

Systematic Approach for the Management and Control of Food Safety for the Street/Informal Food Sector in Ghana

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Abstract The street food vending can be considered as one of the fastest growing informal business sectors in Ghana. However, there have been concerns with the safety of the foods sold on our street. In response to this, there have been various project studies and activities, over the last fifteen years all geared towards addressing the issues of safety of these street vended foods. One of such studies was a series of projects involving scientists, development partners, regulators and street-food vendors association from 1999 to 2005, funded by the Department for International Development of the UK government through its crop-post-harvest program. One of the main outputs of these projects was the development of nine modules for the systematic management and control of food safety for the street-food vending sector in Ghana. The nine modules developed by the project were on partnership, training of street food vendors and regulators, improving consumer awareness, improving street food vendor livelihoods, infrastructure requirements, food safety, food inspection, legal requirements and the supply chain management for the street vending sector. Microbiological survey (45 samples) showed that some street foods are intrinsically safer than others. *Kenkey* and *waakye* are safe products while most *fufu* were contaminated. This paper highlights the objectives of each module, the key issues to be considered and the priority actions for implementing the modules. It also considers critical factors that can lead to success as well as critical factors that might lead to failure.

Keywords Street-food, Modules, Food Safety, Consumer Awareness, Vendor Livelihoods

1. Introduction

Street/informal foods are defined as “ready-to-eat foods and beverages prepared and/or sold by vendors and handlers especially in streets and other similar places for immediate consumption or consumption at a later stage without further processing or preparation”[1]. This definition includes fresh fruits and vegetables which are sold outside authorized market areas for immediate consumption as well as the raw materials or ingredients used for the preparation of street foods such as raw meat, cereals, vegetables and spices.

The World Health Organization recognizes that street/informal foods have an essential role for maintaining the nutritional status of the urban population as consumers demand assurance that the food they and their families are eating is safe, of good quality and nutritious[2]. Studies have shown that street/informal food vendors are often located around offices, factories, schools, markets, construction sites, beaches, lorry stations, commercial sites and along any street where large numbers of people congregate[3-5]. As a

result of urbanization, population growth and socio-economic changes taking place street/informal foods sector has grown significantly. The importance of the street/informal foods is enormous. Street/informal foods are a source of inexpensive, convenient and often nutritious food for both urban and rural poor. It also has the potential as a source of attractive and varied food for tourists and the economically advantaged. It is the livelihood support of a vast number of persons, a chance for self-employment and the opportunity to develop business skills with low capital investment. Finally, it contributes significantly to the urban economics in our nations. For example, in Accra the capital city of Ghana with a population of over 3 million, women represent 70 to 90% of vendors and are often owners or employees of street food businesses purposely established as a livelihood support for the family[4, 6-10]. In addition, the authors reported that the street/informal food vendors had minimal or no formal education and are often unlicensed and untrained in food hygiene or sanitation and work under very crude and unsanitary conditions and majority (75%) did not belong to vendors associations or pay taxes to the government[4].

The street/informal food consumers come from all levels of society with respect to age, gender, social and income status. Many people are patronizing street foods since it plays an important role in helping them to meet their energy

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and nutrient needs. Consumers in urban areas spend less time to prepare food and pay up to 30% more for food compared to their rural counterparts[11]. This had invariably pushed-up demand for more convenience and processed meals in urban areas. In Accra, Ghana, 40% and 25% of the household budget is spent on street foods by the low and high income groups, respectively[12]. The report further indicated that children especially school children purchased and consumed a high proportion of street/informal foods[12].

Although, street foods contribute positively to the food security of those involved in street/informal sector, particularly suppliers of raw produce, food processors and vendors, there are concerns about food safety of street/informal foods[8-10]. Street/informal foods are bequeathed by food hazards. The food hazards are physical (stones, sand, wood chippings, dust, metal pieces, insects), chemical (insecticides, pesticide, mycotoxins, leaching of heavy metals: lead) or biological (*Salmonella spp.*, *E. coli*, yeasts and moulds, *Staphylococcus aureus*)[12-13]. Unfortunately, the food hazards from street vended foods that culminate in public food borne disease are not properly documented resulting in difficult interpretation. Report shows that in Accra, Ghana the incidence of cholera and diarrhoea dramatically increased between 1995 and 1999 by 186% (1,028 to 2,973) and 562% (2,575 to 17,046)[14]. This buttress the concerns raised on the safety of street/informal vended foods in Ghana. The diversify nature of the hazards facing the street/informal sector poses a serious problem to tackle. Information packages to address the needs of stakeholders, policy makers and regulators in the street/informal food sector may be inadequate since measures for dealing with one type of hazard may not be appropriate for another. It is based on these food safety concerns that led to a series of studies on street/informal food vending funded by the Department for International Development (DFID) under the Crop Post-Harvest Research Programme (CPHP), and managed by the Natural Resources Institute (NRI) in the United Kingdom[8,13].

In order to maximize the impact of food safety knowledge for street/informal vended foods nine modules were developed for the sector in Ghana, which will be beneficial internationally. The modules were on partnership, training of street food vendors and regulators, improving consumer awareness, improving street food vendor livelihoods, infrastructure requirements, food safety, food inspection, legal requirements and the supply chain management for the street vending sector. These modules for managing the food safety system were based on principles of Hazard Analysis and Critical Control Point (HACCP) and guidelines of Codex Alimentarius Commission (CODEX), Food and Agricultural Organization (FAO) and the World Health Organization (WHO). The objectives of each module, the key issues to be considered and the priority actions for implementing the modules are highlighted in this paper. Further, it considers critical factors that can lead to success as well as critical factors that might lead to failure in the implementation of the modules.

