Implementation of Food Safety Management in Developing Countries: Is GMP/HACCP confusing?

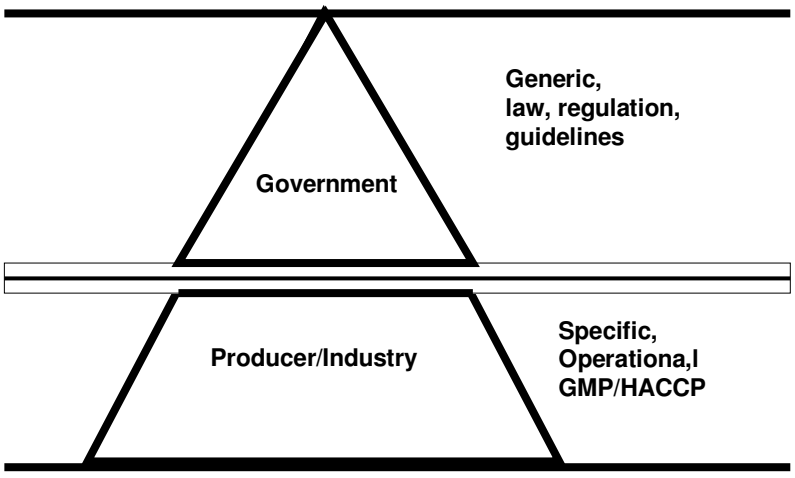
SEAFAST-ICMSF-Borlaug International Seminar and Workshop
Bogor, December 2-4, 2009

Ratih Dewanti-Hariyadi
SEAFAST Center and
Department of Food Science & Technology
Bogor Agricultural University, Indonesia

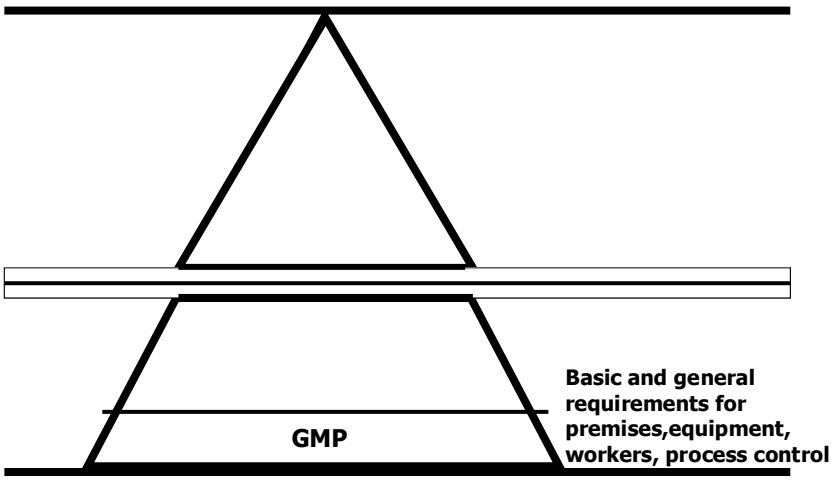
Overview

- Food Safety Management
  - Management at Industry Level
- Constraints in Implementing GMP/HACCP in Developing Countries
- Problems and Confusions in Understanding GMP/HACCP
- Problems in HACCP Plan Development
- Case Studies

