



INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE

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Ghana Strategy Support Program

Aflatoxin: Quality institutions in the groundnut value chain

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Its Importance

- Groundnut is an important crop
 - 495,400 tons produced on 346,900 ha in 2009 – area is going down, but yields are increasing
 - Groundnuts are grown throughout the country; nearly two-thirds of the farmers in the northern three regions report harvesting groundnuts;
 - it is particularly an important crop in two of the three northern regions, where it is one of two important crops for nearly a fifth;
 - since it is such an important ingredient in the local food, nearly all those who produce retain some for consumption as well, particularly so in the north.

Its importance – contd.

- An integral ingredient of Ghanaian diet
 - Eaten roasted and in the form of paste added to a number of dishes
- Regardless of the levels of income, nearly a third of the population purchases groundnut regularly; but nearly half of the households falling into the top three income/expenditure quintiles in the north appear to buy regularly
- Data are not clear, but groundnut and products may account for a tenth of the expenditures on food.

Consumer preferences

Form	Dislike		Neither		Like		Number of observations
	very much	Dislike	like nor dislike	Like	very much	Don't eat	
----- percent -----							
Boiled							
Farmers	2.4	5.6	1.2	28.5	60.6	1.6	249
Wholesalers	0	4.8	33.3	23.8	33.3	4.8	21
Traders/Vendors	0	0	42.1	47.4	10.5	0	19
Cottage processors	0	3.2	51.6	32.3	9.7	3.2	31
Roasted							
Farmers	.4	4.4	2.0	31.3	60.6	1.2	249
Wholesalers	0	18.2	22.7	27.3	22.7	9.1	26
Traders/Vendors	0	21.1	36.8	31.6	10.5	0	19
Cottage processors	0	16.1	45.2	32.3	6.5	0	31
Dzowe/dakwa							
Farmers	.8	2.8	6.9	19.4	26.7	43.3	247
Wholesalers	4.6	9.1	27.3	13.6	18.2	27.3	22
Traders/Vendors	0	15.8	52.6	5.3	0	26.3	19
Cottage processors	0	3.2	61.3	12.9	12.9	9.7	31
Kuli-kuli							
Farmers	1.6	3.2	4.0	22.5	65.9	2.8	249
Wholesalers	0	0	50.0	13.6	31.8	4.6	22
Traders/Vendors	0	5.3	36.8	26.3	26.3	5.3	19
Cottage processors	0	3.3	16.7	33.3	46.7	0	30

Consumer preferences – contd.

Form	Dislike		Neither		Like		Number of observations
	very much	Dislike	like	nor dislike	very much	Don't eat	
----- percent -----							
Groundnut paste							
Farmers	2.4	3.6	15.8	22.7	36.8	18.6	247
Wholesalers	0	4.6	13.6	22.7	50.0	9.1	22
Traders/Vendors	0	0	10.5	31.6	57.9	0	19
Cottage processors	0	0	13.3	20.0	66.7	0	30
Nkati cake							
Farmers	2.5	3.8	6.8	18.2	40.7	28.0	236
Wholesalers	0	0	36.4	4.6	31.8	27.3	22
Traders/Vendors	5.26	0	31.6	15.8	21.1	26.3	19
Cottage processors	0	6.5	64.5	16.1	9.7	3.2	31

Preferences from an urban survey

Do you like groundnuts? The basis for aflatoxin consumption using groundnuts as a vehicle is preference for a product. (in parentheses % responding "yes")

Accra 92% Tamale 97% Takoradi 99%

Would you like to eat more roasted groundnuts? If income increases, consumers will increase roasted (contaminated?) peanut consumption.

Accra 52% Tamale 78% Takoradi 71%

Do members of your family like groundnuts? So, it is not a single person in a household that could eat aflatoxin contaminated peanuts.

Accra 92% Tamale 98% Takoradi 97%

Source: Summary results on this and the next two slides from the survey of the Peanut CRSP peanut utilization and commercialization project.

