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Food Safety Legislation in Some Developing Countries

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Abstract

Developing countries have uniquely intriguing challenges to implementation of food safety regulations as presented at a global scale and thus would benefit from a scientific approach that best suits them. Some common characteristics of food processing industries in the developing world include: they are small scale, cottage in size, mostly start at backyard or in dingy premises, more often than not, are managed by non-food technologists and who are reluctant to engage food technologists whom they believe could be more expensive or unnecessary addition to their current needs. At the same time, they are a bit skeptical of regulating institutions, have no idea as to the acts and legal requirements regulating food business premises and hence prefer keeping their business unofficial. From the foregoing, it is critical that approaches that address these challenges are applied in implementing food safety standards. This chapter reviews these unique challenges and presents case studies from Asia, West Africa and East Africa as well as innovative approaches/strategies that could accelerate implementation of food safety legislations in the developing world.

Keywords: developing countries, food safety, food safety legislation

1. Introduction

Food safety systems in developing countries are weak, fragmented, and not effective to protect consumer's health or help countries competing for export markets. Improving food safety often costs much (or is associated with additional costs which could only be recouped by the items fetching more money) and many developed countries experience real challenge in making food safety legislations work. At least, this is the perception of majority of SMEs. Many years later after the unveiling of codex and ISO standards, these countries' domestic markets suffer from sustained food safety-related issues ranging from food-borne illnesses to food

fraud. In spite of this, a lot of stride has been made with regard to development or adoption of international standards; however, what remains to be seen is the full implementation and hence marked decrease in food safety-related incidences [1].

Food safety concept continues to gain attention particularly in developing countries. Many countries rely purely on small scale (subsistence) and street vendors to feed their populations. Yet, these traders are not usually included in the mainstream food safety systems. In flow of substandard and poor quality goods, corruption, low income, unjust trade, and political turmoil are ills deviling developing economies, and this adds to the challenge of food safety systems' operation. Generally, few of the developed countries have formalized agriculture systems. To this extent, farm implements, fertilizers, seeds crop management practices, and manufacturing are scattered across vast geographical locations. Food insecurity, political instability, outbreaks of communicable diseases and natural disasters are challenges that compete for government attention; hence, food safety is often not prioritized. Yet, the definition of food security from the 1996 World Food Summit Plan of Action mentions access to sufficient, safe, nutritious and affordable food to all people at all times. Often, it seems that in developing countries, not enough emphasis is put on the safety aspect of food security [2].

According to published data by FAO and WHO, about 2000 food-borne-related deaths occur daily in Africa. Over 700,000 food-borne illnesses recorded annually are due to diarrheal-related illnesses and from contaminated food and water. *Salmonella*, *Shigella flexneri*, *Shigella sonnei*, *Clostridium perfringens* and other parasites are major culprits. An alarming average of 3.3–4.1 episodes of diarrheal diseases among children in Africa has also been recorded annually. Coupled with malaria, HIV, TB, these become more debilitating, creating a huge dent on the public health's integrity. Food-borne illnesses lead to reduced productivity, disability, early deaths, low incomes and hence low access to food and the problem becomes cyclic. Illegal use of food additives, (E110, E102, E104, and E124) in local and imported foodstuff including infant foods, is an alarming case. Unless an approach that understands the unique challenges of developing economies are employed, the great food safety legislations may remain in revered books of codex without having a real impact on food safety situation in the developing world [2].

2. Why food safety legislation must work in the developing economies?

First, developing countries bear the greatest global burden of food-borne illnesses and death. The strain this adds to an already stretched public health services is huge. Second, regional and international trade is becoming extremely invaluable. For this reason, more sensitivity to food safety is needed. Benefits of safe, adequate, and nutritious food abound. It is crucial to long-term economic growth, good health, and productivity. It is also associated with a happier population that would enjoy reduced conflict. Countries in Africa and the rest of the developing world have some form of legislation regarding food safety. Some of this, however,

