders. This again will induce compliant farmers to provide their purchasers with stronger proof of compliance, for instance through ISO-certification. Concomitant quality management systems may serve for further advancement in the market, and, in turn increase reporting and disclosure. Many farmers lack the private resources to move into certified production. These have several options to distinguish themselves from free-riders. The first option is to seek the support of government for certification and the required changes in production, e.g. integrated pest management. The second alternative for farmers, is to seek close relations with the purchasers of their input, thereby allowing the build-up of reputation and trust, and support for changes in production. Indeed, various types of risk-sharing arrangements between farmers and manufacturers have become common practice in South Africa. Third, farmers lobby for increased monitoring and control by the food authorities of all groundnut farmers except those in the top market segment. The government then provides the service of appointing free-riders. In sum, the JECFA strategy will enhance the importance of reliable information on farming practices; many farmers and purchasers will turn to the government to deliver such information in all segments of the market except at the top end.

Statistical drawbacks: hotspots and sampling. What makes aflatoxin a special case in point is that even in a laboratory test it is hard to properly assess the risk of a batch of groundnuts. Contamination is spread unevenly throughout a batch and occurs in "hotspots", which makes reliable sampling a tedious exercise that is open for heavy debate. Food authorities are currently preparing a sampling plan. The reliability of a sample test is further related to the stage at which it is undertaken. This is linked to the statistical problem of hotspots. There is consensus that testing a jar of peanut butter reveals little more information than the risk level of that specific jar. Aflatoxin tests could better be undertaken at either the shelling stage or after harvest at the farm. A test after shelling has taken place is likely to be most effective, because there have been more opportunities for selecting by that stage. After shelling, however, it is usually impossible to trace the origin of the nuts so that the information base for preventive measures towards future supplies is lost.

3.4 Purchase of field-dried groundnuts by the peanut butter manufacturers

The groundnuts that are used as input for peanut butter production are of lower grade and price than consumption nuts. To put matters simply, sorting determines whether the destination of the nuts is for raw consumption, or for processing of some kind. Recall that the nuts of lower grade bear higher risk of aflatoxin contamination. The incentive structure for peanut butter manufacturers points to a risk of moral hazard in the peanut butter market: manufacturers lack a positive incentive to use trustworthy groundnuts because the costs of trustworthy input are higher than hazardous input; and because the grade of inputs is not

observable to the buyer. Price competition ensures that manufacturers use low-grade peanuts as low-cost input; food authorities need to ensure that products comply with the regulatory tolerance on aflatoxin levels.

Reduced uncertainty. The JECFA paper makes quite a great deal of improving the grading and selection of nuts, and proposes a mandatory aflatoxin test on shelled groundnuts. Several positive effects can be expected if this should materialise. First, the enhanced selection and testing will increase the likelihood that a bag of groundnuts actually contains what the label says it does. The reduced uncertainty forms an incentive for manufacturers to purchase higher groundnut grades than before, because it allows them to claim with more credibility that their peanut butter contain less than X aflatoxin levels. Such claims can be useful instruments to market products with consumers that are aware of the risks of aflatoxin in consumption, and to deal with retailers that seek to protect their reputation. What matters for the input purchasing choice is that if manufacturers aim to make reliable claims on quality and safety, they will require trustworthy inputs for production.

Small manufacturers. Unfortunately, there are chances that many of the peanut butter manufacturers operating as small-scale enterprises will perceive just the opposite incentive. Currently, these manufacturers source field-dried groundnuts through one of the following channels: local trade houses, small local farms, or commercial grading & sorting facilities. The latter channel is the most supportive in terms of food safety, as the operations at the grading & sorting facilities involve strict selection procedures and aflatoxin tests, even more so after implementation of the JECFA policy. The second best option is to draw on small local farms that combine a comparatively large likelihood of aflatoxin-contaminated output (as discussed above) with the benefits of possible farmer-to-manufacturer relations. The least supportive sources for safe input are the local trade houses, because rent seeking at these operations will likely incur at the cost of the quality and safety of supply.

