FOOD SAFETY PROBLEMS FROM INDUSTRIAL POINT OF VIEW
Philippine Perspective

LIBIA L. CHAVEZ
Consulting Food Technologist
PHILIPPINES

Introduction

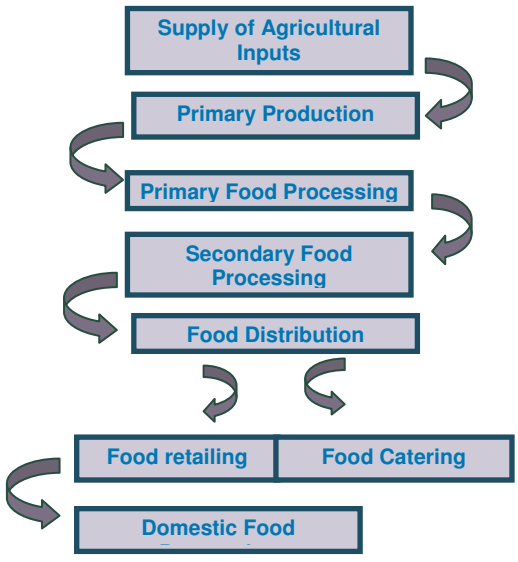
Food Safety.

Food Safety is defined by Codex Alimentarius as the assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use. For food to be safe, it must be free from hazards to health, categorized as follows:

- Biological Hazards (pathogenic bacteria, virus, parasites, worms, etc.)
- Chemical Hazards (natural toxins, agricultural chemicals, environmental contaminants, food additives, etc.)
- Physical hazards (stones, metal fragments, bone shards, etc.).

The Global Food Chain and Food Safety

The food industry is aware that food safety involves every link in the food chain from production to consumption, from farm-to- fork/chopsticks. Food can be contaminated at any point in the food chain and such contamination can compromise the health of the consumer.



The Global Food Chain

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The Philippine Food Industry

Profile of the Philippine Food Industry

There are about 5,000 registered food manufacturing establishments in the country, accounting for 25% of the total manufacturing sector. About 90% are small and medium enterprises, but the 10% large establishments produce 90% of output. Most small and medium food manufacturers are family-owned and are managed as single proprietorships but are registered as corporations with family members as the incorporators. Interestingly, many companies were started and developed by women at home, with the men leaving their employment and taking active management when the company had grown with expanded market.

Unregistered micro to small enterprises ("underground " food manufacturers) could be 10 times that figure. Although producing mostly ready-to-eat and street food, this unregistered sector imposes a significant impact on food safety in the country.

Government Agencies concerned with Food Safety

The agencies of government concerned with food safety are as follows:

Department of Health
- Bureau of Food and Drugs
- Health Department of Local Government Units.

Department of Agriculture
- Bureau of Fisheries and Aquatic Resources
- National Meat Inspection Service
- Philippine Coconut Administration
- National Food Authority (rice and corn)
- Bureau of Plant Industry (crops, pesticides)
- Bureau of Animal Industry (animal health)
- Fertilizer Pesticide Authority

Product Quality Systems Study

In 1999, the Department of Agriculture commissioned a study on Global Competitiveness of Philippine Food products. One of 7 parts of the study was the Product Quality Systems Study which looked into the conformance of Philippine food to global standards of safety and quality.

The study showed that detention at the product destination was a major reason for low competitiveness of Philippine Food products. Products get detained for any of the following reasons:

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- Presence of filth and decomposition
- Improper process for low acid foods
- Labeling violations
- Non-declaration of some additives
- Use of prohibited additives
- Microbiological standards not met
- Presence of chemical hazards

Since most of the reasons for detention cited are related to the manufacturing practices of the processor, a complimentary field observations was done to evaluate the level of conformance to Good Manufacturing Practices. Some the observations were as follows:

- Poor layout and lack of facilities such as screens, floors, drains, ceilings, toilets, hand washing facilities, employee lockers and lounge.
- Poor design of fabricated equipment such as retorts, blanchers and pasteurizers, grinders, etc.
- Personal hygiene practices:
    - improper/dirty attire
    - use of jewelry
    - hand washing protocol not followed (no soap, no sanitizer)
    - use of bare hands when handling ready-to-eat foods
    - smoking and eating in work area
    - improper use of hair cover
    - dirty attire
- Post harvest practices
    - Use of rattan baskets and used sacks as fish containers
    - Inadequate icing of fish and meat
    - Use of up to 50 kg baskets for fruits and vegetables
    - Rough handling of fruits and vegetables
    - Fruits and vegetables placed on the ground
    - Use of banned additives
- Processing practices
    - Use of banned additives
    - Inadequate thermal process for low acid foods/many Filipino ethnic food preparations such as sweetened beans and other ingredients for Halo-Halo.
    - Absence of thermometers
    - Inappropriate packaging materials.
    - Lack of food safety signs on hand washing to remind employees

- It was also noted that inspections and audits by regulatory agencies were done sporadically.

Since the study, there had been marked improvements in GMP implementations in the companies who participated.

Companies who have established food safety management systems, are exporter of fishery product the USA and EU. This is due to the fact that these countries had mandatory requirement for HACCP. Other companies who have implemented food safety systems are

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suppliers or sub-contractors of multinationals such as Nestle, Coca-Cola, Kraft, McDonalds and hotel and restaurant chains.

A GMP and HACCP voluntary certification program was instituted by the Bureau of Export Trade Promotions in collaboration with Bureau of Fisheries and Aquatic Resources, Bureau of Food and Drugs and Food Development Center, an agency of the National Food Authority. This voluntary certification program had been as successful as expected. Major reason for not getting certification or not renewing certification is the cost of certification .

Food Safety Problems

From the point of view of food processing, food safety problems may be grouped as follows:

- Raw Materials
- Processing methods
- Personnel
- Equipment
- Plant layout
- Documentation
- Standards, regulations, labeling
- Inspection and Testing
- Traceability and recall procedures

Raw Material Issues

Raw materials used in the food industry may be fresh produce from land or water (fruits, vegetables, meat, fish) or primary processed products (sugar, grains, flour, starches) which also come from primary produce. All hazard categories, biological, chemical and physical may be present in these raw materials.

Biological Hazards in Raw Materials.

Of the biological hazards, bacterial contamination is the most significant. It is assumed that all produce and livestock contain bacteria , some of which may be infectious or toxin-producing. Scientists say that bacteria were here 3.5 billion years against man's less than 4 million years! Bacteria have innate capability adapt to changing environmental conditions.

1. *Salmonella* is endemic in fowls and birds. Eggs get contaminated from the parent bird. It is also a contaminant in meat from mammalian sources as well as fishes and crustaceans from immediate environment.

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2. *E. coli* which may include pathogenic strains, can contaminate mammalian meat during slaughter. *Vibrio* can contaminate fishery products.
3. Pathogenic bacteria can be on surfaces of fruits and vegetables. Contamination can come from soil, from water used to water plants or irrigate fields, from uncomposted organic wastes used as fertilizers particularly animal or chicken manure.
4. Seafood can become contaminated from run offs carrying animal manure and other wastes.
5. Contamination can also occur during harvest because harvests are usually placed directly on the ground after picking, or on receptacles that had never been cleaned. Aquacultured fishes are placed in dirty sacks and baskets after catch..
6. Because of inadequate inspection or lack of meat inspectors, uninspected meat may find its way to processing plants.
7. Contamination from feeds.
8. Contamination due to rough handling and bruising of fruits and vegetables.

