

# Food Safety and Mango Export Crop Production in Ghana

## ABSTRACT

This article investigates Ghana's agriculture policy on food safety and safety compliance. The research was conducted in Yilo Krobo and Kintampo North, two major mango growing districts in Ghana. Primary data was collected from forty-three (43) respondents made up of 32 farmers and 11 key informants from key state institutions, development partners and processors. The study concludes that close proximity of food safety standards compliance bodies, bilateral and multilateral cooperation by injection of funds, input and skills training play major roles in food safety compliance. Embargo (sanctions) and economic power (money) are resources at the disposal of regulating bodies and consumers' to invoke for non-compliance to food safety standards. These resources are deterrent enough to compel mango producers and exporters to adhere to production standards. The author recommends that state funding to the institutions and agencies responsible for food safety enforcement and monitoring should be regular to sustain the momentum on compliance with food safety.

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## Keywords

Food Safety, Kintampo, Mango, Yilo Krobo.

## INTRODUCTION

Ghana is noted for its intercontinental trade in export crops such as Cocoa, Coffee, Palm Oil and Shea butter (Frimpong-Ansah, 1991; Killick, 1978; Mikell, 1989;). The country's trade in these commodities significantly integrates the economy into the international division of labour. The production of cocoa, oil palm and shea trees led to the intrusion of smallholder farmers into the frontiers of virgin forest (Amanor, 1994; Hill, 1963). Several studies on Ghana's major export crop production noted that though cocoa and oil palm production are dominated by male adults, the same cannot be said of shea whose extraction and processing into butter is mainly the preserve of adult female folks (Chalfin, 2004; Daddieh, 1994; Hill, 1963; Mikell, 1989). The literature further stated that the commercial organisation of production of cocoa, oil palm and shea butter which started in the late 19th century was dominated by smallholder farmers (Amoah, 1998; Mikell, 1998; Hill, 1963).

The economic fortunes of cocoa production and export to Ghana's socio-economic development are enormous (Frimpong-Ansah, 1991; Killick, 1978; Mikell, 1998). Revenue accrued from cocoa export was expended on infrastructure development, provision of social amenities, payment of salary to public sector workers and scholarship scheme for cocoa farmers' children/dependents and outstanding Ghanaian scholars (Amoah, 1998; Frimpong-Ansah, 1991; Killick, 1978; Mikell, 1998). However, cocoa production dropped and foreign exchange earnings fell in the 1970s and therefore cocoa's contribution to the economy dwindled (Killick, 1978; Frimpong-Ansah, 1991; Dzorgbo, 2001). Major factors which influenced the fall in production were: farm neglect due to lower producer price of cocoa,

high import tax on production inputs, and cocoa smuggling into neighbouring countries ( Gyemah-Boadi and Jeffries, 2000; Dzorgbo, 2001; Chalfin, 2004). The situation worsened in the 1980s to the extent that the then Rawlings-led government prioritised diversification of export crops production particularly mango.

The literature on export crops production in Ghana is replete with anthropological and sociological analyses of foreign agencies and state policy influences in the implementation of food safety standards in cocoa, palm oil and shea butter processing and export (Amoah, 1998; Daddieh, 1994; Chalfin, 2004). The same cannot be said of mango in Ghana. The literature on compliance with food safety standards in the cocoa industry in Ghana shows that the state intervened to safeguard safety of exportable cocoa beans (Amoah, 1998). Globally, literature on food safety indicated that compliance with food safety standards is achievable through schemes such as contract farming and farmer based organisation (Narrod et al, 2008; Humphrey and Schmitz 2001). However, the Ghanaian context on food safety did not give details of whether contract farming or farmer based organisation schemes were used to ensure food safety compliance.

Thus, in order to fill the sociological gap in the literature on the emerging mango industry in Ghana, this paper investigates the state's policy on food safety compliance and its influence on multiple extension services delivery in ensuring food safety, as well as the processes of integrating mango farmers into the global food safety standards compliance.

The rest of the article is organised into seven sections which are as follows: Section II looks at the global perspective of food safety in crop exports. This is followed by section

III which deals with the compliance of food safety standards in the cocoa export crop production in Ghana, and serves as a precursor to the safety standards in other horticultural export crops production. Section IV focuses on a brief historical trajectory of mango export crop production in Ghana. Sections V discusses the research methods employed in the study, while the theoretical framework used in conceptualising food safety standards regulations is discussed in Section VI. Major results and discussions are in section VII while conclusion is drawn in section VIII.