The issue is whether the JECFA policy strengthens or reduces the attractiveness of the professional channel for the small manufacturer. Some comments can be provided on what seems to be an important subject for future analysis. The sourcing choice depends on many factors including geographical distance and price. To focus on price for the moment, there will be a certain price allocated to the reliable information on safety and quality in the professional channel that is likely to increase under the proposed policy. It seems reasonable therefore to expect a shift of relative prices in favour of trade houses or local farm output from increased reporting costs at professional facilities. However, the professional facilities may benefit from economies of scale in the provision of reliable information. Also, uncertainty arises regarding the price impact at the trading house where the volume of trustworthy to hazardous supply may change resulting in price increases. A possible driver of change is a strengthening of control on groundnut imports, and especially clandestine imports that have been said to be a major source of aflatoxin in South Africa. This may occur because local farm prices will react to the changes in the market, and thus the impact of the proposed codes of practice on the sourcing choice is uncertain.

Exclusion of small farmers. There is a worldwide trend towards reduced involvement of small farms in the supply to food manufacturers at the benefit of commercial farm practice, and towards vertical integration in the product chain. It has been documented for several types of situations that strengthening of regulation enhances this process (Farina and Reardon, 2000; Reardon et al., 2001). These processes merit economies of scale and investment, and disfavour small-scale suppliers. There are no reasons to believe that the JECFA policy will be different from these documented cases. Already, small farmers whether operating individually or in outgrower schemes are not involved in the supply chain for South Africa's two major peanut

butter brands, Yam-Yam and Black Cat. There is unfortunately no documentation on the sourcing for unbranded peanut butter from country-wide retailer formulas such as Pick 'n Pay and Shoprite/Checkers.

3.5 Reporting on peanut butter

Suppose that the main driver for the reporting choice of peanut butter manufacturers on their output is their relation to consumers and to retail outlets. Manufacturers that use trustworthy inputs are inclined to report on the attributes of their products. On the web site of peanut butter brand Yam-Yam claims are made on various measures and tests that are carried out to reduce aflatoxin levels to mandatory levels. There are no reports on efforts to make these claims more reliable by means of certification or government testing, nor have references been made as to the quality standards maintained by retailer formulas. This may change partly due to the JECFA policy. When aflatoxin control becomes an issue in competition between branded and unbranded products, commercial peanut butter producers such as Yam-Yam and Black Cat may attempt a strategic move to distinguish themselves as being the least-aflatoxin producers. This again implies that the manufacturers, by their efforts to enhance the safety of output, are forced to reduce the risk of aflatoxin-contaminated inputs. It provides these manufacturers with a motive to avoid dealing with suppliers that do not regard safety standards in the market. The JECFA policy will therefore strengthen the use of information exchange between these manufacturers and selected well-organised farmers in order to exclude free-riding farmers. A possible response by retailer formulas is to further reduce uncertainty in the supply chains for unbranded peanut butter. This leads to an increased need for information exchange in lower segments of the market, and reduced opportunities for false reporting on hazardous products and production methods.

4. Policy implications: protecting producer and consumer interests

Next follows a discussion on related government efforts that are required to create the necessary market conditions for the JECFA policy to reduce the uncertainties regarding the safety of groundnuts.

4.1 Government role in safe groundnut production

The JECFA policy serves as a guideline for safe groundnut production. There is a use for such a guideline in various segments of the groundnut sector, as is demonstrated by a 30 percent refusal rate of groundnuts for exports to the EU in the marketing year 2000-01, and widespread tolerance exceeding in branded peanut butter of South African make. Yet, the critical policy issue is how to support the small farmers in their implementation of the proposed code of good agricultural practice.

