

Global Food Safety Hand Book

Case study : Indonesia

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I. Food Systems in Indonesia

Agriculture is an important sector in Indonesia because 50 percent of Indonesia's population consists of farmers. However, the contribution of this sector to the Gross Domestic Product (GDP) is only 13.7% in 2008. This number was relatively constant in the last five years, from 2004 to 2008 (Central Bureau of Statistics, 2010). Of all the agricultural sub sectors, food crops are the main contributor to the GDP with a total share to the total agricultural sector of more than 50%. The minimum contribution of agricultural sector to total GDP and the large number of population working in the agricultural sector strongly indicates that the farmers are poor.

Most of foods produced in Indonesia are used to supply the domestic market and only a small percentage of them are exported. The percent share of agricultural sector to the total export value of the country is around 3%. According to the Central Bureau of statistics (2010), the main export of Indonesia is still dominated by manufacturing products (59%), oil and gas (20%), mining and others (18%).

The key agricultural product of Indonesia is rice, produces, palm oil, seafood and cacao. Rice and fresh produces are produced mainly to supply Indonesia's domestic market. Since 2007, Indonesia has been the largest producer of crude palm oil with a total production reaching up to 16.87 million tones in 2007. Crude palm oil is the raw material of cooking oil, margarine, ice cream, and many other food products. On the other hand, the total production of cacao has been decreasing in the past few years. This situation, however, still placed Indonesia as the third largest producer of cacao in the world (Hariyadi, 2007).

Rice is the most important cereal in Indonesia since it is the main staple food in most regions in Indonesia. In 2009, the total production of rice was 64,329,329 tons which were harvested from 12,878,039 ha of rice field area. More than fifty percent (~54%) of all of the rice in Indonesia is produced in Java, Indonesia's most populated island (Central Bureau of Statistics, 2010).

Banana, orange, mango, pineapple, and *rambutan* are the major fruits of Indonesia as shown in Figure 1. These fruits are normally consumed fresh, although several traditional foods such as cake, *dodol* (an Indonesian sweet, a traditional intermediate moisture food), and chips are prepared from the fruits. Similar to fruits, a large proportion of vegetables are also consumed fresh. Cabbage, shallot, tomato, chili, and leek are the main vegetables produced in Indonesia. Figure 2 shows the total production of the major vegetables in 2008.

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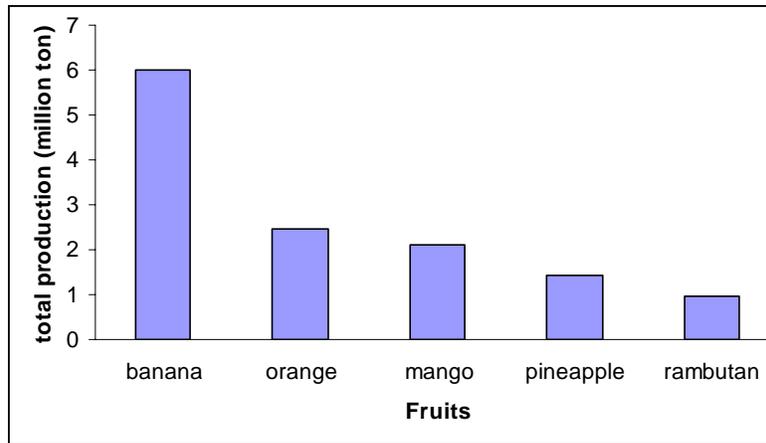


Figure 1. Total production of major fruits in Indonesia in 2008 (Central Bureau of Statistics, 2010).