are most rudimentary, archaic and at times not based on sound science. For these legislations to benefit the rest of the countries, there must be a push to align them to World Trade Organization (WTO)'s agreement on the application of Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) agreements and the Codex standards and codes of practice. Some of the standards are not science-based as required by Codex in a bid to help facilitate regional and international trade among different countries. This then curtails international trade and sometimes creating a bad notion of standards among processors. Several factors hamper the push to realize the implementation of food safety legislations in the countries such as inadequate technical capacity, lack of awareness of economic loss arising from poor quality foods, and weak enforcement of regulations among others [1]. The unveiling of the ISO allowed for HACCP to be upgraded through the International Standard ISO22000:2005 (Food Safety Management Systems—Requirements for any organization in the food chain). The ISO technical committee on food safety created in 1947 is one of ISO's oldest and most fruitful committees, with over 830 published regulations and 125 more in the pipeline. ISO standards have played a crucial role in promoting global standards, development of harmonization and awareness creation. In many developing countries, ISO 22000:2005 is not a mandatory food safety requirement and perhaps due to its complexity, cost of compliance or technicalities, only few companies that most of the times have qualified food safety experts manage to get the certification.

2.1. Key food safety regulations at the world stage with an impact on developing economies' food safety

Africa has been reported to enjoy over 5% annual economic growth in the recent decade, and this growth rate is predicted to continue or even improve in the next couple of years. For African countries, opulence and affluence among her populace is creating a reason for demand of high quality safe and mostly longer lasting products [2]. This can also be said accurately of the rest of the developing economies especially in Asia as well as South America. The Sanitary and Phytosanitary (SPS), World Trade Organization (WTO)'s—Technical Barriers to Trade (TBT) agreements are some of the regulations that require attention of all countries involved in any trans-border trade particularly of agricultural produce. The developing economies are huge exporters of raw or semi-processed agricultural goods, and these put them directly under the requirements of these legislations. Though there exists food safety standards in almost every country in one form or the other, these standards do not adequately help to improve food safety because of two main reasons. First, imports even of poor quality foods are not curtailed sometimes due to laxity, incapacity, or corruption. Some of the regulations are far stricter even beyond the codex requirements this more often than not hinders trade especially inter-regional trade. Second, there is very low level of implementation of regulations across board. This is why the regularization of laws and their harmonization should come into play. There are few global organizations that are at the forefront and with the expertise and neutrality to help countries navigate this concept of global standards harmonization. One such initiative is the Global Harmonization Initiative (GHI). More about the structure strategies and aims of the GHI and other such bodies are discussed in a later subheading.

2.2. Models of national food safety and quality control systems

In general, it can be surmised that there are three major models adopted by countries in national food control systems: the single agency model relies on one organization or umbrella body which is mandated with all the functions of controlling food safety. This model has the advantage that food safety issues are accorded priority, and they can be highly effective. The second model implies multiple agency scenarios. In this case, the role of food safety is sector and commodity-specific. In this system, the roles could also be devolved to federal, local governments or counties and the national level. Some challenges with this model are: duplicity of functions, conflicts, and differing expertise at national and at the regional level, reduced domestic consumer confidence and confusion among stakeholders as to which laws to comply with. The third model is an integrated system: in this system, agencies are assigned jurisdiction based on aspects of food safety which cut across all the sectors such as policy development, coordination, inspection, education, and training. Irrespective of the model that best suits a country, it must be based on the principles of transparency, inclusiveness, integrity; clarity of roles, accountability, science/risk-based approach and equivalence as the benchmarks against which its success is measured [3].

3. Components of a good national food safety system and the status of each in the developing countries

3.1. National food safety policy

This gives the general direction and thrust to the food industry in a country and defines the collective vision for all the actors in the food chain in a country. The presence of a Food Safety policy (FSP) is critical to coordinated function of all the organizations charged with the responsibility to deliver food safety. It is in this document that governments must state and demonstrate food safety and its relation to economic and public health. The case studies of the developing countries here demonstrate at least governments' understanding and commitment to setting up a food safety and nutrition policy.

3.2. Food legislation

Once a food safety policy is in place and adopted, this gives room for appropriate accompanying legislation. The legislation must be updated, based on science; give spell out clearly the roles and obligations of each concerned organization, and above all be enforced. For many developing countries, the full enforcement is a missing ingredient. For food safety legislations to succeed, they must cover all components of the food supply chain. Often in Africa, and the rest of the developing countries, food safety legislations leave out the informal sector which is a major contributor to food value chain and hence any accompanying ills.

3.3. National food standards development platform

There is great variety of indigenous foods in the developing world. Many countries do not have standards that govern preparation and trade of these indigenous foods. Effort is put

currently through Codex Alimentarius Commission's (CAC) Working Groups to change this. This move should be encouraged and many countries ought to bring on the table several of their native foods. However, the standards development process must be supported by scientific data on nutritional and safety aspects of food which is a gap that needs to be filled. In addition, the standards development must be responsive and internationally oriented and the body responsible be accorded a clear mandate.