2. Methodology

2.1. Questionnaire

The structured questionnaire used for the study comprises of 28 questions: eight questions were based on demographics (gender, age, marital status, job occupation, income and educational status) and ten questions were on street vendor's prerequisite practices with respect to basic food safety. In addition, ten questions were on food preparation and vending practices (detection of spoiled foods, purchase of fresh produce and ingredients, storage and defrosting, use of local or aluminium cooking pots, cutting boards, source of water, cooking and reheating). The questionnaire were administrated by four trained person and filed by food vendors 'on the spot' at cooking and vending premises. A letter explained the objectives of the study and assured anonymity of the street foods vendor's response. The response rate was 90 %. It took between 15 to 20 min to fill the questionnaire.

The questionnaires were developed from findings of in-dept interviews. The content validity was established by consultation with experts involved in food safety. It was pretest by 10 persons for refinement. Changes were made to those questions that needed adjustment based on the feedback such as wording of questionnaire, sequencing of questions and clarity.

2.2. Sample Frame

A cross sectional sample of 90 street food vendors serving either *fufu* (53.33%), *waakye* (20.0 %) or *kenkey* (26.67%) was surveyed from the months of January to July, 2007 at 5 selected markets randomly selected in Accra (Table 1). The markets were Accra Kinbu (AK), Accra Post Office (AP), Accra Timber (AT), Kaneshie (KN), Odorkor Sukura (OS). The survey documented information on the production and vending of *kenkey*, *waakye* and *fufu* as presented in figures 1-3.

Table 1. Number of street food vendors interviewed with respect to food sold and market where they operated

| Market | Street food type | | | Total score by market |
|---------------------------------|------------------|---------------|---------------|-----------------------|
| | <i>Fufu</i> | <i>Kenkey</i> | <i>Waakye</i> | |
| AK (Accra Kinbu) | 17 | 4 | 5 | 26 |
| AP (Accra Post-Office) | 7 | 6 | 4 | 17 |
| AT (Accra Timber Market) | 2 | 5 | 3 | 10 |
| KN (Kaneshie) | 7 | 1 | 3 | 11 |
| OS (Odorkor Sukura) | 15 | 8 | 3 | 26 |
| Total score by street food type | 48 | 24 | 18 | 90 |

2.3. Informal/Street Vended Foods

Modules developed for management of street foods focused on three major street vended foods in Ghana. The

foods were *fufu*, *waakye* and *kenkey*. *Fufu* and *waakye* was selected base on an earlier CPHP Project (R7493) which suggested that there are both microbiological and heavy metal health hazards to consumers [13]. In the case of *kenkey*, it was selected based on its popularity among the street vendors and consumers. The preparation and vending of the selected street foods are described below as follows;

Kenkey: In Ghana there are two major *kenkey* called *Ga kenkey* and *Fanti kenkey*. The focus of the study was on *Ga kenkey*. This is prepared from fermented wholemeal maize dough. The fermented maize dough is divided into two halves. One half is partially cooked into a thick paste called “aflata” and the remaining half of fresh dough added and mixed thoroughly with the addition of salt. The blend of the cooked and uncooked is mould into balls of different sizes and covered with cornhusks. The wrapped balls are boiled in water until cooked. *Kenkey* is normally consumed with fried fish and hot pepper or with all kinds of soup depending on the individual’s preference taste. *Ga kenkey* has high moisture and low pH usually served when hot or warm.

Waakye: This is a cooked mixture of rice and cowpeas coloured with the stock of dry millet leaves. The millet

leaves are soaked in water and boiled to release the brown colour. Cowpeas are boiled separately to near cooked point in the brown coloured hot water after which rice is subsequently added to the almost cooked cowpeas and the mixture thoroughly mixed to obtain evenly dispersed cowpeas in the rice. The cooked *waakye* is brownish in colour and is eaten with stew prepared with fish, meat or both. *Waakye* is a high moisture food, of near neutral pH and usually kept and served at ambient temperature or above.

Fufu: This is a sticky paste prepared by pounding with a wooden pistil of cooked cassava only, cassava and either plantain or cocoyam, or yam only in a wooden mortar. Water is added intermittently to lubricate the pistil and also soften the paste during pounding of *fufu*. At a particular consistency and elasticity depending on individual’s preference, the paste is mould into balls and served with soup. The soup can be light (vegetables), groundnuts or palm nuts soup. *Fufu* is a high moisture neutral pH food that is usually served semi-warm with some warming from the hot soup that is added when served.

The process flow chart for the production and vending of *kenkey*, *waakye* and *fufu* are presented in figures 1-3.