Chemical Hazards in Raw Materials

1. Fish and fishery products meat, poultry and eggs can be contaminated from drug s antibiotics and hormones .or from feed ingredients.
2. Corn and peanuts are often contaminated with aflatoxin due to inadequate drying which happens a lot during rainy season and improper storage. Common storage facilities have no provisions for reducing humidity. Humidity conditions in the Philippines especially during rainy season are just what *Aspergillus flavus and Aspergillus parsiticus* need.
3. Methyl mercury levels in fish particularly tuna
4. Pesticide residues in plant products
5. Histamine levels in fish.
6. Cyanogenic glycosides from root crops, particularly cassava.
7. Shellfish toxins and Ciguatoxins
8. Reuse as food containers of agricultural chemicals and fertilizers containers.
9. Chemical contamination of raw materials because of improper handling of chemicals and not separating food from hazardous chemicals.

Physical Hazards in Raw Materials

1. Metal fragments of various sizes have been found in slabs of frozen imported meat used as raw material for frankfurters and other meat products.
2. Bone shards, twigs, stones, glass splinters, etc.

Control of Hazards in Raw Materials

The safety of the raw material supply is a key focus in the development of a HACCP Plan. It is important for processors to know how the suppliers control hazards from their

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end. An effective quality assurance program (SQA) is therefore an effective pre-requisite for HACCP because it is a means of controlling hazards in the raw material. Specifications of the raw material/ingredient , auditing procedures and certificate of analysis or certificate of guarantee are agreed upon by both the vendor and the vendee.

With the adoption of HACCP as their food safety management system by companies such as Nestle, McDonalds, and others , their suppliers and subcontractors were required to also adopt a food safety system that will guarantee the safety of the raw materials and ingredients supplied to them.

A case in point is sugar as raw material. For years, the sugar refineries and millers in the Philippines were blissfully unmindful of GMPs for food , they have been dealing with sugar in much the same way construction people deal with sand and cement, they even use the same equipment for materials handling! But when the major buyers required safety guarantees, the sugar suppliers started to review the sanitation situation in their mills. The audit of the practices in the sugar mills by the customers forced the sugar suppliers to implement food safety measures and adopt the HACCP-based system. The packaging material suppliers also had to go through the same audit procedures.

It is relatively easier for bigger suppliers or formally organized establishments to implement HACCP as part of their guarantee of safety to their customers. Many smaller companies were assisted by the buyer-companies to establish food safety systems.

If the current efforts being done by the Bureau of Agricultural and Food Product Standards in promoting Good Agriculture Practices (GAP) to farms large and small, will be successful, the safety of raw materials particularly fresh produce such as fruits and vegetables, will be greatly improved.

Food Safety Issues Associated with Processing

The food safety problems related to processing are:

- Contamination during processing
- Insufficient process
- Post process contamination
- Use of food additives

Contamination during Processing.

Biological contamination during processing are usually due to

1. improper cleaning and sanitation of equipment
2. non conformance to personal hygiene practices.
3. processing delays
4. temperature abuse
5. contamination of ingredients, raw materials, packaging or food contact surfaces by pests

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Chemical contamination during processing can include

1. lubricant leakage,
2. chemical cleaning residues,
3. leaching out of materials from food contact surfaces, packaging materials
4. accidental spillage of hazardous chemicals,
5. improperly used food additives
6. non-food materials accidentally used as ingredients.

Physical contaminants during processing can come from personnel (nails, glove parts, buttons) from equipment (chips, nuts and bolts), from packaging materials of ingredients and raw materials (plastic pieces, metal locks. Threads, paper)

Insufficient process

Insufficient process can happen because operating procedures are not standardized, monitoring devices are not calibrated or there are no objective monitoring devices at all, the equipment broke down or the person in charge is not competent.

Post process contamination

Post process contamination can occur during packaging, in storage, during transport and distribution. Rough handling, temperature and humidity conditions in storage and transport are causes of post process contamination.

Control of Hazards during Processing.