Weekly expenditures on groundnuts

	Less than 2 cedis	2-3 cedis	More than 3-5 cedis	More than 5-10 cedis	More than 20 cedis
Accra	30%	27%	23%	8%	2%
Tamale	15%	19%	37%	20%	8%
Takoradi	20%	41%	27%	10%	2%

Consumption of groundnut paste

- Do you eat groundnut paste? Peanuts ground into paste include typically split kernels and kernels that are not suitable for other uses. Some damaged or discolored kernels are commonly used in making paste.
 - Accra 96% Tamale 99% Takoradi 99%
- How often do you eat groundnut paste? The frequency increases the probability of eating contaminated paste. Results show only the share of respondents eating it at least 5-6 times a week.
 - Accra 6% Tamale 39% Takoradi 10%

aflatoxin

- Aflatoxin is a toxic, carcinogenic(class 1) by-product of fungi that colonize maize and groundnuts, among other crops
- More than 4.5 billion people in developing countries may be chronically exposed to aflatoxin in their diets
- Aflatoxin contamination most often occurs when crops suffer stress, such as drought and insect infestation
- Ingestion of high levels can be fatal, while chronic exposure may result in cancer or liver cirrhosis, weakened immune systems, and stunted growth
- Exposure to such toxins is successfully limited through stringent food safety regulations in developed countries, but not so in developing countries with subsistence farming, lack of irrigation, and inadequate drying and storing facilities.
- Aflatoxin control has significant implications for both health/productivity and building competitive agriculture



outline

- Objective: to examine the level of aflatoxin contamination of groundnut and its products and production and post harvest practices that contribute to it.
- Organization of the presentation
 - Methodology
 - Practices in the value chain
 - Levels of contamination
 - Quality institutions
 - Control strategies

Methodology

- Survey of all economic agents from producers to small scale processors in July-August, 2011
 - 248 farmers in 11 villages in the northern region
 - 22 wholesalers in Aboaboa and Savanna markets in Tamale and timber market in Accra
 - 22 vendors in Aboaboa, Old, and Ozu markets in Tamale; and Medina market in Accra
 - 30 small scale processors in Tamale and Accra
- 70 samples collected from interviewees
 - 29 raw nuts
 - 46 processed
 - 5 formally processed

Practices: Production

- Average planted area was 3.86 acres, ranging from 1 to 20 acres
- Three-quarters of the producers intercrop with maize, millet, cassava, and sorghum, also susceptible to aflatoxin
- Factors that drive choice of variety are yields and ease in harvesting; drought tolerance and disease resistance are considered important by a smaller share of producers
- Do not use fertilizer: do not know how; crop specific fertilizer not available;
- One-third of farmers use herbicides, few take plant protection measures

Practices: post-harvest

- Nearly 85 percent did not sell immediately after harvest as groundnuts with high moisture content are discounted heavily
- Groundnuts are dried in shell and then shelled prior to sales – they are usually stored in shell until marketed
 - Only a small portion of the groundnuts are marketed in shell
- Groundnuts were traditionally stored in pupuris built in fields
 - Only about 12 percent do now because they are susceptible to theft
 - The rest store in jute and polyethylene bags
 - A small percentage store in “kanbon” or “kanchun”, large sacks made of plastic material

Practices – post harvest contd.

- Considerable quantities of groundnuts are stored
 - On average, producers stored 17.75 bags, more than half a ton; they are sold as needed until next planting
 - About one tenth of the farmers stored 40 bags or more
- On average, producers reported selling about 10 sacks in the previous season
- Selling: about a quarter on farm; about three quarters in the village market and another quarter in town markets

Practices – post harvest contd.

- Considerable storage by traders as well
 - At the beginning of harvesting season, only two thirds of the traders indicated having inventory
 - Little more than half stored in jute sacks – that may have been used for storing other grains -- and a majority stored less than 10 bags.
 - Nearly one half use rented space
 - GHc0.50 per sack for 1-30 days
 - GHc1.00 per sack for week to six months
 - Ghc2.00 per sack for longer than six months.

processing

- Large scale food manufacturers have withdrawn from groundnut processing because of unstable supply of adequate volume of quality groundnuts
- There is some large scale production of roasted groundnuts – not free from aflatoxin
- Small scale informal processing of groundnuts are done largely by women
 - It is not a full time work
 - Less than 10 percent process daily
 - nearly one half process once a twice a week
 - The rest once a week or less frequently
 - They usually process ten bowls of groundnuts which give them a basin of paste

Processing – Contd.