3.4. Science-based risk assessment (RA)

Legislation and standards that serve the intended purposes in guaranteeing food safety and cross border trade must be science-based. WHO and FAO had earlier, in 1992, stated that risk analysis must be the basis of any food safety framework [12], but in developing countries, lack of expertise, low investment in the requisite infrastructure, and difficulty in collecting own toxicological data is a hindrance to RA. This challenge is a huge one and requires collaborative and innovative efforts from all stakeholders. Toxicological exposure data in many developing countries is very scanty, inaccurate, and usually not timely. To help developing countries to conduct risk assessment, FAO/WHO studies is a great place to start but unless these are closely related to the country's specific needs, priority may differ from those of FAO and WHO and depending on FAO/WHO's focus data may take long to finally capture the aspirations of specific countries.

3.5. Inspection

Food quality inspections demonstrate or validate the success or failure of food safety legislations. Legislations that are not enforced are not beneficial at all. This is a major setback in all the aspects of the developing countries. Many factors contribute to this; including low status often awarded to food safety officers, inadequate logistical support, and cumulative tasks required of them hence intermittent attention to the task of inspection. Inadequate geographical coverage in all areas of the country by inspectors of food legislations and neglect of rural community means that their food safety concerns often go unaddressed.

3.6. Laboratory testing services

Inspections, and other aspects of food safety monitoring, depend largely on validation, and this is partly conducted by testing of samples to ensure enforcement of legislation. Rapid laboratory testing is also critical to implementation of food-borne illness' outbreak surveillance. In many cases, laboratory facilities in developing economies whether in Asia or Africa are old, poorly equipped and with either very few personnel or with low competency.

3.7. Capacity

Capacity to implement food safety legislations is a major determiner of success or failure of a food safety management system at the country level. Inadequate capacity is a bottleneck that cuts across many areas. This may be due to lack of competent personnel, lack of funding or poor logistical support to carry out the different aspects dealing in food safety.

3.8. Training and education in food safety

Food safety legislation requires regular, planned ongoing training, and upgrading of knowledge for food control officers, law enforcers, consumers and all stakeholders. Many factors regarding food safety change from time to time. This may include status of chemicals for use as food additives, and even specifications like microbial criteria or tolerable daily intakes. Competent, updated and, a responsive team is required to harness these developments for the purposes of making food safety legislations work.

3.9. Epidemiological surveillance

One of the key hurdles to success of food safety legislations is dealing with unreported cases, of illnesses and deaths that arise from food-related illnesses. There must be a link and a close one at that between the food safety enforcing bodies, and the public health departments. Not just that countries must strive to strengthen the epidemiological data collection tools, but also the consumers ought to be well informed about the procedures and benefits of reporting every case even to including suspected cases.

3.10. Codex Alimentarius Commission (CAC) membership

Membership to CAC is voluntary as well as adoption of its standards. It focuses on ensuring consumer safety and promotion of trade. The CAC's legislation should only be a bare minimum and since they are based on science, they avail the platform that supports countries to provide safe and nutritious foods to their domestic as well as for international market. On this score over 50 African countries are members of CAC and this puts them at a platform to engage on food safety legislation [4].

4. Gaps and the hindrances to full implementation of food safety legislations in developing countries

So far, there are a number of factors that make it difficult for the food safety legislation to work “perfectly” in the developing countries. One of these reasons is minimal application of HACCP to food processing industry and particularly because its implementation is not a mandatory requirement. On the other hand, multinationals and some special food value chains, particularly the export-oriented ones, have adopted HACCP or even stricter systems as has been demanded by their customers in these markets. Of course, this varies across countries with South Africa leading other African countries in embracing third party certification of food companies. Developing countries must be made to understand and appreciate the fact that food safety management systems that work, provide more benefits to the citizenry and is better for the economy. These facts, however, may never have been so clearly stated and understood by those responsible for food safety legislation, implementation, and monitoring [2].