## **Food Safety and Crop Exports--A Global Perspective**

Food markets in developed countries such as Netherland, United Kingdom, France, Germany and other European Union member states have instituted several changes in the requirements of agricultural production and these changes have far-reaching implications for crops production and export growth in developing countries. According to (Okello and Swinton, 2007:269), micro-organisms and pesticides food contamination have generated apprehension for the shopper in Europe and America and these phenomena led states in Europe to ratify stringent food safety regulations. They add that developing countries (where most fruits and vegetables are produced) and European Union representative firms of fresh produce retailers and exporters are obliged to respect and adopt the International Food Safety Standards.

These requirements have been summarised as: “(i) pesticide use and handling standards; (ii) traceability systems and (iii) hygiene standards” (Okello and Swinton, 2007:270).

The necessity to control microorganisms and pesticides and ensuring safe export crops production requires specialised skill and capital investments which small-scale farmers, without a doubt, cannot afford. The danger, then, is that quality standards and food safety rules of consumers and retailers in developed countries can act as effective barriers to small-scale fruit crops producers in a country like Ghana in participating in the export markets.

The debate on how to link smallholder horticultural export crop producers to the global market under the International Food Safety Standards has been reduced to two schools of thought (Narro et al., 2009; Humphrey and Schmitz, 2001). Thus while Humphrey and Schmitz (2001) focuses on contract/fostering system, Nerrod et al. (2009) advocate for collective action or farmer base organisation as channels of ensuring compliance with food safety standards.

Humphrey and Schmitz (2001) state that the “fostering system” is adopted by multilateral and bilateral donor agencies in providing effective technical assistance to producers of horticultural export crops through transnational company-smallholder farmers partnership. The fostering system works well under contract farming because it meets the frequent need of adjusting production practices while adhering to international food safety standards. They focused on contract farming as a strategy for integrating farmers into food safety compliance. Under the scheme, transnational companies, mostly supermarkets, specify the food safety quality system, transmit information about the quality system and enforce farm auditing, inspection and certification compliance. Humphrey and Schmitz (2001) note that these companies employed trained technical

assistants as farm managers while agronomists were engaged for regular and unannounced farm visits. On the other hand, Narrod et al. (2008) centred on collective action or farmer-based organisation as the channel for integrating farmers into food safety compliance in the production process. They suggested that the strict requirement of food safety standards and the obligation of tighter food safety standards led to considerable organisational changes in farmer mobilisation with a preference for collective action or farmer group organisation. They noted that collective action arises when the efforts of individuals are needed to accomplish an outcome and it was believed that these collective actions ensure economies of scale and solution to specific skills for meeting the safety standards that smallholders have limited resources to meet. Narrod et al. (2008) study shows that small producers of fruits and vegetables in Kenya and India have coped with stringent demands for food safety from their main export markets through public-private partnerships. The partnership played major role creating farm linkages which met market demands for food safety at the same time as retaining smallholders in the supply chain.

### **Compliance with Food Safety Standards in Cocoa Export Crop Production in Ghana**

Food safety standards compliance in Ghana's cocoa industry from the 1890s to 1966 was managed and controlled by Cadbury Brothers Limited (CBL) an expatriate institution agency with collaboration from Cocoa Research Institution of Ghana-CRIG (Amoah, 1998). In the 1890s, CBL appointed agricultural instructors from Trinidad, Sao Tome and Principe to establish demonstration farms in Ghana and strengthen the already existing headquarters of Agriculture Station at Aburi in

1907 (Amoah, 1998:3).

The CRIG, a state institution headquartered at Tafo in the Eastern Region of Ghana supported the success of cocoa production in Ghana from 1910 to 1977. CRIG undertook disease control and the education of farmers on agronomy practices to ensure food safety in the cocoa industry. The CRIG in 1936 declared cocoa swollen shoot virus, cocoa mirids (capsid) and cocoa black pod disease (caused by fungus *Phytophthora Palmivora*) as an infectious disease and recommended cutting off the infected cocoa trees (Amoah, 1998).