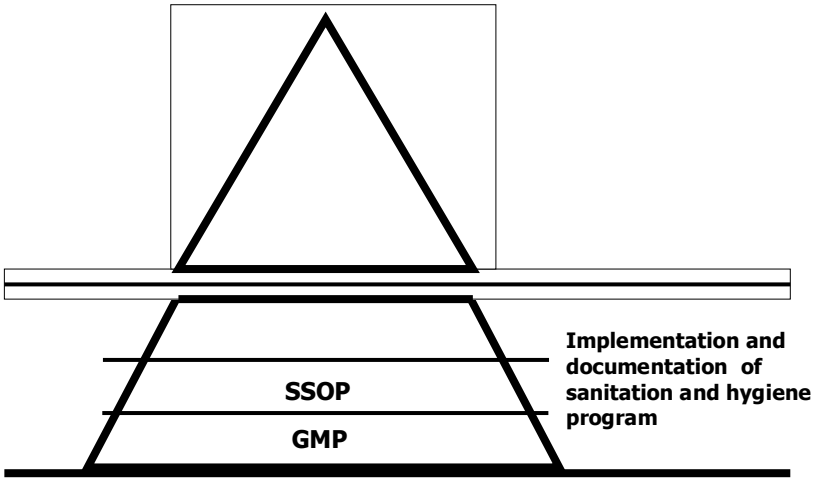
Food Safety Management



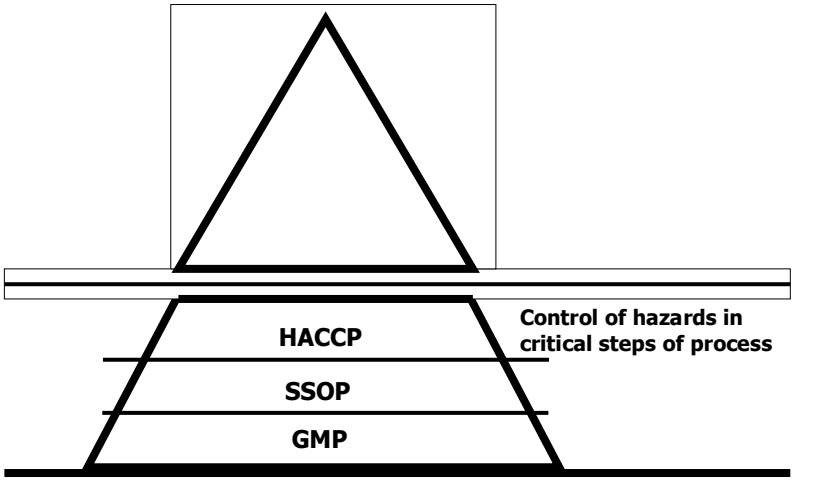
Food Safety Management at Industry Level



Food Safety Management at Industry Level



Food Safety Management at Industry Level



Constraints in Implementing GMP/HACCP in Developing Countries :

- Infrastructures
- Size of food industry
- Finance

- Language
- Foods of Tradition
- Attitude







Infrastructures

- **Lack of Potable water**

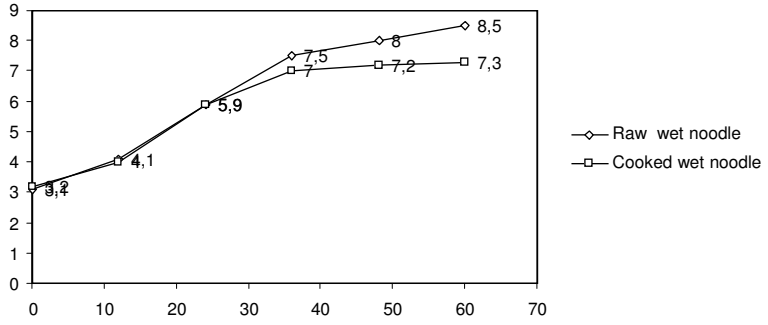
  - Drinking water is not always available in some area
  - Tap water in some area does not meet drinking water requirement
  - Is clean water sufficient?
  - Sometimes water quantity is not adequate
  - Big industries have water treatment installation, ` small industries don't

Infrastructures

- **Lack of Cold Chain**
  - cause product to spoil rapidly
  - support pathogen growth
  - has prompted some irresponsible producer to abuse illegal chemicals a preservatives, e.g. use of formalin for food preservation (wet noodle cases in 2006)
    - ironically efforts made were geared toward looking for "magic bullets", not to take care of the roots of the problem : GMP not implemented. GMP is hampered by use of chemicals such as formalin