4.1. The two faces of developing countries' food safety management systems

Most developing countries at least host multinational companies that are crucial and that serve a niche market. This includes the likes of Coca Cola, Unilever, Mars Incorporated, and Wrigley's among others. These are companies whose food safety management systems are extremely strict. In most cases, they are more focused on the use of their internal standards and auditing techniques than they do rely on the inspections mounted by governments. They have systems replete with a robust backup and huge capacity in terms of laboratories, personnel and necessary logistics. Unfortunately, in the developing countries, these lie and operate side by side with the uncoordinated; unregulated street food supply chain that indeed are greater sources of food especially for the urban, poor and middle class dwellers. The existence of the two tier-food safety operations in the developing economies: the multinationals and the local startups, is a phenomenon that must be harnessed as a learning point to enable food safety be addressed to all who are affected by it.

5. Case studies: status of food safety legislation in West Africa

5.1. Food safety legislation in Ghana

Ghana's food production system is dominated by informal—very intricate-small- and medium-sized enterprises (SMEs). Hazard Analysis and Critical Control Point (HACCP) systems are not applied by SMEs and occasionally by the large food processors in a reactionary manner, that is, in response to a food safety threatening incident or at the behest of consumers in foreign markets. Most of the local foods and brews are not necessarily included in the standards in Ghana, and this leaves a gap in which food safety programmes cannot be implemented yet these foods contribute massively to the quantity and nutritional intake of the population. These neglected food supply chains could easily be the source of food-borne illnesses and even death. Essentially, there is low literacy that people who are sensitive about food safety are seen to be doing so out of their affluence or to belong to a different class than everybody else. Compared to other challenges like lack of electricity, roads, and food insecurity due to inadequate supplies, food safety is not a priority to most developing countries. This may be the reason why inadequate funding is put toward this endeavor.

This lack of priority means many food supply chains for the majority of the rural areas and town dwellers are not regulated, and to compound this further, traceability mechanisms are almost nonexistent. However, for a few commodities traded formally and internationally, reasonable food safety parameters and legislations are in place. These commodities include; cereals, fruits, vegetables, oil seed, cocoa, and shea nuts. Ghana Food Safety Authority is faced with an inadequate food testing capacity quagmire. This is in reference to equipment, personnel, and the location of the main government laboratory in Accra, serving the whole country [5].

5.1.1. Main actors in ensuring food safety in Ghana

The various Ministries Departments and Agencies have been set up drawing from various legislations. There is, however, a need to have these standards revised and aligned to modern food regulations. Ghana Standards Boards' mandate is to establish and promulgate standards. It also promotes standardization in industry and commerce thus promoting industrial efficiency. Further, it promotes welfare, health and safety for consumers. In addition, it runs the certification scheme, inspection of food safety operations and metrology. Government of Ghana has several ministries involved in food safety legislation; with the ministry of Environment and Science, Trade and Industry, Ministry of Health, and Ministry of Food and Agriculture taking the leading roles. In the Ghanaian system standards setting formulation/drafting and advice is divorced from the bodies involved in control and enforcement of legislation. There is also separation of risk analysis and advice from the bodies mandated with management and operationalization of the food safety system. However, Ghana has also taken an important step in drafting the National Food Safety Action Plan (NFSAP) to restructure food safety, agriculture, and health institutions to improve efficiency and governance. Such a move allows for a coordinated effort among Ministries, Departments and Agencies, allowing for smooth operations, avoiding duplication of duties, eliminating conflicts and encouraging better enforcement of food safety legislation [5].

5.2. Food safety legislations in Nigeria

Food safety in Nigeria is undermined by inadequate application of Good Agricultural Practices (GAP), abuse of agrochemicals, use of pesticides for fishing, misuse of pesticides for stored grains, chemical contaminants like lead poisoning, and abuse of additives (butylated hydroxyl anisole, nitrates/nitrites). Other challenges include use of toxic packaging material with degradable components, public ignorance, uncoordinated approach and lack of technical expertise, including poor laboratory facilities. On top of this, there is inadequate enforcement of the available legislations. At the same time, food-threatening droughts force inclusion of contaminated food in to the value chain.

5.2.1. Components of national food safety control in Nigeria

The legal framework mirrors that of Ghana with major components being: legislation, policy, institutionalization (institutional framework), inspection, and laboratory testing services. National food safety policy was established in 1999. The establishment of the food safety policy in Nigeria set the country on a path toward well-coordinated food safety legislation. It recognizes the roles of the public sector and that of private sector in addressing challenges of food safety in a multisectoral model [6].