According to Amoah (1998:136-140), "cocoa losses to these diseases were estimated to constitute about 20 percent (for cocoa mirids) and 10 percent (black pod disease) respectively of world crops annually". He further stated that subsequent to the earlier events, the Cocoa Services Division of Ghana (CSD) estimated that "the state lose about 4,559,057 cocoa trees in 1994 to about 7,525,714 cocoa trees in 1996 to cocoa diseases" (Amoah, 1998:139).

During the colonial era, cocoa farmers resisted the cutting of cocoa trees. They feared that the colonialists were trying to destroy their livelihood and suspected them of establishing new cocoa farms in South-eastern Asia to compete with Gold Coast producers. Subsequently, Nkrumah's government in 1962 mandated the United Ghana Farmers' Co-Operative Council (UGFCC) to be in charge of controlling cocoa disease but the farmers refused and alleged that UGFCC targeted the destruction of cocoa farms belonging to farmers who were sympathisers of the opposition United Gold Coast Convention (UGCC) particularly in Eastern and Ashanti Regions (Gyimah-Boadi and Jeffries, 2000; Amoah,

1998; Killick, 1978). Also, the farmers accused UGFCC as being an appendage of Convention Peoples' Party (CPP).

In view of this fierce resistance from the farmers to the idea of cutting affected cocoa trees, the state recommended spraying affected farms and subsidising the price of spraying machines and insecticides to encourage farmers to spray their farms. However, insecticides which were used in the control of these diseases were found to have high toxic for food safety among cocoa growing areas (Amoah, 1998). In 1988, 46 cocoa black pod districts including farmers in Akumadan and Bechem in Ashanti and Brong-Ahafo Regions respectively were identified. Thus, farmers in these areas benefited from a three-year programme of mass cocoa spraying through farmers' training and education on how to control the black pod disease.

According to Amoah (1998) study, the cocoa swollen diseases to a larger extent negatively affected cocoa production in Ghana. The author said:

Government subsidy on spraying machine in 1973/74 season was 84 percent and this figure rose in 1981/82 seasons to 95 percent. Subsidy on insecticide in 1973/74 was 11 percent, in 1979/80 the figure rose to 99 percent (Amoah, 1998:137). Government of Ghana from 1970 to 1988 spent USD 143.59 million on replanting disease resistant cocoa seedlings in order to ensure increase cocoa production and disease prevention (Amoah, 1998:145).

Food safety policy on post-harvest cocoa beans was centred on fermentation, drying procedure and storage. The Produce Inspection Division

(PID) of Cocoa Marketing Board (CMB) made sure that fresh mature cocoa beans are picked, pods broken and covered with the appropriate materials to enable adequate fermentation. They enforced a ban on drying cocoa beans by fire, but instead encouraged the drying of the beans with natural sunlight. This action prevented contamination of beans by fire and smoke. The inspectors, also, sample checked cocoa beans at depots to ensure the elimination of the purchase of adulterated cocoa (by the removal of mouldy, weevil-infested, and decayed beans) from being exported. Besides, buying centres and storage facilities were located closer to the farm gates to forestall wastage and deterioration of cocoa beans due to poor storage (Amoah, 1998).

### **Brief Historical Trajectory of Mango Export Crop Production in Ghana**

The mango industry as an emerging economy is mostly controlled by the private sector due to a state policy of free market and trade liberalisation (MoFA, 2009; Gyimah-Boadi and Jeffries, 2000; Chalfin, 2004). Major attempts were made in the 1960s and 1970s for the production and export mango in Ghana (Abutiate, 1988; Frimpong-Ansah, 1991). First, the Nkrumah-led Convention Peoples Party (CPP) government agricultural policy partly focused on supply of input for production and research into yield and diseases control. Mango cultivars were imported and tried at several agriculture research centres such as Kpeve, Ejura, Somanya and Kwadaso (Abutiate, 1988). Second, the introduction of 'operation feed your industry' policy by the Acheampong-led Supreme Military Council was characterised by the subsidisation of production inputs, gradual tax reduction on production technology (Cutlass, equipment and agrochemical) and

further establishment of new experimental nurseries and farms at Kintampo and Wenchi.

Dixie and Sergeant (1998) note that Ghana's

mango export figures from 1991 to 2003 was in tens of thousands metric tonnes. However, the figures changed to hundreds of thousands and beyond from 2004 to 2009.