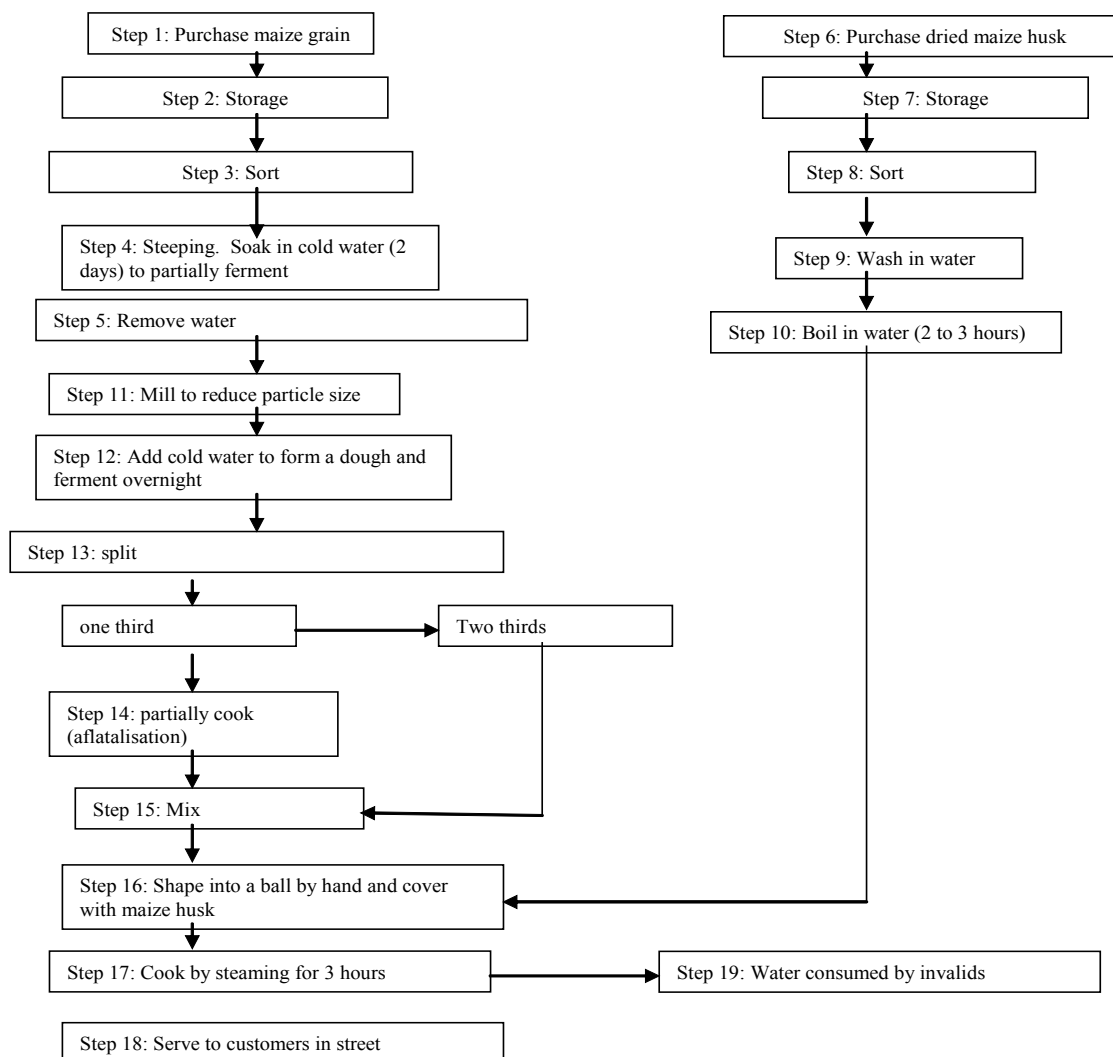


Figure 1. Process flow chart for the production and vending of *kenkey*

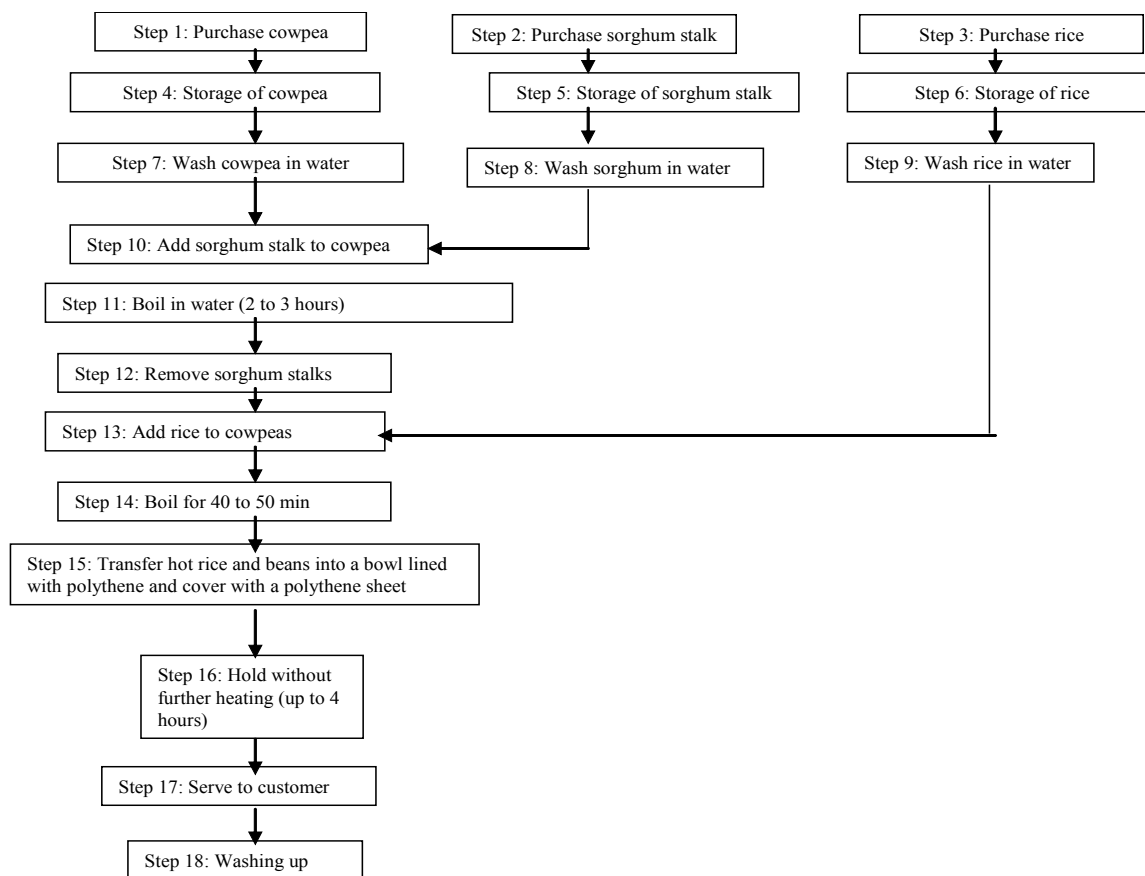


Figure 2. Process flow chart for the production and vending of *waakye*

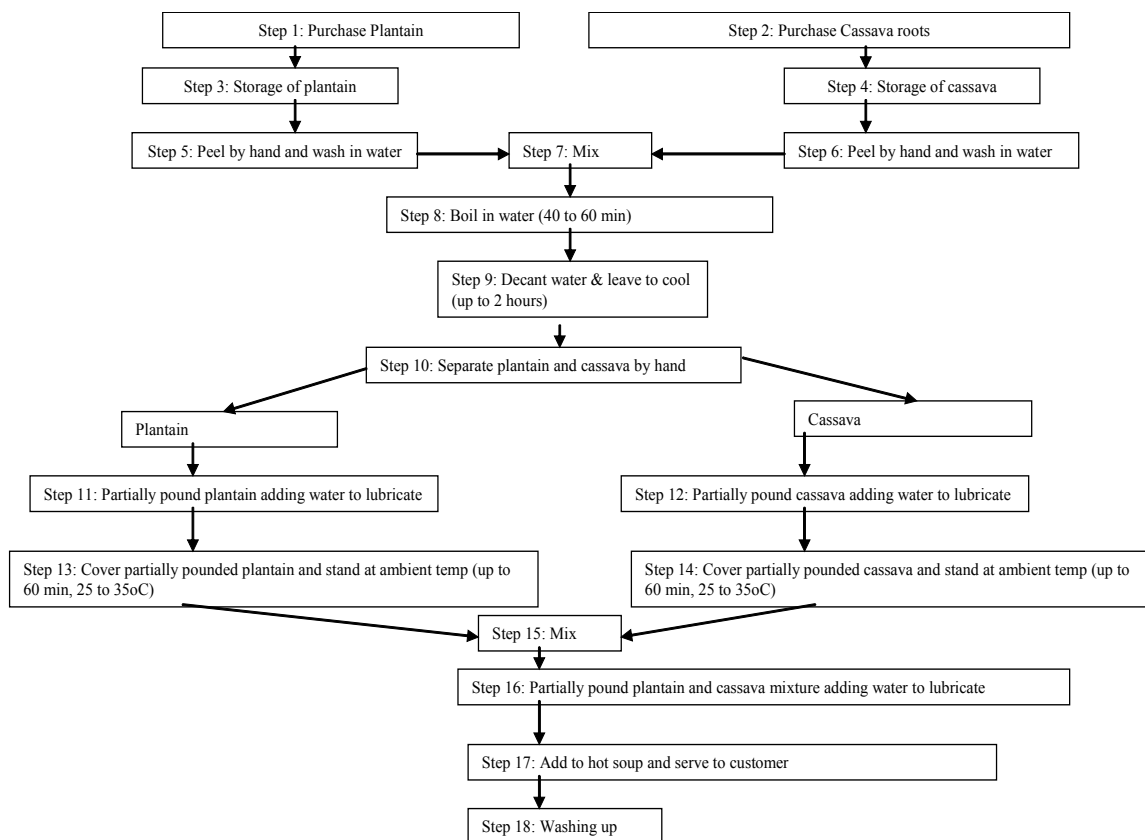


Figure 3. Process flow chart for the production and vending of *fufu*

2.4. Development of Modules

In formulating the modules suggested questions asked included: why develop the module, who benefits from the module and who are the players, issues to be addressed in the module, how will the module be developed, how will the module be sustained, how do you know you are making progress, how will the module link up with the other modules in the system. The following was considered; prioritization regarding management and control, practicality of content including cost, personnel and capacity and relevance of content to real-life-situation. "How to" or "Know How" were further employed in the development of the modules as follows; how to recognize the system, map the players and organizations, what are the rules governing this system.

A total of nine modules were developed following the suggested questions. The modules developed were designated as: Module 1: Partnership; Module 2: Training of vendors and regulators; Module 3: Improving consumer awareness; Module 4: Streetfood vendor livelihoods; Module 5: Infrastructure requirement; Module 6: Food safety; Module 7: Food inspection; Module 8: Legal requirements; Module 9: Food supply chain management.