5.2.2. Bodies responsible for food safety legislation in Nigeria

The country boasts of numerous food-related legislations. The laws focus on consumer protection, proper coordination, development of relevant policy, and priority setting in enforcing food legislation. It advocates HACCP as the basis to all food production and processing

operations. The other organizations in Nigeria, charged with food safety include the Ministry of Health, National Agency for Food and Drug Administration and Control, the Standards Organization of Nigeria, Ministry of Agriculture and Research and Development and Fisheries, Plant Quarantine Service, the Consumer Protection Council, Federal Ministry of Environment and, Federal Ministry of Trade and Industry. It also recognizes the role of university, research, and local governments in creating awareness and training of personnel for most food safety focused agencies. The key factors to successful food legislation in Nigeria are increased public awareness and customer education about the dangers of neglect of food safety. There should also be better coordination among the bodies charged with responsibilities for food safety. Lastly, capacity building by training of personnel, producers and regulators is vital toward achieving success in implementation of food safety legislation. The SMEs should be urged to form associations for ease of government support in terms of training and awareness creation [6].

5.3. Status of food safety legislation in East African Community (EAC)

Kenya has over 22 Food safety-related legislations under different Departments and Agencies. Kenya became a member of the Codex Alimentarius Commission in 1969. It has since played some crucial functions in various Codex committees and is currently chairing the CCAFRICA region. It has also adopted more than 100 Codex standards. Kenya has developed a National Food and Nutrition Security Policy. Food Safety is a key pillar of the policy document and it can be found under the subtopic of "Food Safety, Standards and Quality Control." The proposed National Food Safety Authority will be an innovative platform. Chiefly it will be mandated to conduct risk assessment, an area that has been grossly underrepresented in Kenya and the rest of the developing economies. It is also expected to promote human health and ensure better coordination among all the multiple-stakeholders in food safety. The Kenya's food safety management model is integrated with several bodies across different sectors mandated to ensure safety quality and promotion of trade for specific products in some cases [7]. Kenya is an integral member of the East African Community (EAC). The East African Community has been keen to harmonize several commodity standards with a total of 42 standards recorded as having been harmonized. The thrust has been to facilitate trade and remove barriers allowing for faster movement of goods across borders and thus reducing food losses. Most of these achievements have been through the Working Groups on various commodities. Despite the efforts directed to securing food safety in Kenya, foodborne illnesses, and outbreaks, fraud, and other ills are still reported with regularity [7].

5.4. The food safety situation in Asia contrasted to Africa

Having looked at some cases of developing countries in Africa, the focus shifts to understanding the food safety scenarios of developing countries in Asia. Two countries that are an important part of the Asian continent, Nepal and India are presented in a bit of depth. Developing countries in Asia have definitely unique food safety scenarios. Nepal, for example, became a member of WTO in the 2004, and hence food safety has acquired a reasonable interest. The most important challenges are as follows:

- Poor food safety regulation and enforcement infrastructure
- Inadequate technical and regulatory, assessment of conformity
- Inspections are difficult as the food producers, processors, traders and retailers are in large numbers and scattered across the country.

5.4.1. Major regulations governing food safety in Nepal

Nepal is a member of CAC, WTO, FAO, and South Asian Association for regional cooperation (SAARC). It is also a member of the World Organization for Animal Health (OIE) and Bay of Bengal Initiative for Multi-sectoral Technical and Economic Cooperation (BIMSTEC). The country drafted its first food legislation in 1966. This piece of legislation was called the Food Act. The Food Act spelled out the basis for control of inspection of food premises, destruction of nonconforming products and ensuring safety and quality of imported foods. This was then followed by the Plant Protection Act of 1972 and Animal Health and Livestock Services Act of 1998. The upsurge in international trade and economic liberations in Nepal in the 1990s made food safety a priority as it became critical for acceptance of products traded internationally. Initially, the focus of food safety strategies was toward end product testing. Increasingly though, the knowledge of HACCP and other important food safety systems has resulted in the focus moving to the “farm to fork” continuum. Food safety legislation is increasingly based on HACCP principles even though this is not mandatory yet. Owing to the fact that the country does not have a traceability component, effecting recalls, understanding sources of food contamination, and hence mitigation in times of food-borne outbreaks becomes very cumbersome and may take too long [8].