**Table 1: Trend of mango exported over the period 2001 to 2009**

Year	Export Volume (MT)	Increase in Base Volume
2001	62	0
2002	64	2
2003	83	19
2004	179	96
2005	268	89
2006	295	27
2007	983	688
2008	1200	217
2009	2000	800

Source: Dixie and Sergeant (1998), MoFA (2010)

Notwithstanding the stringent food safety regulatory requirement, statistics on hectares of mango cultivated in Ghana in 2008 was 6,360 hectares (MoFA, 2010:8). Subsequently revenue generated from the export of horticultural fruit crops in 2010 was Ghc78, 662,250 (USD 54,724,537) where mango contributed about 2.4 percent to the earnings (GEPA 2010). Furthermore, processing industries generated Ghc 35,488,780 (USD 24,689,188) revenue from value-addition to fresh fruits in Ghana in 2010 (GEPA (2010).

## RESEARCH METHODS

The study is qualitative with case study approach used in the investigation of food safety compliance and characteristics of mango farmers in Yilo Krobo District and Kintampo North Municipal in Eastern and Brong-Ahafo Regions of Ghana respectively. The rationales for selection were: first, mango is the main

export crop grown in these two districts. Yilo Krobo is an old mango production area for export since the later part of the 1990s while, Kintampo North area is an emerging one. Therefore, the organisation of production and experience of mango farmers in the two areas differ which the study explored and analysed. Second, Yilo Krobo is a coastal savannah area closer to the national capital, Accra, while Kintampo North is located at the middle forest transitional ecological zone several kilometres away from Accra. These geographical features influence input and output market and cost of doing business. The primary data for the study was gathered from interviews conducted during two production seasons fieldwork from September 2012 (minor season) to August 2013 (major season). The secondary data was sourced from official publications, the Ministry of Food and Agriculture Policy and other government official statistical documents.



A total of forty-three (43) respondents were sampled. These comprised 32 mango farmers selected from a sample frame of 111 and 11 key informants from fruit processors and exporters, key state institutions and foreign development partners.

Snowballing and purposive sampling methods which are qualitative research methods were used in the selection of sampled respondents. The snowballing sampling technique enabled the interview to start with known farmers who served as a link person to other farmers. The purposive sampling technique focused on mango farmers who produced exportable products and whose farms were certified for food safety standards compliance. The purposive sampling technique was used in the selection of key Informants.

The instrument used for the in-depth interview was unstructured interview schedule with pre-selected themes. The method of analysis adopted for the study was mixed methods approach to data analysis which was thematic and content analyses based on the author's subjective evidence during the fieldwork.

## Theoretical Framework

In conceptualising compliance with food safety standards in mango production for export in Ghana, I chose Giddens's theory of structuration as espoused by sociological theorists (Giddens and Sutton, 2015; Turner, 2007; Ritzer and Goodman, 2004; Haralambo, Holborn and Heald (1991) to explain food safety standards compliance regiment in mango production and export chains. Giddens's structuration theory postulates that "in every society, communities and groups, peoples' behaviour follow a regular and predictable ways because individuals perform certain

actions or activities in accordance with their knowledge on the structure that guides such behaviour" (Giddens and Sutton, 2015:90). Resorting to the structuration theory, Turner (2007: 461-2), Ritzer and Goodman (2004:380) and Haralambo et al. (1991) stated that the theory focuses on individuals social activities and how these social interactions are performed and coordinated within a structure. Structure has two properties, viz. rules and resources (Turner 2007; Haralambo et al. 1991). Turner (2007) stated that rules are what people (actors) internalised as knowledge which guide their repeated interactions or in the reproduction of behaviours. Resources, the second property of structure is identified as authoritative non-material resources (Haralambo et al. 1991) or materials that give power to actors in mobilising and shaping action/activities of others (Turner 2007).

Compliance with food safety standards in mango production for export is embedded in transnational level social activity. Implicit or explicit in this transnational social activity is a well-defined structure (rules and resources) which are monitored and enforced by the state (public) or private institutions and agencies. Food safety standards regulation is more than making rule. According to Havinga (2006:2), standard regulations transcend "standards setting, monitoring compliance and enforcement" as such, "these are legal rules backed by sanctions in order to sustain attempt to alter the behaviour of others according to defined standards".