One can observe in South Africa that there is proper control on aflatoxin in exported groundnuts. By government directive, maximum levels of aflatoxin in raw exported nuts were set at levels of the EU, the major export destination. The industry developed sampling and testing procedures according to guidelines set by the European Commission, which accredited the South African Bureau of Standards to certify local laboratories. Thus, the South African government was involved in the industry's compliance strategy, but hardly at its own initiative. In these instances, the commercial exporters capture the regulatory process by initiating codes of practice and standards. The role of government was that of a responsive enabler. In contrast, health and agriculture departments take a very pro-active stance in the current effort to address the risks in groundnut production and consumption. It has appeared difficult to involve

commercial growers and processors in the process of safeguarding public health. One reason is that export control is already established; another reason is that commercial growers have set up private laboratories and quality assurance systems.

Food authorities will, therefore, have to take the lead in enhancing the safety of supply by small groundnut farmers. There are several options for the South African government, which include providing access to laboratory facilities and safe inputs for small farmers' co-operative operations. In combination with education on good hygienic and agricultural practices these could strengthen the capacity of farmers to produce cash crops. Some public research efforts may facilitate this process. Useful research issues would include labour-intensive pest management and weeding; and the assessment of market opportunities on the local market and in niche supplies. To reduce the risk of exclusion, small holders will have to expand or join forces in co-operative operations. Government may support the former by addressing the access of small-scale entrepreneurs and farmers to credit, and the latter with capacity building efforts. One other option for smallholders is to engage in contractual arrangements with suppliers, e.g. in an out growers scheme, whereby government acts as a risk broker.

4.2 Government role in safe peanut butter supply

There are two main issues for the South African food authorities in facilitating peanut butter supply that contains low levels of aflatoxin. The first issue is to bring improvements in the information base on the inputs to peanut butter production. By addressing selection and grading practices, the JECFA policy takes an important step in this direction. The complementary need to enhance access to reliable laboratory tests is currently being addressed by the authorities. The proposed policy does not, however, make an explicit link between groundnut grade and the likelihood of aflatoxin contamination. This is unfortunate given that reliable information on aflatoxin levels is expensive – recall the hotspots – and the signalling power of grade as an indicator of aflatoxin is widely acknowledged. For that reason, a mandatory labelling requirement on the grade of groundnuts used for peanut butter production seems an effective way to provide consumers with information on hazard likelihood. See Golan et al. (2000) for a discussion of mandatory labelling as an instrument of food safety policy.

The second issue of concern is the sourcing practice of small peanut butter manufacturers. The introduction of good practices under the JECFA policy could very well reduce small producers' reliance on trustworthy groundnut suppliers. This was discussed above as a result of a shift in relative prices of the various supplies as a result of the new policies. In response, food authorities are advised to integrate small peanut butter manufacturers and commercial groundnut suppliers. Integration serves food safety considerations as a two-edged sword: not only is it one of the few options to increase the trustworthiness of small producers' inputs; it serves to enhance reputation-building by commercial producers too. The Groundnut Forum, representing the commercial peanut processing industries, noted that the major impediments to safer groundnut supply included the unsatisfying separation of contaminated from healthy groundnuts at the farming and primary processing stages, and the notorious difficulty of sampling (Department of Health, 2002). This illustrates that high-value producers do not perceive a need to change their own practices. More importantly, these producers neglect the possible relations between commercial and small-scale supply in the following dimensions.

Reputation on the global market place also depends on the local market. This is arguably the most compelling link between commercial and small-scale producers. Large-scale commercial producers, especially exporters, benefit from efforts to reduce the risk of domestic food scares. In that sense these producers are free riders that can be expected to contribute to efforts to address the aflatoxin contamination sector-wide.

Cross-contamination. Without a comprehensive approach to address the issue of aflatoxin contamination, there is still a remaining risk that contaminated nuts enter the high-value groundnut chain. The bulk character of groundnut production is in part due to this risk. The risk of cross-contamination for high-value producers is reduced by the use of certified seed, but remains vulnerable to fraudulent practices.

Shared raw supply. Choice grade export and home production and lower-grade output are intrinsically linked at the sorting stage. In short, the raw groundnut input discarded for export production is input to the production for the domestic market. This puts processors in the position to influence the domestic input markets for peanut butter and feed production.