5.4.1.1. Food safety institutional framework in Nepal

The Food safety and quality management system in Nepal is under the Ministry of Agriculture and Cooperatives. This is done through the Department of Food Technology and Quality, which is focused on safety and quality of food in the market and ready to eat food. While the Department of Livestock and that of Agriculture are charged mostly with handling safety at primary production of food. The Nepal Council for Standards and the Nepal Bureau of Standards and Metrology are charged with standards development and implementation in Nepal. They are the standards governing body and custodians. Nepal Council for Standards (NCS) is mandated to approve all Nepalese standards while the Nepal Bureau of Standards and Metrology (NBSM) functions as the secretariat that prepares the standards. NBSM has developed and adopted more than 100 standards related to food. Through the South Asian Regional Standards Organization (SARSO), the country is also actively involved in development of regional standards. The Food Standards Board (FSB), advises government on standards and principles and also ensures that they are aligned to international standards. [8].

5.4.2. Food safety legislation in India and the institutional frame work

The food safety and quality management systems in India are under the mandate of the Food Safety and Standards Authority of India (FSSAI). There exists an increased demand for safe,

high-quality food and greater choices among the Indian consumers. Food safety incidences like the 2015-withdrawal of *Maggi noodles* and the governments' surveillance of food-related illnesses contribute to create awareness on food safety among Indian consumers. Still, over the years, many food-borne illnesses are unreported and foodborne outbreaks are erratically reported. In 2006, about 13.2% of households reported food-borne illness. Food Safety Standards Act (FSTA) of 2006 was designed to improve the overall safety of consumers and aid advancement in international trade. Food Safety Standards Authority of India (FSSAI) is wholly responsible for food safety matters. However, even after a decade of transitioning, there are still overlaps of legislations between the Bureau of Indian Standards and FSSAI especially with regard to milk. The same case is observed in fruits and vegetables as both the FSSAI and Agricultural Marketing Standards apply yet both are based on CAC standards. These incidences confuse consumers and make it difficult for producers to distinguish whether the regulations are mandatory or not. Finally, there also exist state-level legislations that require compliance, and this sometimes complicates the intra-state trade [9].

5.4.2.1. The focus for better operation of food safety and management system in India

There is a need to improve capacity to enable effective inspection and monitoring of food safety conditions in India. Prosecution and administration of food laws require to be devolved at the state level but currently lies at national level and therefore far flung areas are hardly reached. The country needs to improve laboratory access that currently is deficient and efforts should be made to improve on the number of specialists in the food safety related fields. The main focus in India's food safety management system is on upgrading laboratories and collaboration between the AGMARK and the FSSAI labs and the sharing of data. This way, only failed samples should be passed on to the national reference laboratory. The universities and FSSAI need to train and employ food safety experts. There is a need to increase awareness of all stakeholders especially on updated regulations. There must be increased emphasis on training of food handlers especially among the informal and small-scale food processors and producers. Currently, awareness is disproportionate among the rural consumers, and yet, these consumers like everyone else deserve good quality food. Use of mass media campaigns to target rural consumers will improve their awareness. Lastly, it is crucial to remove overlap in responsibilities of the organizations and assign clear mandates and modes of collaboration must be agreed [9].

6. The role of GHI and other professional societies in implementing food safety legislation in the developing economies

GHI was launched in 2004 by the International Division of IFT and the European Federation of Food Science and Technology (EFFoST) in collaboration with Food Safety Magazine and Elsevier Science. GHI officially achieved the status of a nonprofit, charitable association in 2007 and is registered in Vienna, Austria. GHI aims to harmonize food safety legislations and regulations based on solid science as datum for building consensus. GHI identifies issues presented with justification and evidence, then prioritizes them depending on the availability

of experts as Working Groups (WGs) who then evaluate evidence provided to address the specific issue at hand [10]. Making food safety work in the developing countries requires a knowledgeable population. More often than not, the masses are easy to persuade and sometimes fall prey to misleading reports on food safety. Sometimes, politicians are culprits who twist food safety issues for political gain even when the claims are not scientifically sound. A case in point was the anti-GMO crusades conducted in Kenya in 2014–2015 leading up to the government's ban on production and trade of GMOs. GHI in its approach to promotion of harmonization of food laws is addressing serious issues that could be exploited to make food safety work in developing countries. These are discussed below.