In this paper, farming, agronomic practices and institutional (public and private) support are all regarded as social practices or interactions which culminated into the compliance with food safety standards. The adherence to food

safety standards in mango production for export in Ghana, in itself, a social activity did not occur in a vacuum, rather, the agronomic practices in mango farming and off-farm post-harvest handling activities are regulated by a certain structure (rules and resources-coercive power). The rules of behaviour (agronomic practices) which the individual actor (farmer) follows are standards of production set by international bodies, state institutions and private agencies backed by sanctions. The standards regulating agencies are: International Plant Protection Council (IPPC), state agencies include Environmental Protection Authority (EPA), Ghana Standards Authority (GSA) and Plant Protection Regulation Services Division (PPRSD). The private regulatory agencies are: AfriCert, Blue Skies fruit processing company while the development partner agencies are: USAID and GIZ. These food safety regulating institutions and agencies have the power to shape the production and exporting activities of farmers and exporters. The embargo (sanctions) and loss of economic power (money) are resources at the disposal of regulating bodies and consumers' to invoke for non-compliant to food safety standards. These

resources are deterrent enough to compel mango producers and exporters to adhere to production standards.

## RESULTS AND DISCUSSION

This section focuses on four thematic areas. These are: monitoring the state's agriculture policy on food safety standards in crops production, integrating mango farmers into global food safety compliance, multilateral/multiple extension services delivery and its influence on ensuring food safety compliance with global food safety. However, the discussion of the major results is preceded by the sociodemographic characteristics of respondents.

### Socio-Demographic Characteristics of Respondents

A total of thirty-two (32) farmers were interviewed which consisted of twenty-eight (28) males and four (4) females. The key informants in the study were nine (9) males and two (2) females totalling eleven (11). Table 2 below shows the frequency of the respondents.

Table 2: Gender and respondents category

Category	Male	Female	Total
Farmer	28	4	32
Key informants	9	2	11
Total	37	6	43

Source: Author's field data, 2013

In table 2, the gender category of the mango farmers revealed that only four (4) female farmers met the sampling criteria of producing mango for ten years and their farm sizes are 2 hectares and above. These farms were certified with Global Good Agriculture Practice (GAP) certificate. The two female key informants

indicated earlier in table 1 were head of the Plant Protection Regulatory Services Division (PPRSD) of the Ministry of Food and Agriculture (MoFA) at Pokuase in Ga West Municipal in Greater Accra Region and the second female was the procurement officer of Blue Skies fruit processing company.



These 32 farmers have a total farm size of 404 hectares with an average of 12.6 hectares. The farm sizes in hectares are presented as follows:

**Table 3: Farm sizes and frequency of respondents**

Farm size (Hectare)	Frequency of Respondents
2-10	21
11-20	6
21-30	1
31-40	3
91-95	1
Total	32

Source: Field data, 2013 (not drawn to scale and 2.47 acres equals a hectare)

Table 3 shows that majority of the farmers (21) cultivated between two and ten hectares. The 21 farmers include three (3) females and they are classified in the study as small-scale holder farmers. The farmers who cultivated between 11 hectares to 20 hectares include a female. Analysis of the farm sizes pointed to one thing. That is female representation is comparatively low among large-scale mango farmers. The author attributes this situation to multiple livelihood practices that the few engaged in

thus making not solely a mango farmer.

The educational level of farmers featured prominently in adherence to food safety standards in mango production. This is because of the fewer number of extension service providers who were expected to disseminate contemporary production technology and information to scattered smallholder mango farmers. The educational levels of farmers are presented in Table 3.

**Table 3. Education Level and Gender**

Level	Male	Female	Total
Basic	8	2	10
Secondary	13	2	15
Post-Secondary	4	0	4
University	3	0	3
Total	28	4	32

Source: Author's field data, 2013

The cross-tabulation of education and gender indicated that two females had basic and secondary education respectively. It is instructive to note that in this study, none of the female respondents had a post-secondary or university education. The article could not

conclude that women with higher education do not want to venture into mango farming largely because of the sample and representativeness of females in the study. The importance of education is amply stated in the statement of the chief agronomist of GIZ and Blue Skies

simultaneously as follows that:

*The high number of farmers who had secondary education (15), post-secondary (4) and university (3) facilitated easy dissemination and adoption of information on current technology on mango production.*

Premised on the assertion of the agronomists, the author held the view that the high number of farmers who had pre-university and university degrees played a prominent role in adoption of scientific technology in food safety standards compliance. Coupled with that, majority of the farmers were experienced in farming and agribusiness activities as well as experiences from public and civil service. This made them appreciate the importance of food safety in production, post-harvest handling of fruits and export demands.