- Paste is obtained by grinding lightly roasted groundnuts.
- Oil is obtained by pressing groundnuts
- The cake left after oil extraction is used in making Kulikuli
 - Kulikuli is a snack fried in groundnut oil
 - Crushed, kulikuli zim is used as a condiment to flavor meats, plantain and added to soups – more than 60 percent of the processors made them
- Roasted groundnuts are sold by 13 percent of processors

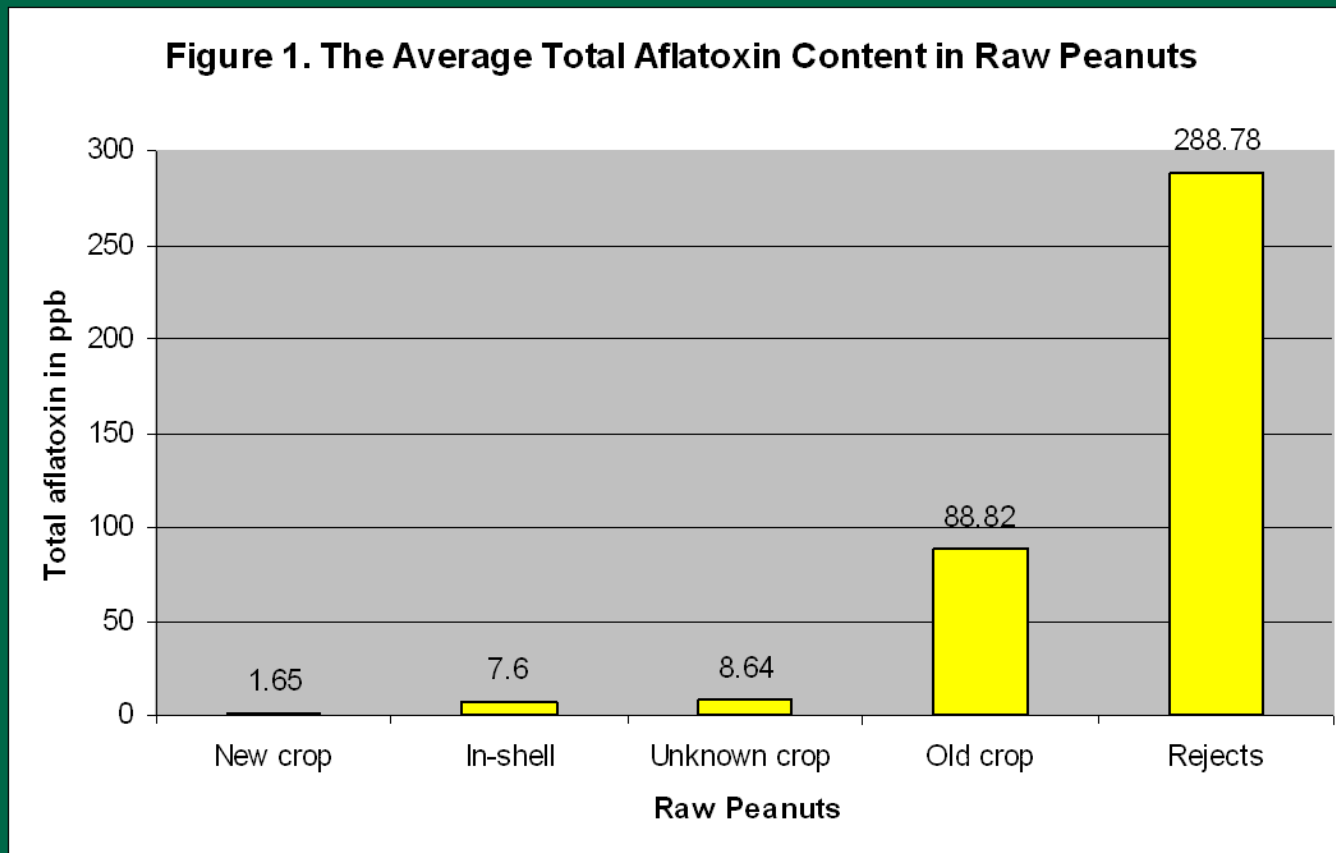
Aflatoxin contamination

- Aflatoxin is a metabolite of the fungi of the *Aspergillus* species
 - *Aspergillus* grows on the outer surface of the groundnut pod and spreads inwards reaching the inside of the kernel
 - Aflatoxin contamination discolors the kernels
 - Damaged kernels are more likely to become contaminated – harvest and post harvest handling and insect damage