6.1. Development of working groups on nomenclature of food safety

The organization believes that meaningful consensus building regarding food safety legislations and regulations can only be achieved if stakeholders have the same understanding of the working definitions of terms used in the area of food science and technology. This is often taken for granted, yet GHI experts prove that even among English-speaking nations like the UK and the USA, some terms used can markedly differ in their meaning. Take the definition of food additives for example, this is markedly different between Canada, US, EU and Japan. GHI has a Working Group Nomenclature on Food Safety and Quality, which had started with harmonization of Russian and English legislations particularly with regard to definitions of terms used in food safety and quality. Such a common definition will lead to a better understanding among food safety experts and enhance consensus building among the developing countries as well with the promise of better implementation of food safety legislation and regulations [11].

6.2. Training and education

The GHI Working Group on Education's aims to develop a curriculum for educating the public and all stakeholders in the food value chain is very timely. The curriculum is targeting food handlers and also everybody else in the food value chain. The WG aims to create training tools and materials written in simple understandable language and including use of pictorials targeting those who are not able to read. In addressing the knowledge gap, GHI works to ensure that certain key messages in food safety need to be presented in the local languages and in a manner that is understood to the media, political class, and consumers. GHI is of the opinion that food safety legislations and regulations are often written in a manner and a language that is difficult to understand even for trained professionals. Regulations must be "translated" into understandable language, so that people affected can appreciate them.

6.3. GHI wants regulations to be based on good science

GHI's impartiality can be harnessed to help promote consensus on standards and eradicate possible barriers and destruction of an otherwise safe food due to different countries' legislation. Evidently, it is not for lack of consensus among scientists that differences in food safety legislation occur but rather in the language and communication of the science to various stakeholders. To improve this, building of capacity in terms of personnel, data management,

and risk assessment is critical. Most regulations, however, should be the same in all countries; differences may only be needed because of specific eating patterns or genetic issues, like in Japan and Finland where a large part of the population has no beta-galactosidase and therefore cannot digest lactose, which makes too high concentrations of cow's milk in food products toxic for such people. GHI wants to harmonize the regulations so that trade barriers are removed and food is not destroyed at the border just because the regulations between countries differ [10, 11].

6.4. Global incident alert network

The GHI is developing a Global Incident Alert Network for unauthorized food additives. In such a case, whenever it is found that an illegal (unauthorized) substance that can harm consumers is added to food, in any part of the world, the individual who discovered that is tasked with the role of alerting a dedicated committee who will then have the means and the protocol to verify the issue within a short period of time and communicate the same to the relevant authorities who should then take the necessary actions to correct the situation. If necessary, this may be done anonymously, avoiding reprisals by the employer. Such an initiative can also help developing economies and enhance transparency and adherence to food safety rules and regulations [11].

6.5. FAO, CAC and other international organizations

Codex Alimentarius Commission (CAC) is an intergovernmental body that is involved in development of food safety standards and is officially recognized by WTO as the arbitrator in conflicts involving food safety legislation between countries or companies at the international level [12]. Though CAC has done a great deal in this regard, it has faced a few challenges that derail its efforts in harmonizing food safety regulations. First, it meets annually and this means the matters agreed at such meetings do not receive speedy progress. Second, the participants to these committees are not always food technologists with grounding on food safety; furthermore, they may strive to secure the interest of the countries they represent as a priority. The African Union (AU) has formed expert committees that mirror those of Codex. These food safety experts' committees now can offer thoughts considered as Africa's position on food safety matters. This is a key development as it offers a focal point of responding and dissemination of information. The AU is also fronting the formation of the African Food Safety Authority that will set standards for monitoring Africa's food supply chain, an equivalent of the European Food Safety Authority (EFSA). There must be a good political will for food safety legislations to work in the developing economies and this initiative being spearheaded by the political arm of AU may just be the right recipe for stimulating local action [2, 11].

6.6. Innovations that could lead to a faster and better legislation of food safety in the developing world

The first strategy is the implementation of the rapid alert and response system: that was proposed by GHI in 2014. This system if operationalized can lead to information sharing across the countries. Sharing strategic information could easily save lives by stopping potential

food-borne outbreaks before it happens or at least at a very early stage. Analysis of some of the major incidents involving food-borne illnesses in the world indicate that a majority of them would have been prevented had there been a proper reporting channel from those who were involved but who did not talk due to fear of reprisals and possible loss of jobs [11]. Operationalization of such an alert would enthuse consumer confidence leading to increase the economic development. Such a move would stimulate demand for high quality products that puts the whole food safety management system of the developing countries on a higher trajectory. Easier reporting channels, operationalization of help lines, including mobile apps that consumers and small-scale processors can reach to seek help and meet with experts in food safety can provide huge impact.