## Monitoring Agriculture Policy on Food Safety

The State Policy on food safety standards revealed that monitoring of international food safety standards is decentralised in the production communities in Ghana. A key informant from development partner agencies stated that

*to adhere to the International Plant Protection Council's food safety standards, food processing companies in Ghana such as; Blue Skies, Integrated Tamale Fruit Company and Hans Peter Werder and AfriCert, a certification body accredited by International Organic Accredited Service in USA were the foreign agencies and institutions who played gate-keeping role on behalf of brand-name retailers and supermarkets in Europe in ensuring food safety*

*standards compliance in Ghana.*

These agencies and institutions monitor production practices such as agrochemicals used in enhancing soil fertility, control of weed, pests, and insects. They, also, evaluate post-harvest handling and storage of fruits to prevent food contamination in the packaging process.

As part of the globalisation ideology, the Government of Ghana has created a national governance structure to regulate the activities of export crop producers in the country. The agencies and institutions that perform these functions are the Ghana Standard Authority (GSA), Environmental Protection Authority (EPA) and Plant Protection Regulation Services Division (PPRSD).

The GSA sets Ghanaian food safety standards in compliance with IPPC standards and certifies mango fruits after the fruits are subjected to maximum residual level (MRL) test. The EPA regulates import, registration, publication and use of agrochemicals in the production of mango. Also, the PPRSD does biological control of plant pest and diseases on mango crop and certifies or quarantines infested mangoes meant for export. Careful analysis of food safety policies shows that the structure is demarcated into legislative, executive and judiciary functions and roles. Where some agencies made the regulation, others trained farmers to execute food safety standards compliance and some judge farmers' production processes by issuing farm compliance certificates.

## Integrating Mango Farmers into Global Food Safety Compliance

Ghana's Food and Agricultural Sector Development Policy (FASDEP II) identified

the farmer-based organisation as the most cost-effective channel to ensure delivery of extension service to scattered smallholder farmers all over the country through which food safety standards could be achieved (MoFA, 2009). However, according to an extension officer from the Ministry of Food and Agriculture, the ministry realised that the research unit and public sector extension is not well funded. Consequently, the state espouses access to multiple extension service providers. This gesture enabled direct contact of development partners with mango farming communities and made the contribution of development partners in the promotion of increasing productivity and food safety compliance in the mango industry paramount.

The identified development partners and state agencies and institutions who were engaged in integrating the Ghanaian mango farmers into global food safety were USAID, GIZ and Ghanaian extension technicians from PPRSD, EPA and GSA. Evidence of these collaborations is explained in accordance with each institution and agency. The data analysis revealed that the foreign and state agencies and institutions identified in the study collaborate in building the capacity of farmers to comply with food safety standards in mango production.

The study indicates that the 32 farmers got their mango seedlings from certified mango nursery operators who were trained and certified as mango nursery operators through GIZ's African Cashew Initiative (ACi) and USAID's sponsored ADRA Programmes. The initiative of the GIZ and USAID in ensuring that seedling supply to farmers for cultivation came from certified mango nursery operators certifies one of the International Plant Protection Council's (IPPC) major requirement which states that

planting materials (including seedlings) for exportable products must come from certified sources to prevent harmful organisms injurious to plant or plant products and human health to be exported and consumed (IPPC, 2000). The fulfilment of this requirement integrated mango farmers in Ghana into compliance of IPPC's standard of getting planting materials from accredited sources.

### **Multiple Extension Services Delivery and Its Influence on Food Safety Compliance**

Under the sponsorship of development partner agencies like USAID and GIZ, specialised agronomists from South Africa and Germany collaborated with the Ghanaian extension service officers from MoFA training and capacity building for mango farmers. This is evident in one of the respondent's statement that:

*the training focused on farm maintenance cultures such as pruning, agrochemical (weedicides, pesticides/insecticides and fertiliser for flower induction) usage, farm hygiene, farmer safety, harvesting and post-harvest handling of fruits. Other areas were the identification of mango pests and diseases and farm record-keeping on agrochemical usage and interval of application and other daily farm activities carried out.*

This feat was achieved through the farmer based association for the dissemination of information on food safety standards and compliance set by wholesaler and retailers in developed countries. The pivotal role played by the farmer based organisation in the study communities (Yilo Krobo and Kintampo North) confirms other studies (see Narrod et

al. 2009; Humphrey and Schmitz 2001) on the importance of farm-based organisation in gathering scattered smallholders for education on crops production practices.