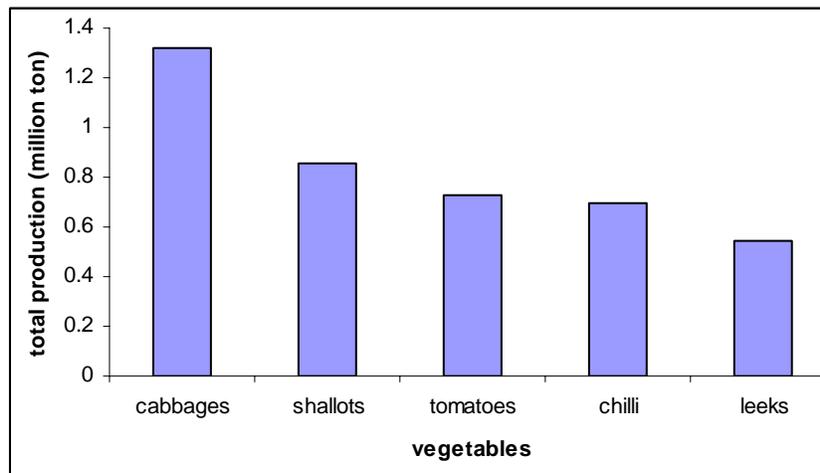


Figure 2. Total production of major vegetables in Indonesia in 2008 (Central Bureau of Statistics, 2010).

The number of food industries in Indonesia has increased significantly in the last five years and their total outputs were more than doubled during 2003 – 2008 as shown in Table 1. Large and medium scale food industries showed higher increase in total output than that of small and micro scale ones. In contrast to the general trend, the total output of small and micro scale food industries in 2007 -2008 decreased slightly as compared to their total output in 2006.

Table 1. Total output of food industry in Indonesia in 2003 – 2008 (in billion IDR)

Food industry category	Year					
	2003	2004	2005	2006	2007	2008
Large and Medium	162,388	171,318	204,053	264,566	335,547	435,990
Small	11,352	13,580	21,709	36,965	27,316	29,967
Home/micro scale	19,488	20,191	21,304	41,174	39,638	39,601
Total	193,228	205,088	247,066	342,705	402,501	505,558

Source: Food Review Indonesia, 2010

Food habits in Indonesia's rural areas are relatively different to those of the urban areas. In the rural areas, people tend to consume fresh food. They also normally prepare their food by themselves for the entire family. For practical reasons, the urban population tends to consume more processed food that is commonly sold in supermarkets. In 2009 alone, more than seven thousand new hypermarkets and supermarkets were launched. Since most of the family members of urban population have activities outside the house, they also frequently eat out in restaurants, canteens or other food service establishments (Susilo, 2010). This phenomenon is also reflected by the fast growing of restaurants and other food establishments that can be easily found in urban areas.

Most food is produced in the rural area where vast farming area is readily available. The food is transported to major cities mainly using trucks. Although harvesting and transportation is generally carried out late afternoon and during night when temperature is lower, transportation from the farm to the market in the cities is often responsible for the main loss of the produce's quality and quantity. This is because of the heavy traffic along the road and the temperature which sometimes reaches above 30°C. Physical damage of the fresh produces due to overloaded trucks during the transportation also contributes to the loss of quality and quantity. In general, the system lacks the cold chain and therefore the quality and possibly safety may be compromised. As a result, the initial microbiological counts of various vegetables are quite high.

II. Food Safety System in Indonesia

In the past two decades, food safety has become a very important issue in Indonesia. The first national regulation regarding food in Indonesia was issued in 1996, i.e. Act no 7 1996 on Food. Following the Act, a government regulation no. 18/1999 on food labeling was also issued. The regulation standardizes labels and claims posted in food packaging. In 2004, a government regulation number 28/2004 on food safety, quality and nutrition was announced.

Act no. 7/1996 laid several terms and requirement for food production, food safety and food sanitation as well as sanctions for producers who do not comply with the requirements. The Act described limited aspects of food safety covering food additives,

food sanitation, irradiated foods and genetically engineered foods. The government regulation no 28/2004 accommodates the basic requirements for all food producers i.e the implementation of good agricultural practices, good fresh food production practices, good manufacturing practices, good distribution practices, good retailing practices, good ready-to-eat food production practices in the whole food chain. The regulation also describes several institutions that play a role in food safety management at the country level. Management of food safety at the country level is aimed to protect public health while also in the meantime promoting food trade. It is acknowledged that safe food products are required to build strong and healthy community. In addition, food safety management is also important in producing safe quality food so that food trade, especially food export, could be facilitated. The Ministry of Fisheries and Marine Affairs, for example, has mandated that all seafood industries are required to implement the Hazard Analysis Critical Control Point (HACCP) system as a part of their food safety management.