Acceptable levels

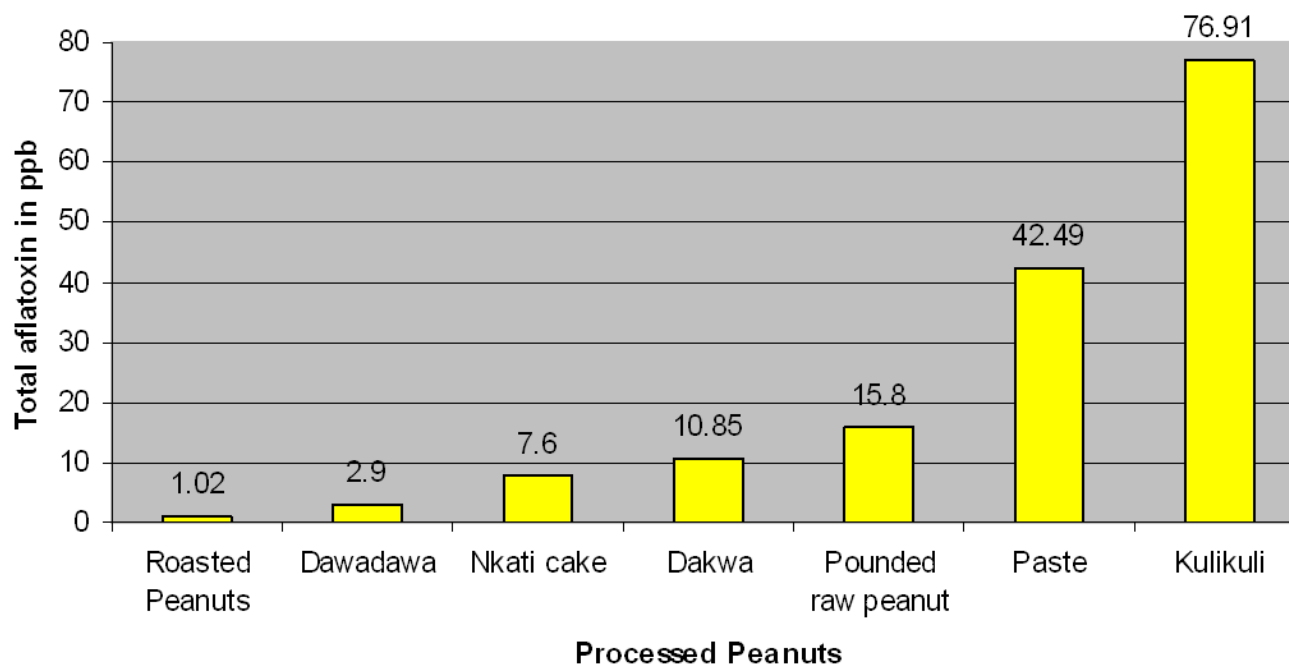
- Ghana Bureau of Standards: 15 ppb in raw shelled groundnuts
- FDA: 20 ppb of total aflatoxin in groundnut and groundnut products
- EU: 15 ppb with exceptions; groundnuts and products intended for human consumption may contain no more than 4 ppb, with a target of 2 ppb.