Agrochemicals used in mango production are sensitive issues for both the country of origin of production and destination of consumption. The Environmental Protection Authority (EPA) regulates the agrochemical industry by licensing chemical manufacture, importation and the use of pesticides for agriculture, horticulture, gardening, public health and other pesticides related uses (MoFA 2010). The mango farmers revealed that the EPA periodically publishes recommended herbicides and insecticides allowed on mango field. This is a social phenomenon which guided farmers in the purchase of their agro-input from private agrochemical store operators. As a consequence, the MoFA, development partner organisations and fruit processing companies, particularly Blue Skies, engage mango farmers constantly in updating them on the appropriate registered and approved agrochemicals to be used on their farms. Careful analysis of success in the use of appropriate agrochemical for production and adoption of required food safety standards compliance was as a result of high level of education of the farmers.

The PPRSD, another state institution, played a major role in the sensitisation and training of farmers on plant protection. An official of PPRSD in charge of the biological control unit stated that farmer sensitisation and training includes plant, insects and disease control on the farm. He said:

*The unit has identified fruit fly, mango stone weevil, mealy bug, anthracnose and mango scarp.*

According to the official, PPRSD taught farmers the need to prune their mango trees to reduce dense canopy, pick falling and rotten mangoes from the farm and make sure that they are buried to avoid the continuation of the life cycle of the diseases that affect the fruits.

Specific technical assistance which the Biological Control Unit of PPRSD gives farmers are mainly geared toward pests and diseases control is termed “Bus Stopping control measure”. The BCU officer explains that:

*By the bus stopping control measure, all reported incidence of pest infestation, compelled BCU to visit the epidemic area, assess the situation in order to ascertain the veracity of the infestation. Upon their assessment, the farmers were advised on the management of the phenomenon. This is because experience had shown that whenever farmers are desperate they use any available agrochemicals without recourse to expert advice and this act of desperation has economic or financial, health and ecological effects on the farmer, consumer, and biodiversity. The advice sometimes touches on the feeding habit of the insect or pest such that they can use either systemic or contact pesticides in controlling the epidemic.*

The rationale for the bus stop control measure as stated by the official was that:

*It is believed that farmers should take precaution not to build up pest and disease population in the ecology from production to harvest.*

The Head of PPRSD at Pokuase in the Greater Accra Region emphasised that her unit (Plant Protection and Regulatory Services

Department) collaborated with the Tropical Crops Research Institute in Benin and the Lebanese government assistance to help farmers control the fruit fly by deploying pheromone trap also called fruit bait. She stated that:

*Mangoes from Ghana to Lebanon were embargoed in 2008 because fruit fly was detected on the exported cargo. However, in 2012 when the bilateral agreement was signed, Lebanese agronomists collaborated with other agencies and farmers to meet the IPPC fruit safety standards leading to the resumption of mango export to Lebanon again.*

The economic effects of mango pests and diseases infestation can lead to fruit spoilage, economic income loss, export ban and high probability of crop failure. Farmers have adhered to the recommended remedy for the control of pests and diseases by pruning the plants to allow aeration, avoidance of high plant population and dense plant canopy and good farm management practices. The successful implementation of PPRSD's mandated function and compliance of food safety in mango production were attributed to farmers' experience in farming over the years, agricultural tours of farmers to mango farms in South Africa and food fair tours to Germany and farmers' level of education.

The field data established a pattern in the provision of the farm infrastructure. Seventeen (17) farmers have erected sheds for the storage of mangoes and farm inputs. The 32 farmers have constructed places of convenience on their farms. Eight (8) farmers had dug wells on their farms to enable them to have access to good and safe water and twenty-four (24) have access to river water. The enormity of the cost of

constructing on-farm infrastructure is a drain on the small-scale farmers especially.