3. Results and Discussion

3.1. Street Foods Safety Baseline

A food safety baseline study indicated variations between markets and vendors selling different food types. Analysis of heavy metal residues indicated that concentrations of the heavy metal (lead) in street foods were generally low. Interestingly, cooking pots produced by informal manufactured cooking pots contained high concentrations (419mg/kg) that could leach into foods at levels slightly above the maximum permitted level recommended by WHO and FAO. However, formal manufactured cooking pots showed levels below the maximum permitted level of WHO and FAO[12]. The authors reported that *kenkey* (dough and water) cooked in pots produced by a formal manufacturer (mean lead concentration of 9 mg/kg) did not have any detectable lead (<0.065 mg/kg). However, *kenkey* (dough and water) cooked in pots produced by an informal manufacturer (mean lead concentration of 360 mg/kg) had levels of lead at or above the maximum permitted concentrations recommended by WHO of 0.2 mg/kg. In the case of cooking in brand new pots, the concentration of lead was highest at between 0.619 and 0.757 mg/kg and this declined to between 0.203 and 0.225 mg/kg after the cooking pots had been aged by using at least three times[10, 13].

This study was based on a survey of informal cooking pots purchased from three merchants and indicated variation in concentrations of lead. This was because of variations in practice from one informal foundry to another in addition to the type of scrap metal that they purchase for manufacturing the cooking pots at any given time. The report clearly stated that although the concentrations of lead leached into the food

samples were at the maximum level or slightly above WHO and FAO recommended limits, its risk to consumer health is probably small. However, any amount of lead in food is a food safety risk since it can accumulate in the body over time.

Microbiological survey of selected street food vendors was conducted during the survey of prerequisite food safety practices of street food vendors. In the survey, selected vendors provided food samples for microbiological analysis. Three selected street foods were purchased from 14 *kenkey*, 14 *waakye* and 17 *fufu* vendors and the microorganisms monitored were *E. coli*, aerobic plate count, coliforms, *S. aureus*, *Salmonella sp.* and *B. cereus*. The results of the microbiological analysis showed *E. coli* as a reliable indicator of poor basic food hygiene practices because it is associated with faecal contamination. *E. coli* presence can be inferred that other food borne illness organisms may also be present. In addition, street food types showed large differences in microbiological contamination. The studies show that none of the *kenkey* samples analysed recorded *E. coli*. The other organisms were either not present or at low levels. This was attributed to the low pH (between 3.4 and 3.8) of *kenkey* and therefore was considered low risk. Although some *kenkey* vendors work in unsanitary conditions and received the lowest total scores in the basic food safety survey, the product itself is safe with respect to microorganisms.

The second food type of the study was *waakye*. All the *waakye* samples were generally safe except two samples that were contaminated with *E. coli*. *Waakye* is usually served warm (33 to 37°C). The study observed that *E. coli* may have occurred in this product because it is moist and had a near neutral pH. It was held at an unsafe temperature (between 8°C and 63°C). Usually leftover food from the previous days sales are not refrigerated which act as a source of microbiological contamination as the leftover food are added to the next preparation. Interestingly, considering the baseline survey, *waakye* vendors had higher total scores than *kenkey* but lower than those vending *fufu*.

The *fufu* samples analysed showed the majority (13 out of 17) had detectable *E. coli* suggesting poor food hygiene practices and poor process control. The continuous human handling during the moulding of the *fufu* may have contributed to the high *E. coli* contamination. Other organisms detected that show present of a food safety hazard included *S. aureus* (detected in 10 out of 17 samples). In the survey of food safety prerequisites the *fufu* vendors received the highest score. However, this score, along with all the other food vendors were very low, similarly to earlier reported studies[6, 7, 11-14].

In a similar study conducted on street vendors in the city of Bloemfontein, South Africa to assess the microbiological quality of the food being sold as well as the level of hygiene conditions under which these food stalls operate, the presence of specific microorganisms such as *E. coli*, *S. aureus*, *Salmonella sp.* and yeast was associated with food sellers lack of hygienic practices in handling food[15].

3.2. Module 1: Partnership

Stakeholders were identified and partnership established among them. The stakeholders included street food vendors, Non- Governmental Organizations (NGO's), local authorities, food standards authorities, research institutions and food laboratories whose mandated policies, institutional linkages and food laws associated with street vending are carried out in Ghana. The institutional linkages are presented in figure 4.

The partnership was to develop strategies which can improve the safety and quality of street foods. In order to achieve their objective, a successful coalition partnership approach comprising street food vendors, consumers, input suppliers, NGO's, local authorities, food standards authorities, research institutions and food laboratories was formed. In building partnership, partners identified included the Traditional Caterers Association of Ghana, Indigenous Caterers Association of Ghana, Maggie Fast Foods Association (check-check), National Association of Domestic Bursars and Matrons, Nestac (Tea Sellers Association), Ghana Consumers Association, Accra Metropolitan Authority, Ghana Tourist Board, Metro and Municipal Assemblies, Ghana Standards Board, Food and Drugs Board, Food Research Institute, Ministry of Health, Ministry of Food and Agriculture, Environmental Protection Agency, National Board for Small Scale Industries, University of Ghana, Ghana Atomic Energy, Traditional Councils and Farmers Associations .