As part of their efforts to safeguard the interests of both producers and consumers, food authorities should actively seek to integrate the operations in upper level and sub-standard segments of the groundnut market. The commercial sector is related to the sub-standard segments as a supplier of seed or raw material, which puts commercial companies in the position to reduce aflatoxin levels in small-scale production. Authorities could actively promote that commercial producers share the responsibility to safeguard outgoing groundnut flows from contaminants, and have these producers contribute skills and other resources as investments to achieve that goal.

4.3 Institutional issue

Much of the current occurrence of aflatoxin levels is related to the liberalisation of the oilseed market, which occurred around 1995 (Department of Health, 2002). That period of political transition in South Africa saw the demise of the Oilseeds Board, together with several other collective private organisations closely linked to agricultural and food policy. The Oilseeds Board had governed the aflatoxin policy from 1976 on. Liberalisation and political transition came at the cost of a removal of existing infrastructure for control. There are several reasons to think that under the Oilseeds Board, management of aflatoxin risks was equally difficult then as it is now. Information on aflatoxin levels was scarcely available in groundnut transactions then and now. There was a similar type of market segmentation that excluded numerous groundnut farmers from the oilseeds marketing board, and accordingly denied proper seed supplies and favourable price incentives. After the demise of the Oilseeds Board commercial groundnut farmers united under the wings of the united oilseed producer organisation, GRAIN SA. The groundnut industry (processors and manufacturers) joined forces in the Groundnut Forum, to which representatives of the competent food authorities were invited to specifically address the issue of aflatoxin contamination. These authorities set up a joint working group of designated officials from the Department of Health and the Department of Agriculture. In turn, farmer and industry representatives sit in on this governmental steering committee. Arguably, this arrangement allows for a better balance of the stakes of the four interest groups identified in this paper. Specifically, the interest of small producers and poor consumers can be better protected if there is an active involvement of food authorities in the sector.

5. Conclusion

The previous sections have revealed that South African consumers and producers of groundnuts and peanut butter are confronted with several uncertainties and risks. The JECFA policy is aimed at reducing two key risks: first, the incidence of aflatoxin contamination in the output of farmers that are willing and able to implement the proposed code of good agricultural practice (GAP); second, the chance that contaminated nuts pass undiscovered at the professional sorting plants. False reporting on the likelihood of aflatoxin contamination will

occur in more incidences. It is suggested that the forces of competition will serve to enhance the safety of supply if the link between groundnut grade and the likelihood of aflatoxin contamination is explicitly made. A related labelling policy on aflatoxin levels could facilitate true reporting on output and thereby even further reductions of contamination.

The most important finding, however, is that the small farms and food firms that supply to the poor consumers are unlikely to enhance the safety of their output. Without complementary policies, resource-poor farmers will not implement the proposed GAP, and small peanut butter manufacturers are unlikely to source more from professional sorting plants. Policy to reduce contaminants in supply will, therefore, have to distinguish between various categories of producers. If policy strategy is directed strictly towards prevention of the risk in production, important leaps may be overlooked, and consumer hazards will prevail. The efforts required by food authorities are quite low if existing incentives for producers are favourable to safe supply. Then, the government's role is to enable buyers to retrieve information on risk levels by, for instance, providing standardised laboratory practices and supporting an accreditation structure. If incentives are unfavourable, and the market does not deliver acceptable levels of safety, then direct interventions in the market are required. An example may be a ban on certain inputs or a mandatory product standard. This will raise a need for an increased monitoring and surveillance effort, which in an upper level of the market is feasible but it is unlikely to work in the sub-standard market segments. Policy options for market segments that involve producers beyond the reach of competent authorities, are to address the inputs into production and the hazard awareness of vulnerable consumers. Access to better inputs and information should both enhance the safety of small-scale supply, and reduce the vulnerability of small-scale producers.

In a case like the groundnut issue described here, international assistance could contribute to a proper balance of consumer and producer interests in various ways. First, 'the North' should provide proper information and communication on standards that apply in their markets and in undertaking risk assessments adapted to specific needs of vulnerable consumers and scale producers. Second, with respect to the latter, 'the North' could support the development of local markets as well as export markets for producers that are at risk of exclusion from food markets. Such strategies could include an assessment of alternative means to secure the livelihood of vulnerable producers.