Also, farm certification is safety standard in mango production in order to access the export market. The certification is on good agricultural practice (GAP). The study identified three farm certification schemes which were Eurep GAP, Global GAP and Ghana GAP which implement safety standards set by European retailers, global and the Ghana Standard Authority (GSA). One key informant, an agronomist, pointed out that:

*The certification scheme covers traceability records of individual farmers. The records take cognisance of plant protection (chemicals used for pest control) and plant growth regulation (flower inducing chemicals).*

An executive of the FBOs in Yilo Krobo stated that the farmers' association have appointed internal farm auditors who visit their farms to acquaint themselves with records of agronomic practices that were going on prior to external assessment by AfriCert and fruit processing companies. The rationale for this internal assessment is that the external assessment and certification were group based and the inaction of a member can cause the entire membership for non-compliance. During the period of data collection (September 2012 to May 2013), the 32 farmers' farms were certified by AfriCert IPPC, a recognised body from East Africa based in Kenya. The result shows that Ghana Standard Authority gives a certificate of proof of Maximum Residual Level (MRL) test conducted on the mango fruit. A farmer in Kintampo North made a statement on MRL test by saying that:



*I got my fruits and that of those who operate the nucleus farm scheme under me tested by the GSA. Internal farm auditors go to the farms, pick fruits from the trees diagonally at random. At least hundred fruits are taken from ten trees. This is labelled as a specimen and sent to GSA for testing and certification. The cost of a group test of the specimen in 2012 was two hundred and fifty Ghana cedis (Ghc250.00).*

Accounts given by agronomists from Blue Skies Fruit Processors suggest that mango farmers who produce for them have their fruits tested for MRL by internationally recognised body in the United Kingdom. Analysis of farmers' investment in storage, water and sanitation and subjection of their fruits to MRL test was premised on their collective willingness to produce safe and quality mango that would meet the international market requirement. This was because the farmers recognised that revenue/income from accessing international market commensurate the cost of investment they made.

Plant Quarantine Unit of PPRSD is the recognised competent authority in Ghana to undertake mandatory phytosanitary inspection and Quarantine of exporters' pack-houses. Phytosanitary officials usually observe how the fruits are washed with chlorinated water and the application of wax on the fruits before they are packed for export. Again, at exit ports, the inspection officials undertake a visual inspection of boxes packed with mango fruits. They sample and pick boxes containing treated mango destined for export markets. When laid down procedures are exhausted, then the Plant Quarantine Unit certifies every consignment of

mango fruits that leaves the Ghanaian shore. During the study period, 2070 metric tonnes of mango was sold for export to exporters and processors. The volume of mango exported was the evidence that food safety standards compliance is attained in the mango industry.

## CONCLUSION

The article focused on agriculture food safety policies, mango farmers' integration into compliance with global food safety standards, multiple extension services delivery, and how they influence compliance with food safety. These factors (policy, integration and multiple extension services delivery) affected mango production organisation, international or global recognition of safe mango production in Ghana, and the subsequent increase in export volume.

The paper found that the state is strongly committed to compliance with food safety standards in agriculture, particularly in mango production. This is amply demonstrated through the institutionalisation and empowering the Ghana Standards Authority, Environmental Protection Authority and Plant Protection Regulatory Services Division. These institutions regulate food safety at production and post-harvest handling levels, as well as pre-export certification.

Multiple extension services delivery by state agencies and development partners were timely interventions that strengthened the cash trap state extension unit in building capacity for farmers. The collaboration that existed between the MoFA and the development partner organisations in the mango production sector pointed to an overwhelming fact that the extension services were heavily reliant on external sources for funding. Effective

control of pests and diseases attack on mango trees, use of appropriate agrochemicals and input, rigorous activities carried out in farm certification, maximum residual level test, and commodity certification bore ample testimony to the fact that state institutions such as GSA, PPRSD and development partner agencies are responsible for making sure that food safety is assured and achieved in mango production in Ghana. Besides, farmers' level of education experience in farming, farmers' health consciousness of consumers, the proximity of food safety regulatory bodies and willingness to access high premium market significantly played a major role in the food safety standards compliance.

The institutionalisation of farmer based organisations was an effective medium for smallholders in mango production to acquire skills in good husbandry practices in farm sanitation improvement. Food safety standards compliance has a positive effect on the environment and ecosystem. By the use of appropriate chemical and dosage in controlling pest and diseases, the rapid depopulation of agents of pollination such as friendly pest, birds and other living organisms which co-existed for sustainable and renewal of the ecosystem are maintained. The author recommend that state funding to the institutions and agencies responsible for food safety enforcement and monitoring should be regular to sustain the momentum on compliance with food safety.

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