The food safety problems related to the processing step can be controlled by:

1. SSOPs on the recommended 8 key areas
2. Implementing Good Housekeeping Practices
3. HACCP implementation
4. Monitoring with user-friendly forms
5. Operating Manual incorporating SSOPs, HACCP and other quality programs
6. Adequately trained personnel
7. Equipment preventive maintenance
8. Close supervision

Food Safety Issues Associated with Personnel

The food safety problems associated with personnel are as follows:

- Inadequate food safety knowledge of person supposed to be responsible for food safety
- Unskilled and untrained food handlers and operators
- Hygiene monitoring
- Training needs

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Some companies find difficulty in getting competent personnel who can be responsible for food safety. This is more felt by companies located in provincial locations. Participation in public seminar-workshops on GMP and HACCP planning and implementation offered by various government agencies, extension service of universities and non-government organizations helps in developing in-house competence in food safety Other companies avail of consultancy services offered by food safety consultants.

Unskilled food handlers are a common food industry problem. Company pre-employment training is often inadequate particularly with respect to sanitary food handling and personal hygiene. Several innovative solutions have been done. Apprenticeship is one. A prospective employee, who has passed health requirements first train as an apprentice with a team of regular workers . When the tutors see that the apprentice can do the operation well, she is given an oral and written examination before being formally employed by the company. Some companies avail of in-house training workshops on various aspects of food safety

Hygiene monitoring had always been a problem in the industry. Use of simple checklists and frequent random checks has been helpful in solving this problem. An innovative systems implemented by one company used a video camera to record habits and mannerisms that violate personal hygiene rules. The recording is shown to the employee corrective measures are discussed. With the newer technology of cell phone cameras, this practice became easier to do.

Jewelry check nail checks, swabbing of hands have been some solutions to avert contamination from personnel. In another company , each employee carries a personal handbook of company rules and regulation, most of which were about personal hygiene. An accompanying self checklist is filled up daily and submitted to management as a hygiene monitor. A variation of self check is the buddy check. There had been limitations of these methods, but a regular audit by the responsible person minimizes problems.

The need for employee training . Training has to be on-going and on-the-job. Personnel training opportunities include the following:

1. Formal in-house training sessions which has to be scheduled regularly (quarterly is recommended / or at least once a year), using training materials specifically designed for the specific operations in the plant. The HACCP Plan and SSOPs are used as basis for preparing such training materials.
2. Formal participation of key people in public training seminars and symposiums where they can share with others in the industry.
3. A 10-minute daily pre-operation meeting with the immediate supervisor , reminding all personnel of the job to be done for the day including reminders for hygienic operations,
4. Regular 30 minute to 1 hour monthly/ bi monthly/weekly food safety meetings .
5. Poster reminders about hand washing and other sanitation measures;

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6. Circulating food safety related articles from magazines, and newspapers,

7. Food safety articles on company newsletter or bulletin boards
8. Random or regular written examination,
9. Informal discussions
10. Reviewing hygiene monitoring results with employees and discussing corrective actions for the lapses,
11. Sharing and discussing with all employees the audit results from regulatory agencies or independent third party auditors, good as well as bad, help them realize their personal stake in the safety of the products they help process.

Food Safety Problems Concerning Equipment and Instruments

The food safety concerns in this category are the following:

- Poor design of fabricated equipment
- Re-fabrication of surplus equipment
- Improper installation
- Preventive maintenance
- Cleaning and sanitation of equipment
- Not calibrated monitoring instruments

Poor equipment design is one of the major problems in the industry. Many fabricators have no concept of building in sanitary features. Niches for bacterial contamination are found everywhere. This is because there are no specialized sanitary food equipment fabricators, and no authority that oversee food equipment fabricators. Besides the cleanability issue some fabricated pasteurizing or heating equipment are very slow heaters, generations of bacteria can grow before the effective temperature is reached.

Closely related to poor design is **wrong or faulty installation**. This can happen with imported equipment. Companies find the installation option of suppliers too expensive considering these are paid in foreign currencies. The problem is even bigger if the equipment is a used reconditioned equipment and no longer has the accompanying manual.

Preventive maintenance must be built into the operating system of the company. In most cases maintenance is an emergency situation activity instead of a preventive one. There should be a trained person in charge of preventive maintenance even if the there is a maintenance agreement with an independent maintenance company.

The use of a **suitable sanitizer** is often an issue with many companies. In the Philippines, the most cost effective sanitize is chlorine. SSOPs for proper use are written down. Chlorine solutions are prepared weekly.