In recent years, improvement in economy and a vast development in information technology have made public to become more aware of food safety issues. In general, concerns of public are heavily related to the use of additives in foods, adulteration of food such as addition of melamine in powder infant formula, emerging pathogens such as *Enterobacter sakazakii*, avian flu viruses, plastic packaging, genetically modified foods etc. On the contrary, less concern is paid to hygienic practices, especially with regard to the food services industries as shown by the regular visits to various street food stalls not furnished with basic food sanitation requirements. The act and regulations have addressed some of the issues, however, more communication and or public education is needed to give a better public understanding on food safety aspects.

In order to assure food safety for both domestic consumption and export, Indonesia has adopted an integrated food safety system (IFSS). The Indonesia IFSS was created based on the WHO's "*Guidelines for Strengthening National Food Safety Programs*" to achieve equivalence to the international food safety standards. The Indonesia's IFSS consists of three functional networks i.e. food intelligence network, food control network, and food promotion network that reflects the three components of risk analysis i.e. risk assessment, risk management, and risk communication; respectively.

The food intelligence network, which is an approach to risk assessment, was established as a strategic plan to collect and evaluate information on food-borne diseases and hazards associated with the food chain including food surveillance, food assessment and food-borne diseases. The network includes not only the government agencies but also other stakeholders such as food industries and academia. Regular meetings for this network have been set up; however improvement of the number and quality of baseline data are crucial to have a scientific assessment of a particular pathogen-product pair.

Under the IFSS framework, food control is undertaken by a range of government officers from various agencies or ministries with a food safety authority in their mandates. For example, the inspection of fresh produce is undertaken by ministry of agriculture; while that of processed food is carried out by NADFC. Therefore, the food control network was also created to bring together different food authorities in Indonesia in deciding the appropriate management.

Risk communication in Indonesia is performed by the food safety promotion network. It is a joint partnership among the technical people from a range of agencies and institutions. This network is responsible for disseminating the results of risk assessment and decisions regarding the risk management. The network also coordinates the development of food safety promotion materials and educational resources to support the national food safety initiatives, such as training courses for food industry, training courses for food inspectors, flyers for consumers, leaflets for industry, food safety messages in journal, magazine and poster.

As opposed to a single agency or a multiple agency system, an integrated food safety management system supposedly has several advantages, such as consistency in food safety control at the country level, less political burden because of minimum changes in the role and function of the existing food authorities, promoting the application of uniform procedures along the food chain in the country, differentiation of the risk assessment and risk management activities for better consumer protection, presence of external division to deal with international issues/regulation (such as SPS/TBT agreement) and agencies (Codex), promoting transparency of decision making and accountability of its implementation and financially more efficient in the long run. In Indonesia IFSS various authorities are involved in different activity. Table 2 shows the role of various food safety authorities for different food business category. For example, training for small and medium food processing industries is provided by the local government, whereas training for distribution/retail of processed food is provided by NADFC. The table also clearly indicates that different authorities are involved in different steps of activities of a certain food business. Therefore, the three aforementioned networks initiated by the NADFC need to be continuously nurtured to improve the communication among the authorities such that the control systems are harmonized.

The Act no 7/1996 on Food requires that every producer implement a food quality assurance system and laboratory testing. The NADFC has a central laboratory and several testing laboratories at the province level. Capacity building is continuously carried out to improve the capability of the laboratories to test hazardous chemicals, pathogens and adulterants. In addition, many government laboratories other than those operated under NADFC, several accredited private or university-owned laboratories are also available for the testing services.

Another institution important for food safety and quality in Indonesia is the National Standardization Agency (NSA) which is a contact point for Codex Alimentarius Commission and the coordinator for national standards development including those for foods. Although most are voluntary, several food standards such as those for bottled water, flour, iodized salts, refined sugars are mandatory and an SNI (Standar Nasional Indonesia) or Indonesian National Standard is compulsory for each of those food categories. The NSA has also developed a standard for Hazard Analysis Critical Control Point (HACCP) implementation by food industries as part of their food safety management system. Implementation of HACCP for foods is voluntary, except for seafood products.