The coalition partnership explored the wider framework in which the policies, institutional linkages and food laws associated with street vending were carried out and by determining the sources and extent of food safety hazards that could jeopardize livelihoods and consumer health. In addition, the research partnership developed strategies that could be used to control identified food safety hazards in an economical and socially-acceptable manner. Remarkably, the coalition approach began during an earlier CPHP project (R7493) and was successfully formalized during the project in 2003 to 2004[13]. New partners were invited to join the coalition and some stakeholders/agencies, which substantially enhanced the project. The role of international organizations such as Natural Resources Institute (and manager of the earlier project) was initially excluded from the project at the inception of the project until this was successfully resolved.

The evaluation of the extent of hazards from heavy metals and microbiological contamination in selected street foods in Accra, identification of the sources of heavy metal and microbiological contaminations and verification of economically viable and socially acceptable control measures for reducing the hazards to acceptable levels were documented by the DFID/CPHP funded street food project in Ghana[13, 14]. In addition, it made recommendations and consultative documents delivered to policy, regulatory and enforcement agencies and a strategy for dissemination to the sector to improve the safety of foods in the street food sector.

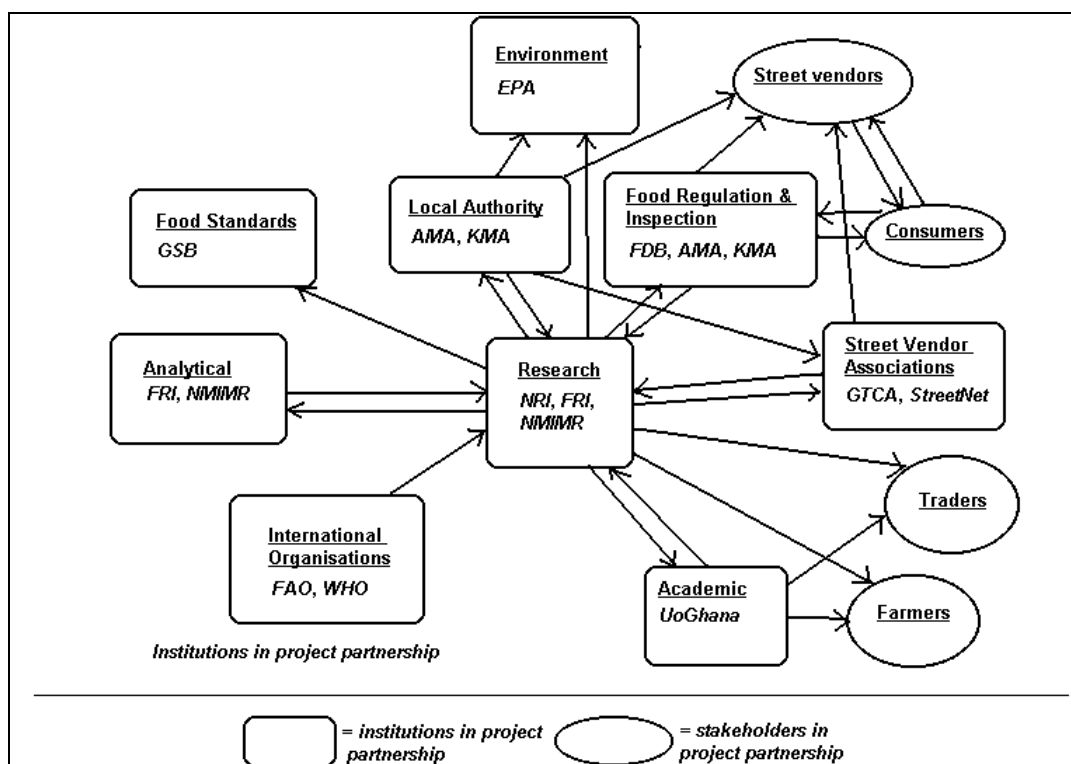


Figure 4. Linkages between coalition partners and stakeholders (NRI -Natural Resources Institute, United Kingdom; FRI- Food Research Institute; NMIMR- Noguchi Memorial Institute for Medical Research; UoG- University of Ghana; KNUST- Kwame Nkrumah University of Science & Technology; FAO- Food and Agriculture Organization; WHO- World Health Organization; GSB- Ghana Standards Board; FDB- Food and Drugs Board; EPA- Environmental Protection Agency; AMA- Accra Metropolitan Assembly; KMA- Kumasi Metropolitan Assembly; GTCA- Ghana Traditional Caterers Association)

3.3. Module 2: Training of Street Food Vendors and Regulators

There was the need for more training of street food vendors and consumers by all the partners. An earlier survey of 265 street food vendors indicated that many had limited understanding of their business finances and this hindered the successful growth of the business. A survey of 530 consumers indicated that most consumers did not associate unsafe food with food borne illnesses. New male dominated street food vending businesses, known as 'check-check food vendors' have recently arisen with similar food safety issues that need to be addressed[13,14]. Training sponsorship was solicited from companies in the food industries such as Unilever, Nestle and Ghafo, which was an opportunity for such companies to launch their products. The location of training workshops were sited close to the workplace of the street food vendors, market places and lorry stations referred to as 'On-spot workshops'. Street food vendors were trained on improved methods of cooking, food safety and management. Training manuals, some in pictorial forms were provided and simplified in local languages. There is clear evidence that people retain information better if it is presented in picture or written form compared to hearing it verbally[16]. Garforth and Lawrence[17] noted that in both print and broadcast mass media, often little effort are made to involve the user in the design and production of media content, which was very important step if information was to become more relevant, useful and accessible. Similar extension challenges were observed by other authors[18, 19]. Therefore a participatory development of the training materials and training was adopted at every step of the study similar to other studies[20, 21]. These included four television documentaries and billboards by the Food Drug Board, four posters and training manuals for Environmental Health Officers, street vendor and NGO's. Three hundred street food vendors were trained but falls substantially short of the estimated 60,000 street food vendors in Accra. Adequate incentives were presented to the trainees such as monetary and sponsor's products. Evaluation after training was conducted to ascertain impact of the training and research findings were made available to the processors and vendors.