Aflatoxin in raw groundnuts



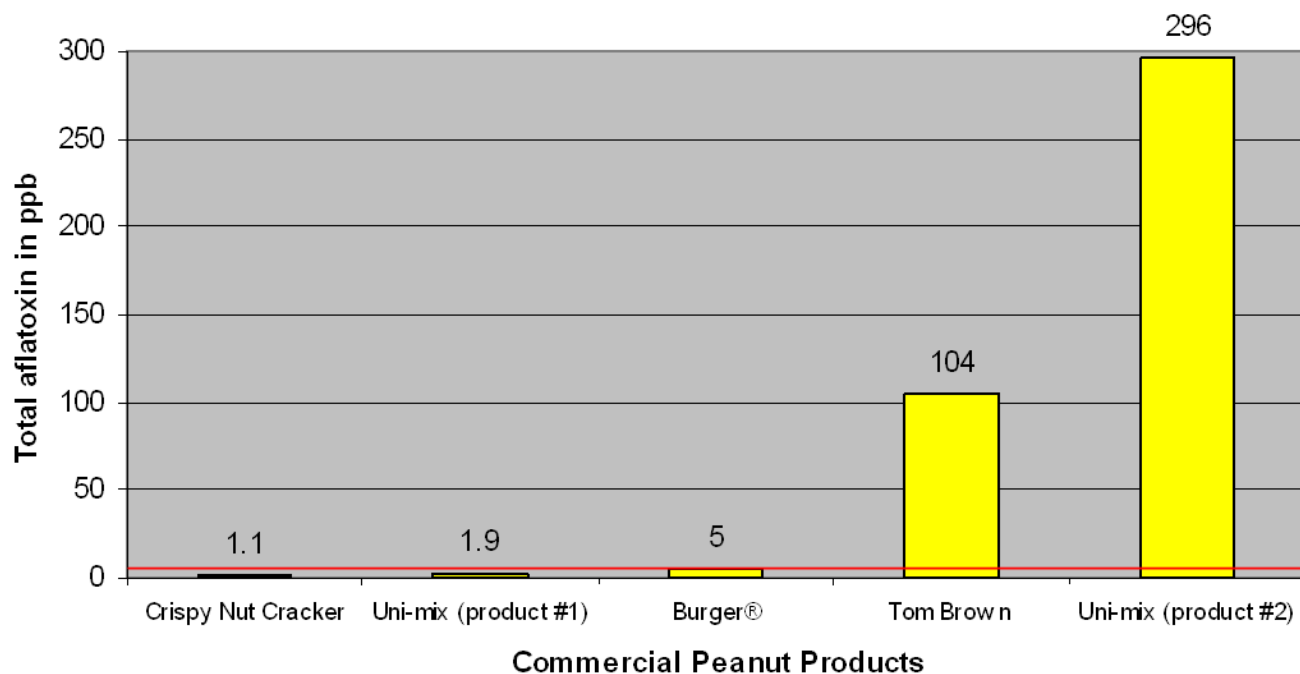
Aflatoxin in informal products

Figure 2. The Average Total Aflatoxin Content in Cottage Industry Processed Peanut Products



Aflatoxin in formal products

Figure 3. The Average Total Aflatoxin Content in Manufactured Peanut Products



Key findings

- New crop groundnuts have acceptable levels of contamination; previous year's crop, as expected, has unacceptable levels
- Very high levels in rejected kernels – but they don't go out of the food chain; often sold to dawadawa makers
- Roasted groundnuts which may often be made from new crops has acceptable levels
- Informal products diluted with other material have acceptable levels
- But informal products that contain only groundnuts have unacceptable levels of contamination
- Formally manufactured products too have high levels of contamination.

Do quality institutions minimize contamination?

- Nearly all traders and vendors have criteria by which they assess the quality of groundnuts they buy
 - Wholesalers care about the presence of damaged kernels, kernel size and color
 - About 40 percent of them looked for discolored kernels, usually molded on the outside
 - Nearly 80 percent of traders visually inspect every bag and also samples taken from them
 - Small scale processors pay attention to skin color, taste, oil content and kernel size
- Kernels are rejected because of their size – potentially more contaminated – but they don't leave the human food chain: 30 percent grind them into paste; 25 percent sell to others; 55 percent use them in other ways



Other practices

- Machine shelling may damage kernels more than hand shelling – farmers often moisten the pods to reduce breakage.

Control strategies

- Consumer education – through the market
 - Information problem – particularly in processed products
 - Perceptions of risk and willingness to pay for aflatoxin free products
- Regulation
 - Limited testing capabilities; none certified internationally
 - High costs of monitoring informal products (\$90 per sample)

Control strategies – contd.

- Prevention
 - Improved cultivation practices
 - Improved storage facilities
 - Grading and sorting
- Reduce health damage
 - Use of bentonite
- Who will bell the cat?
 - Is this likely to be market driven?