Table 2. Food safety authorities in Indonesia according to Government Regulation 28/2004

Activity	Food business category								
	Farming	Fresh produce	Distribution /retail of fresh produce	Food processing (big industries)	Food processing (small and medium industries)	Distribution / retail of processed food	Fresh food	Processed food	Ready to serve food
Permit/ business certification	Local government (district)	Local government (district)	Local government (district)	Mol, MoFMA, NADFC (special product)	Local government (district)	MoA, MoF, MoT	MoT	MoT	Local government (district)
Food registration				NADFC		NADFC, MoF	MoA, MoFMA	NADFC	n.a
Supervision	MoA, MoFMA, MoF	MoA, MoFMA, MoF		Mol, MoFMA, NADFC	Local government supervised by local NADFC	NADFC	MoA, MoFMA	NADFC	NADFC
Training	MoA, MoFMA, MoF	MoA, MoFMA, MoF			Local government (district)	NADFC	MoA, MoF	NADFC	Local government (district)/ NADFC
Evaluation and Pre-Market approval				NADFC			n.a.	n.a.	n.a.
Inspection/ investigation	NADFC	NADFC	NADFC	NADFC	NADFC	NADFC	n.a	NADFC	NADFC
Reporting to	MoA, MoFMA, MoF	MoA, MoFMA, MoF	MoA, MoFMA, MoF	Mol (industry), NADFC (product)	Local government (district)		n.a	NADFC	Local government (district)
Legal action	Local government	Local government	Local government	Mol (industry), NADFC (product)	Local government (district)	NADFC	n.a	NADFC	Local government (district)

Note: MoA: the Ministry of agriculture; MoFMA: the Ministry of Fisheries and Marine affairs; MoF: the ministry of Forestry; Mol: the Ministry of industry; MoT: the Ministry of Trade; NADFC: the National Agency for Drug and Food Control; n.a: not available

Despite of the systems that have been established for managing food quality and safety, recent data indicated that more than fifty percent of Indonesian food products were rejected to enter the United States due to filth and or salmonellae (US FDA, 2004). The export detention data suggests that basic sanitation, hygiene, and good practices along the supply chain are still the main food safety problem in the country. It is also interesting to see the profile of industries including food industries in Indonesia in which 9 million of them are classified as small and micro enterprises. These small and micro enterprises are those with a capital of less than 1 billion IDR (approximately US \$ 100,000) and employees of fewer than 20.

The fact that most of the food industries in Indonesia are of small and micro scale highlights the problems in the implementation of any food safety management system. In general, micro and small food industries have limited financial and human resources to assure their product safety and quality. This situation often gets worse because of the inadequate access to food safety prerequisite infrastructures such as clean water and electricity. Therefore, government involvements in the improvement of food safety for small and micro scale food industries are very crucial. The government can not stop at setting up regulations and inspect the compliance the food producers but also have to help the small and micro food industries to comply with the standards.

Lack of financial resources and electricity are also the reason for the lack of cold chain system. Without proper cold chain, microbial growth and deterioration reactions undergo more rapid and consequent decreases in the product quality and safety. This problem has prompted some irresponsible producers to abuse some chemicals as preservative such as the use of formalin as a preservative in certain perishable foods.

Indonesia is a large archipelago consisting of many islands thus information may not be adequately disseminated. Disparity in infrastructures and human resources has also contributed to the inadequate information on food safety and quality especially in the remote islands. Unequal development of various authorities in the food safety management is also potential for overlapping and or lack in the management.

III. Food safety cases/incidences in Indonesia

Food safety cases in Indonesia are likely to be underreported. During 2001-2009, for example, it was reported that the number of food-borne disease outbreaks per year was 122 involving 5808 cases and 36 fatalities as calculated from Table 3 (Suratmono, 2010). Of the 109 outbreaks reported up to November in 2009, 36.7% was associated with microbiological hazards, 20,2% was due to chemical hazards, and about 40.4% could not be determined of their causes because of lack of samples or inconclusive results (Suratmono, 2010). Although data were limited, a higher percentage of outbreaks associated with microbiological hazards have actually been established in the past few years. However, no particular pathogens have been etiologically linked to most outbreaks.

Outbreaks investigation is carried out by the NADFC and Ministry of Health (MoH). In general, limited resources were the reason for limited reported data on the outbreaks thus preventive actions could not be established. No particular program has been established to improve the surveillance for foodborne outbreaks or their investigation.