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The EU no-chlorine policy, is considered a problem by some Philippine food processors who find other sanitizers more expensive.

Food Safety Issues Regarding Building and Plant Layout

Ideal plant layout is designed to avoid any crisscrossing of raw materials / in process goods with finished products . Provisions are made for adequate segregation of raw material and finished goods, food from non-food materials and hazardous chemicals away from food and food contact surfaces, and for quarantine space for incoming raw materials. Patterns of staff movements are considered along with provision for changing rooms, laundry, hygiene facilities, hand wash stations, canteen and resting lounge and visitors viewing areas.

This ideal situation is not always attainable. Even in a new building, constraints of space and construction precludes many features that could be put in place. But the greater problems are in the following situations:

- Facilities that had expanded from "garage" type of operation in homes. The whole processing plant could look like a beehive with separate compartments for various product lines. Access to and from such compartments by both materials and workers are common problems.
- Renovated processing facilities. The original could often times be a former residence or an old warehouse or even old shipping containers, converted to a processing facility. Drainage, plumbing and pest control could be serious problems.
- Leased facilities.
- Sub contracting. The current BFAD GMP guideline has a specific section regarding sub-contracting because in the past responsibilities for food safety (that surfaces during complaints) have been contentious issues between the two parties.
- Location of waste water treatment facilities in small areas.

Scheduling of operations to avoid the mix of raw materials and finished product handling are done to avoid possible cross contamination from crisscrossing operations. This can disrupt processing schedules but are implemented when there are no other options

The cost of complying with requirements of GMP is a big burden to the industry.

Documentation Problems

Documentation is a problem area for many food establishments. The Philippine food industry is still in the process of developing the habit of recording data and completing documentation requirements for HACCP implementation.

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The major issues on documentation are the following:

- Process control procedures, SSOPs are not written or even if written are not systematically filed.
- Not immediately recording results of monitoring. Recording before or too long after the event that requires recording.
- Not having the suitable monitoring tool/instrument leading to extrapolation or estimates.
- Difficult to fill data forms.
- Monitoring person not specifically trained in the monitoring activity. Monitoring assignment not specified in job description.
- Recording in a "temporary " record e.g. back or palm of one's hand, a sheet of paper torn from where ever like a newspaper, a bus ticket or even on a tissue paper.
- "Doctored" data.- Recording the "expected" data. How immediate supervisor reacts to non-conforming data leads to "doctored" results. Workers feel intimidated if they have to explain a discrepancy and often feel personally responsible so they decide to record only the expected correct data.
- Incomplete records (lacks data, not signed or not dated)
- Failure to review primary monitoring data.

Solutions to monitoring problems:

- Adequate training in documentation protocols
- Providing easy- to- use, easy- to- understand forms. Computerization helps a lot but making entries needs even more training.
- Providing necessary tools/instruments for monitoring.
- Locating monitoring records/forms near or easily accessible to the operation where data is generated. No need to run to the production office to get the record book every time.
- Dealing with non-conforming data not accusingly at the person doing the recording but always focusing on the food safety consequence so immediate corrective actions can be done as needed.
- Timely review of data generated by the immediate supervisor and the person in charge of food safety. Do not wait till end of the shift or day to review data.
- Training personnel so they develop the habit of recording immediately and accurately.

Standards, Regulations and Labeling

Many companies are not knowledgeable about the product standards of the consumer and tend to mix up product specifications for various customers. Specific problems:

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- Minimum allowable levels of various substances from antibiotics, mercury, to natural toxins such as histamine, aflatoxin, to specific bacterial counts.
- Labeling requirements of various country destinations. Current allergen labeling and Trans fatty acid data in Nutrition Facts for USA, prohibited and restricted additives, are some of the current concerns in the industry.
- HACCP Plan or HACCP accreditation requirements.