The second aspect that needs quick redress is regional risk assessment. Due to the nature of funding and capacity required to make this happen, countries and institutional collaborations in this area will help developing countries to not only cost-share requisite infrastructure, but also the ensuing data that may be similar in a number of cases. Such an undertaking will help countries avoid duplication of efforts, reduce unnecessary spending on infrastructure, and enhance better collaboration on matters of risk analysis data among neighboring countries.

Third, knowledge and training of populations on the food safety basics is the most important aspect in making food safety work best in developing economies. Food technologists and the food technology organizations including those adhering to the IUFoST ought to play a bigger role in pushing food safety agenda and particularly in the area of training and education. Both IUFoST and GHI have a training component (the universal food safety curriculum) that is envisaged to greatly improve consumer and other stakeholders' confidence to play their role of keeping processors and vendors in check with regard to food safety. Creation of awareness to consumers about their rights and privileges confers them confidence and empowers them to keep the food industry and government on toes to deliver on their food safety mandate. All food processors and street vendors, regardless of their remote location and "small" service, must be encouraged to register into clusters of 50–100 or even smaller groups through which expert knowledge on basic hygiene and safe food handling practices can be passed on to them.

Fourth, every single cottage industry that is set up must be made comfortable to realize that the food safety legislations are actually for their good and not meant to keep them away from business. This requires a better working relationship between law enforcing bodies and these food startups. The focus for these legislating bodies should be to midwife these businesses first to profitability through functioning food safety systems, rather than focus on levies when the factories can hardly break even.

Fifth, massive and urgent educational input is required in the area of abuse of additives, or fraud in using chemicals like calcium carbide as an artificial ripening agent in fruits and vegetables by unscrupulous traders in countries like India, and some places in Kenya [13]. Or even the use of formalin in meat preservation, or large doses of sodium metabisulphite in meat preservation to mention a few. The use of these and other cancer causing chemicals must be addressed to consumers and processors and their relation to cancer or the ensuing impact of that, on households and public health explained. It is very critical to make sure that people are made aware of the dangers of the use of such chemicals and their abuse. However, the education must be complete by making consumers understand the relationship between dose, exposure and the possibility of dangers particularly on additives. This way alarmistic

remarks that cause panic resulting in loss of what would essentially be good food, will be avoided [11].

Lastly, laboratory facilities are key pillars to ensuring food safety in developing countries. However, they require huge initial investments, high running costs, and very well-trained personnel who are equally expensive to sustain. Developing countries should be encouraged to consider setting up regional centers of analysis, intra-country laboratories, shared regional analytical capacity, and even regional training. This suggestion when implemented will greatly lower the costs and improve access to laboratory analytical facilities. The collaborating countries can also realize a state-of-the-art facility thus enabling quick in-depth analysis that is very important in case of mounting surveillance or diagnostics in cases of disease outbreaks. The private sector involvement and support in availing laboratory analysis and facilities should also be considered seriously as a means to bridging the gap.

6.7. Next dimension to making food safety work in developing economies

Education is key area that must be addressed to provide capacity. Safety consciousness as a culture along the entire value chain is key. Food Biosecurity or Defense is increasingly becoming important, yet most developing countries are yet to begin to put policy mechanisms or laws that govern their food value chains and protect it from fresh threats like bio-insecurity or even bioterrorism. This also goes to developing countries' capacity in responding to biosafety concerns and accompanying legislation. It is high time developing countries begin to deal with the concepts of GMOs based on evidence and perhaps exploit this area that may lead to sufficient foods, thus eliminating the need to allow unsafe foods to enter the value chains due to food insufficiency [11]. Even though the countries have differing opinions on GMOs, the inadequate capacity to test for transgenics in developing economies makes it twice critical that some form of harmonized response based on evaluated and impartial evidence, be reached to facilitate transboundary movement of GMOs.

7. Conclusions

This chapter has focused on the unique challenges to food safety legislation in some developing economies and the innovative ways in which the stake holders should approach the subject and make it more effective. It has also presented case studies of food safety situations in some developing countries: Asia (India and Nepal), West Africa (Ghana and Nigeria) and East Africa. Finally, it proposes major innovations that could be put into play to make food safety legislation work more effectively in the developing economies.

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Conflict of interest

The authors have no conflicts of interest in addressing this topic.

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