Such programs occurred for infectious disease such as dengue fever etc. Routine monitoring and inspections of food service establishment with regard to GMP implementation is carried out by NADFC and MoH, however the coverage is low. A study by Susanti (2010) showed that only 15% of medium-large scale food industries and 4% of home-small industries throughout the country are inspected routinely. The inspection results during 2005-2008 suggested that 85% of the medium-large industry and 60% of small-home industry had implemented GMP satisfactorily

Tabel 3. Food-borne disease outbreaks in Indonesia 2001-2009*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009**
Number of outbreaks	26	43	34	164	184	159	179	197	109
Number of cases	1955	3635	1843	7366	8949	8733	7471	8943	3050
Number of fatality	16	10	12	51	49	40	54	79	17

*Suratmono, 2010

**report up to November, 2009

Based on the data that ready to eat food served at home or by food service industries were the most commonly cause of outbreak (Table 4), several pathogens especially those that form spores could be suspected as the causative agent of the outbreaks. In addition, common practices to store ready-to-eat food at room temperature (danger zone) and large scale cooking to cater big parties by food services industries could actually allow some spore formers such as *Clostridium perfringens* or *Bacillus cereus* to germinate and cause food poisoning. Another common problem in ready-to-eat food preparation is inadequate sanitation and hygiene implementation, which may introduce non spore forming bacterial pathogen such as *Salmonella* to food and cause infection. *Salmonella* is a very likely candidate since it is an important causative agent of food borne illnesses worldwide, the main cause of food export from Indonesia rejected by US Food Drug Administration (2004) and was isolated frequently in various food including shrimp (Dewanti-Hariyadi et al, 2005). In addition, typhoid fever is also still a major problem in certain area in Indonesia. In certain endemic area, a prevalence of 1,400 typhoid cases per 100,000 population has been reported (Suwandono, 2003).

Table 4. Foods associated with outbreak in Indonesia in 2009*

Type of food	Percent (%)
Home-made food	42
Food service food	27
Industrial processed food	15
Street food	13
Others	1

*Suratmono, 2010

In 2008, there was a problem pointing out specifically to a pathogen, i.e. *Enterobacter sakazakii* (*Cronobacter* sp). The food safety issue came about following a scientific paper published in an international journal suggesting finding of this pathogen in some follow-on formulae (Estuningsih et al., 2006). The finding spread outside the scientific community has a very powerful impact on public. The imbalanced information of the previously unknown pathogen has led to a troublesome condition where some mothers stop giving powdered infant formula (PIF), yet they replaced it with pasteurized milk or starch-based drink. This phenomenon was indeed a drawback since it could result in malnutrition in babies. The public outcry has also put this bacterium on electronic and paper-based media for a few weeks and a demand for *E. sakazakii* testing for all PIF to assure the absence of this pathogen in PIF. After series of intensive public education through seminars, talk shows, articles and negative testing results on over ninety types of PIF and follow-on formulas carried out by the government, the public confusion diminished. In October of 2009, the National Agency for Drug in Food Control (NADFC) issued a decree that adopted the Codex Alimentarius Commission guideline for the production of PIF. The guideline outlined the sanitation and hygienic procedures for *E. sakazakii* control in plant facilities and a sampling plan which include *E. sakazakii* testing in addition to *Salmonella* testing. The government also issued a guideline for PIF reconstitution using boiled water having temperature of 70°C. The guidelines were expected to decrease the presence of this bacterium in PIF and PIF preparation by mothers or hospitals. *E. sakazakii* was isolated from PIF marketed in 2006 but not from PIF samples marketed in Bogor during 2009, although was recovered from weaning foods and some dry food products such as starch and cocoa powder (Dewanti-Hariyadi et al., 2009). Up to the present, however, no *E. sakazakii* outbreak linked to PIF has been reported in Indonesia.

A more classical problem of food safety in Indonesia is the abuse of certain non-food grade chemicals in food processing. Formalin, a formaldehyde-containing solution, is sometimes used to preserve fish, tofu and wet noodles. Publication of the findings in 2006 had also caused a loss of some domestic trade, especially for the three aforementioned commodities. There were several reasons why the problem occurred. First, it was easy to access and obtain the chemical which was supposedly used for glue making and corpse preservation. Secondly, inadequate sanitation during production and lack of cold chain or refrigeration system has resulted in a short shelf life. The condition has prompted certain individuals to apply formalin to lengthen the shelf life without considering the risk of the hazard to human. The first problem was solved by a collaborative effort between NADFC, Ministry of Industry and Trade in a better management for the trade of hazardous chemicals. The second is handled through continuous education in food hygiene and sanitation process. Since refrigeration or cold chain has not been addressed adequately, the formalin problem has not been fully managed. The government routinely inspect presence of this chemical in foods, especially those that have previously been linked to the use of formalin. Sanctions for the abuse of hazardous chemicals use in food have actually been regulated in Law no 7, 1996. The above incident has increased the law enforcement for such abuse.