Acknowledgements

The research for the present study was undertaken for the preparation of *Guidelines on Food Safety, SPS and Trade for Developing Countries*, on assignment of the World Bank under its programme Trade, Standards and Food Safety for Market Access and Agribusiness Development. Financial support from the Dutch Ministry of Agriculture, Nature and Food Quality is gratefully acknowledged. Thanks go out to the designated officials at the Departments of Health and Agriculture in South Africa, for letting the author take part in the policy process regarding the aflatoxin issue. The opinions expressed in this paper should be attributed to the author only, not to any of the institutes mentioned above.

References

[1] Bureau, J.-C., E. Gozlan and S. Marette (1999) "Quality signalling and international trade in food products" Unpublished manuscript. Grignan: INRA-ESR

[2] Chan, Man-Kwun and Bill King (2000) "Review of the implications of changes in Eu pesticides legislation on the production and exports of fruits and vegetables from developing country suppliers" Report prepared for the UK Department of International Development. Chatham Maritime: National Resources Institute

[3] Codex (2002) Discussion paper on the development of a code of practice for the reduction of aflatoxin contamination in peanuts. Paper for the 35th session of the Joint Expert Committee on Food Additives and Contaminants, 17-21 March 2003, prepared by the South African delegates. Annex to document ALINORM 03/12A, April 2003. Rome: Codex Alimentarius Commission

[4] Department of Health, South Africa (2000) Role and responsibility of the public health sector regarding food safety control. Pretoria: National Department of Health, Directorate Food Control

[5] Elbasha, E.H. and T.L. Riggs (2003) The effects of information on producer and consumer incentives to undertake food safety efforts: a theoretical model and policy implications. *Agribusiness* Vol. 19(1), pp. 29-42

[6] European Commission (2002) Final report of a mission carried out in the Netherlands from 11 to 13 February 2002 in order to assess the control measures in place for import controls on products of plant origin. Report no. DG(SANCO)/8515/2002. Brussels: European Commission, DG Health and Consumer Protection

[7] European Mycotoxin Awareness Network (2002) web source www.lfra.co.uk/eman, accessed 20 December 2002

[8] Golan, E., F. Kuchler and L. Mitchell (2000) "Economics of food labeling" Economic Research Service, U.S.D.A., Agricultural Economic Report No. 793. Washington D.C.: U.S. Department of Agriculture

[9] Jeuring (2003) Personal communication to Mr H. Jeuring, inspector of groundnut imports with the Dutch Food and Non Food Authority, January 2003

[10] Medical Research Council (2001) 'Aflatoxin in peanut butter'. MRC Policy Brief no. 3. Tygerberg, Cape Town: Medical Research Council of South Africa

[11] Merx, R., T.J. Achterbosch and A.J. Smelt (2002) Proceedings from the workshop on country assessment and development of guidelines for food safety capacity building, Pretoria, South Africa, 25-26 April 2002. Wageningen: IAC

[12] Otsuki, T., J.S. Wilson and M. Sewadeh (2001) 'What price precaution? European harmonisation of aflatoxin regulations and African groundnut exports' *European Review of Agricultural Economics* Vol 28 (2), pp. 263-283

[13] Reardon, Thomas and Elizabeth Farina (2002) The rise of private food quality and safety standards: Illustrations from Brazil. *International Food and Agribusiness Management Review* 4: 413-421

[14] Reardon, Thomas, Jean-Marie Codron, Lawrence Busch, James Bingen and Craig Harris (2001) "Global change in agrifood grades and standards: Agribusiness strategic responses in developing countries" *International Food and Agribusiness Management Review* 2(3)

[15] Stiglitz, J.E. (1989) Imperfect information in the product market. Chapter 12 in R. Schmalensee and R.D. Willig, *Handbook of Industrial Organisation*, Volume 2, pp. 769-847. Amsterdam: North Holland