Department of Trade and Industry regularly disseminates requirements of various country destinations of Philippine food products through newspaper announcement, website, and memoranda to industry associations and through training sessions offered at the Philippine Trade Training Center or other agencies. Companies have complained about the specificity of label formats but they have to conform anyway. Companies are always advised to look closely at the trade and food safety regulations of prospective export destinations as part of their market development list of "must- do".

Inspection, Audits and Laboratory Analysis

Inspection and Audits. Although these may be a matter of perception, common complaints in the industry regarding inspections and audits are as follows:

- Regulatory authorities are more intent on finding faults and not inclined to assist in helping them comply with regulations.
- Inspectors have their own interpretation of regulation, no two inspectors have the same interpretation of regulations.
- Some inspectors do not know the science behind the regulation, so are unwilling to go beyond what is specifically stated or unwilling to listen to justification.
- Lack of inspectors

Laboratory Analysis. Specific problems are:

- High cost of laboratory analysis
- Most local laboratories especially government laboratories lack capability to comply with the analytical precision required by export markets (residue testing, trans fatty acids, dioxin, etc.)

Traceability and Recall Procedures

The problems associated with traceability and recall which are now standard requirements are:

- Faulty assignment of lot code. For most companies, the lot code can only immediately trace the date of production and not the production batch.
- Inadequate production records (related to documentation and personnel training needs)

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- Inadequate dispatch record. Many companies do not tract the lot code of deliveries to customers so in the event of recall it would be difficult to zero in on specific areas that would have been affected.
- Illegible markings. This is a problem with frozen goods, when lot labels used are not waterproof.
- No written protocol for recall procedures.

Conclusions

The food safety problems of the food industry can occur at any stage of the food chain and at any of the steps during the processing of the product. Most of these food safety problems are within the capability of the individual companies to solve as indicated by the examples done by other companies. Longer term solutions to other problems would require collaboration or cooperation with others in the industry, with industry association, academic and research institutions, private consultants and certainly with the government regulatory agencies and the market or customer of the products.

By implementing HACCP and incorporating the HACCP pre-requisites and HACCP methodology in the company's Standard Operating procedures as embodied in a written Operations Manual, many of the problems can be controlled All companies should strive to make documentation a part of the company culture.

Recommendations

Role of Food Industry Associations

Industry associations can offer solutions to existing food safety problems:

- By sponsoring regular food safety regulation dissemination sessions.
- They can also discuss issues concerning food safety problems directly with the government regulatory agencies. There had been efforts in the past of food industry-regulatory agencies collaboration particularly on the development of product standards. The same kind of cooperation can be done on matters of food safety.
- By encouraging all members to get implement HACCP as a food safety system on voluntary basis even if their market does not require it.
- Work towards an entity within the association that can specifically address food safety problems, build testing capability, etc. This has been done with great success by food industry association in many countries.

Role of Academic and Research Institutions

- Improve and expand food safety as a subject in the food science and technology training curriculum.
- Use actual food industry problems for class projects and experiments.

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- Prepare data bases for such parameters as pH, water activity, total acidity, salt concentration of various Philippine food preparation particularly ethnic food preparations.
- Standardize procedures building in food safety measures for ethnic food preparations.
- Develop "quick and dirty" methods of analysis as in-line testing of various parameters that can be used as CCPs for various food preparations.
- Work out areas of cooperation with specific food companies, food industry associations, cooperatives or whatever grouping to expand extension activities in matters of food safety.
- Expand extension service to include food safety educational campaign to primary and secondary schools and youth organizations.

Role of Government and Regulatory Agencies

- Improve inspection capability
    - More training food safety inspectors
    - Hire more inspectors
    - Develop standardized inspection and audit tools for specific food preparations.
- Improve testing facilities
- Work for a unified Food Safety Authority.
- Incorporate food safety knowledge and hygiene in science and health subjects in primary and secondary schools.

Possible Areas of International/EU Cooperation

There are three areas of cooperation that I think deserves focus, these are:

- Development of standardized inspection and audit tools for specific food sectors.
- Development of standardized training materials in food safety implementation for industry personnel.
- Development of capability in fabrication of sanitary food equipment.

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