IV. Programs for food safety training and capacity building in Indonesia

Food safety has become a public issue predominantly because of the improvement of information technology. Government institutions, particularly those involved in the management of food safety as mandated by the Government Regulation no 28/2006 commonly had capacity building program. The NADFC in collaboration with Bogor Agricultural University, for example, has developed a training system for food inspectors in which three classifications of inspectors was established, i.e. basic inspectors, junior inspectors and senior inspectors. The curriculum and sets of modules for each level have been developed and the training programs have been carried out in the last 5 years. Similar trainings in collaboration with other parties were also developed in other institution such as Ministry of Agriculture, Ministry of Fisheries and Marine Affairs, Ministry of Industry, etc.

Food safety education for industries are provided by the above government institutions through their programs, for examples Ministry of Trade has programs for GMP and HACCP training for exporters, Ministry of Agriculture developed a *Prima* program to improve the safety of fresh produce while NADFC developed a star program to improve the safety of small-medium scale food industries. The *Prima* program and star program are similar, i.e. government acknowledgement for food safety and quality management of fresh food and processed production, respectively. The star program, for example, classified micro and small-medium food industries into 3 categories, i.e. star 1 for those implemented good hygienic practices for at least the workers, star 2 for those complying with all Good Manufacturing Practices aspects and star 3 for those implementing the HACCP principles in their food production.

Food safety education to public is provided by many parties including government, universities and private/industries. However, because of the large number of islands (17,508) stretching over 5,120 kilometres (3,181 mi) from east to west and 1,760 kilometres (1,094 mi), many areas may not have received as much information on food safety as the others.

V. Information Resources on food safety in Indonesia

With the integrated food safety and quality management system as mandated by the government regulation number 28, 2004, there are various institutions in the countries with responsibilities in this aspect. The following website contains regulations, guidelines and public education in food safety and quality provided by each institution :

The National agency of drug and food control: http://www.pom.go.id/e_default.asp

Ministry of agriculture: <http://www.deptan.go.id/index1.php>

Ministry of marine affairs and fisheries: <http://dkp.go.id/dkp5en/>

Ministry of forestry: <http://www.dephut.go.id/index.php?q=en>

Ministry of industry: <http://www.depperin.go.id/Eng2006/>

Ministry of trade: <http://www.depdag.go.id/index.php?lang=EN>

National Standardization Agency : [http:// www.bsn.go.id](http://www.bsn.go.id)

In addition, information on the type of industries, agricultural activities can be accessed in the Central Bureau of Statistics website at: <http://dds.bps.go.id/eng/>.

VI. Moving Forward

Food safety in Indonesia can be improved by building up the management of food safety at the regulatory level and solving several technical problems. Mapping of the responsibility among food authorities has been established in Government Regulation No 28/2006; however, the communication between food safety authorities needs improvement. This is important such that all regulations and or guidelines are in the same language and overlapping can be minimized. It is also important to provide clear information to the food authorities on the impact of a regulation not only to large food industries but also to small and micro food industries which are the majority of food industries in Indonesia. Impact assessment of a regulation is important to ensure that the food industries are able to comply with the regulation and improve the safety and quality of their product simultaneously.

Consumer awareness on food safety is a strong driving force to push food safety forward. Consumers must know that safe food is their rights and can not be compromised. Government through its food authorities and other channels should increase public awareness on food safety.

Several technical problems that have to be addressed are sanitation and hygiene improvement for small and micro food industries, basic infrastructure (clean water and electricity) improvement, research and development to improve the existing food processing technology, and establishment of a cooperative scheme to allow small and micro industries have access to food grade additives. The technical problems mentioned are mostly associated with small and micro industries. In general, large and established food industries already have good food safety management system to assure their product quality and safety that meet the consumer's demand.

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