3.4. Module 3: Improving Consumer Awareness

Few consumers are concern about the safety of street foods[2, 6, 12, 14]. All the partners vigorous pursue consumer awareness of street foods at schools, colleges, universities, churches, and social clubs. This was achieved through education of consumer, starting for children and the classrooms by all partners by application of participatory training material development[17-21]. Parents were educated through lunch time talks at workplaces. Documentaries on food safety were shown at schools, colleges, universities, and workplace. Research findings were made available to the consumers.

3.5. Module 4: Street food Vendor Livelihood

Through training workshops street food vendors were made aware of the fact that their livelihood depends on street foods and participation was important[18-22]. They as a matter of concern must observe all the by-laws, regulations and standards in the trade, which was similar to practices in other countries[10]. Vendors ensured that their foods were not contaminated. The regulators, Accra Metropolitan Authority, Ghana Standards Authority, Food and Drugs Board, Metro and Municipal Assemblies, Ministry of Health and Environmental Protection Agency provide health education for the vendors. The Government extend support to the vendors for education on income records. The street food vendor associations solicited for loans from the government and the banks on behalf of the members. The National Board for Small Scale Industries (NBSSI) extended their support to the street food vendors. However, there was the need for entrepreneur skills training for processors and vendors.

3.6. Module 5: Infrastructure Requirement

Standards of structures were set for the vendors by the regulatory groups. These were Accra Municipal Authority, Ghana Standards Authority, Food and Drugs Board, Metro and Municipal Assemblies, Ministry of Health and Environmental Protection Agency. An inventory of existing structures was conducted and adoption of a standard structure made. Planned structures agreed upon by the vendors and regulatory groups were built for the vendors by Accra Municipal Authority. Sponsorship were solicited from companies such as Unilever, Nestle, Ghafo by Accra Municipal Authority and the street food vendor associations to build standard structures for the vendors. The structures were located at designated places for vendors to sell their wares by the regulatory bodies. Infrastructure on markets were improved to prevent raw or cooked foods been displaced on the floor. In locations lacking utilities such as water and toilet facilities the regulatory boards provide alternatives such as water reservoirs. Vendors were not granted permission to sell where utilities were woefully inadequate. Market women were also educated on the dangers of displaying food on the floor at markets.

3.7. Module 6, 7 and 8: Food Safety, Inspection, Legal Requirements

All the by-laws on food safety were harmonised and documented in local languages for street food vendors, taken clues from earlier reports[16-21]. The by-laws on food safety were provided by Accra Metropolitan Authority, Ghana Standards Authority, Food and Drugs Board, Metro and Municipal Assemblies, Ministry of Health and Environmental Protection Agency. Street food vendors associations were trained on the by-laws. A taskforce was formed by Accra Metropolitan Authority to monitor the street food night vendors. Radio, television and cinema

adverts were introduced for street food vending and only medically fit vendors were allowed to sell food. Logistics, motivation and education were introduced for processors and street food vendors. The regulators inspected facilities at canteens at schools, colleges, universities, and workplaces.

3.8. Module 9: Food Supply Chain Management

The food supply chain management was divided into three sectors; production, transportation and processing. Production: Species variety and the land for the production of the produce were checked as appropriate by the Metro and Municipal Assemblies. Sources of water were checked as appropriate by the Metro and Municipal Assemblies. Farmer's education on the use of fertilizers and pesticide on farms were monitored. Education of vegetable growers was conducted by the Ministry of Food and Agriculture. Transportation: Education of transporters by the Ghana Private Road Transport Union (GPRTU) and Progressive Transport Association (PROTOA) to use appropriate vehicles and proper packaging for specific foods such as meat and bread.

Processing: Food millers were educated on food safety to be able to identify and reject rotten produce sent for milling by the food vendors. There were provision of appropriate processing packages and storage of food for the street food vendors. Food vendors were trained to properly store leftover foods which are a source of microbiological contamination. Street food vendors and consumers were educated on the dangers of expired goods and rotten foods by the regulators.

4. Conclusions

Street/informal vended foods contribute significantly to the urban and peri-urban economy in Ghana. Street foods must have all the attributes of food safety to eliminate foodborne disease. The developed modules were timely intervention to successfully manage street/informal vended foods in Ghana. Utilities at markets and vending locations as well as infrastructure for street food vending were established. Intensified training of street food vendors and consumers created awareness of the relationship between contaminated food and foodborne disease.

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REFERENCES

- [1] FAO, Street foods made safer, FAO, <http://www.fao.org/news/2001/010803-e.htm>. (accessed on 21 August 2001). 2001.
- [2] WHO, Essential safety requirements for street-vended foods (revised edition), Food Safety Unit, Division of Food and Nutrition, World Health Organization. pp. 35. 1996.
- [3] Anon, Street foods, report of an FAO technical meeting on street foods. 6-9 November 1995, Calcutta, India. pp. 63-78. 1997.
- [4] Obeng-Asiedu, P., Socio-economic survey of street vended foods in Accra, In: Enhancing the food security of the peri-urban and urban poor through improvements to the quality, safety and economics of street-vended foods. In Johnson, P. N. T and Yawson, R. M (Eds). Report on workshop for stakeholders, policy makers and regulators on street food vending in Accra. 25 - 26 September 2000, Food Research Institute, Accra, Ghana, pp. 20 - 23, 2000.
- [5] Laryea, J., Improvements to street food vending in Accra. Report on workshop for stakeholders, policy makers and regulators on street food vending in Accra. 25 - 26 September 2000. Food Research Institute, Accra, Ghana. pp. 23 - 27. 2000.
- [6] Tomlins, K. I., Johnson, P. N., Obeng-Asiedu, P. and Greenhalgh, P., Enhancing the food security of the peri-urban and urban poor through improvements to the quality, safety and economics of street-vended foods. Final Technical Report, R No 7493 (ZB0199), NR International, Chatham, UK. pp. 76. 2001a.
- [7] Tomlins, K. I., Johnson, P. N. T. and Myhara, B., Improving street food vending in Accra: problems and prospects, In: Food safety in crop post harvest systems. In Sibanda, T. and Hindmarsh, P. (Eds). Proceedings of an international workshop sponsored by the Crop Post Harvest Programme of the United Kingdom Department for International Development. 20-21 September 2001, Harare, Zimbabwe. pp. 30-33. 2001b.
- [8] Tomlins, K. I., Johnson, P. N., Obeng-Asiedu, P., Myhara, B. and Greenhalgh, P., Enhancing product quality: street food in Ghana: a source of income, but not without its hazards, PHAction News, 5, <http://www.iita.org/info/phnews5/content.htm>. (accessed on 11 July 2002). 2002.
- [9] Tortoe, C., Johnson, P-N. T., Ottah-Atikpo, M., Quayson, E. T., Nyumuah, R. O. and Lamptey, J. A., 1st International meeting on the development of modules for street/informal food vending in Ghana, Zambia, Zimbabwe and India. DFID/CPHP/NRI/FRI PROJECT R8433 (ZB0375), 26th June - 1st July, 2005, Accra, Food Research Institute/CSIR, Ghana. pp.109, 2005.
- [10] Tortoe, C., Johnson, P-N. T., Atikpo, O. M., Modules for managing Street/Informal Food Sector in Ghana. Food Research Institute/CSIR, Accra, Ghana. pp. 65. 2008.
- [11] Argenti, O., Feeding the cities: food supply and distribution, 2020 Focus 3 (Achieving Urban Food and Nutrition Security in the Developing World), August 2000, Brief 5(10). International Food Policy Research Institute, Washington, D. C, USA. 2000.
- [12] Maxwell, D., Levin, C., Armar-Klemesu, M., Ruel, Morris, S. and Ahiadeke, C., Urban Livelihoods and Food and Nutrition Security in Greater Accra, Ghana, International Food Policy

Research Institute, Washington, USA. pp.190. 2000.

- [13] Tomlins, K. and Johnson, P. N., Developing food safety strategies and procedures through reduction of food hazards in street-vended foods to improve food security for consumers, street food vendors and input suppliers. Crop Post Harvest Programme, R8270 (ZB0339). Project Final Report, 1 February 2003 - 31 December 2004. Natural Resources Institute, United Kingdom. pp. 67. 2004.
- [14] Arde-Acquah, A., Health related problems with street foods in Accra. Overview of recent cases. Report on workshop for stakeholders, policy makers and regulators on street food vending in Accra, 25 - 26 September 2000, Food Research Institute, Accra, Ghana. pp 28 - 32. 2000.
- [15] Lues, J. F. R., Rasephei, M. R, Venter, P. and Theron, M. M., Assessing food safety and associated food handling practices in street food vending. International Journal of Environmental Health Research 16, 319-328. 2007.
- [16] Zimmerman, M., Newton, N., Frumin, L. and Wittet, S., Developing health and family planning materials for low-literate audiences: a guide. Washington D. C. Program for Appropriate Health Technology. pp. 7-9. 1996.
- [17] Garforth, C. and Lawrence, A., Supporting sustainable Agriculture through extension in Asia. London: ODI Natural Resources Perspective, No. 2. 1997
- [18] Nokiema, J. B., Testing forestry extension materials in Burkina Faso. Unasylva 47, 184. 1996.
- [19] Turongruang, D. and Demaine, H., Participatory development of aquaculture extension materials and their effectiveness in transfer technology: the case of the AIT Aqua Outreach Programme, Northeast, Thailand. In P. Edwards, H. Demaine and D. C. Little (eds.). Rural Aquaculture Wallingford. CABI Publications. pp. 307- 322. 2002.
- [20] Lupele, J., Participatory materials development in rural Zambia. Southern Africa Journal of Environment Education 20, 85-96. 2003
- [21] Mody, B., Designing messages for development communication: An Audience Participation Based Approach. London: Sage Publications. 1991.