Infrastructures

- **Lack of Cold Chain : wet noodle**



Growth of bacteria in wet noodle made in a small industry implementing GMP during room temperature storage (DFS, 2005)

Infrastructures

- **Lack of Cold Chain :**

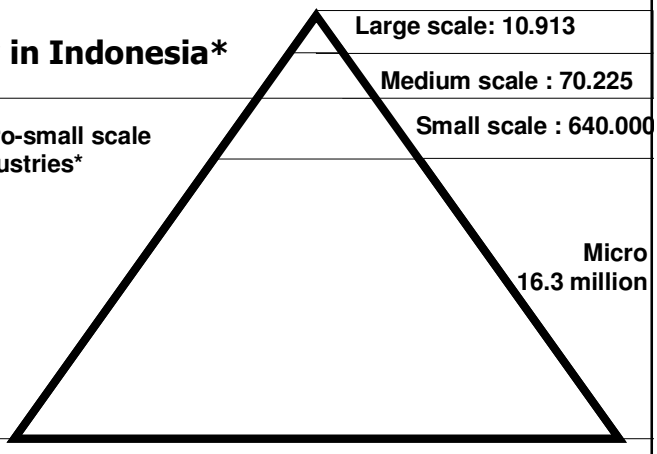
Wet-noodle type	Total Plate Count (Log CFU/g) at producer's level		
	Small industry (no of industry)	Laboratory	Small industry applying GMP (no. trial)
Raw	3.65 - 5.95 (n=8)	1.6	3.69 (n=2)
Cooked	1 - 7.2 (n=5)	1.0	ND

magnifies problems when initial load is high

Industry Size

Size of Industry in Indonesia*

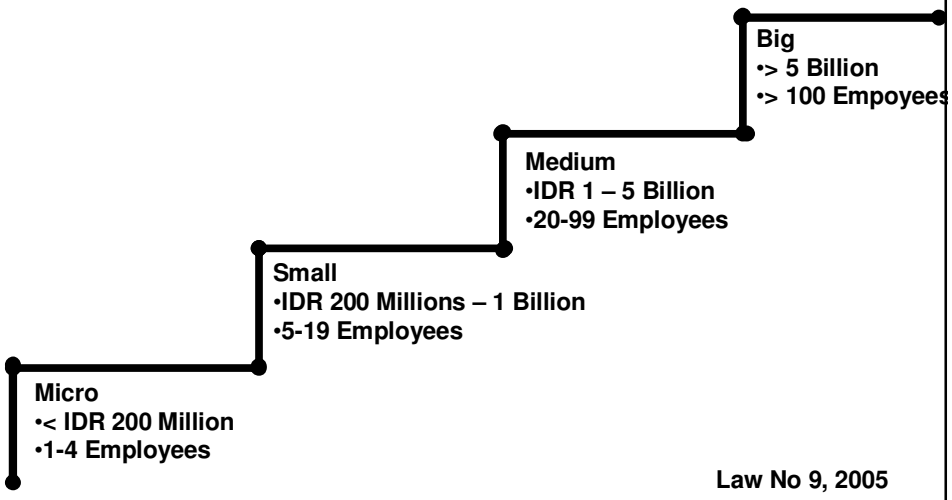
16.9 millions are of micro-small scale
9 millions are food industries*



*54% is food industry (National Statistics Bureau)

*http://lnweb18.worldbank.org/eap/eap.nsf/2c4ea74c4d42fe8d852568b60074a864/2ae8441a70a3522985256d7900577f39/$FILE/SMEOverview.pdf

Classification of Enterprises



Law No 9, 2005

Industry Size

Consequences of small industries

- Inadequate facility
- Inadequate equipment
- Lack of resources
- Lack of technical skills
- Lack of money

Indonesia "Food Star Program"(Piagam Bintang)*

- Star 1 : 677 units (752 granted,75 revoked) (2008)
- Star 2 : 40 units (2009)
- Star 3 : 7 units (2007)

NADFC, 2009. Directory of Food Safety*

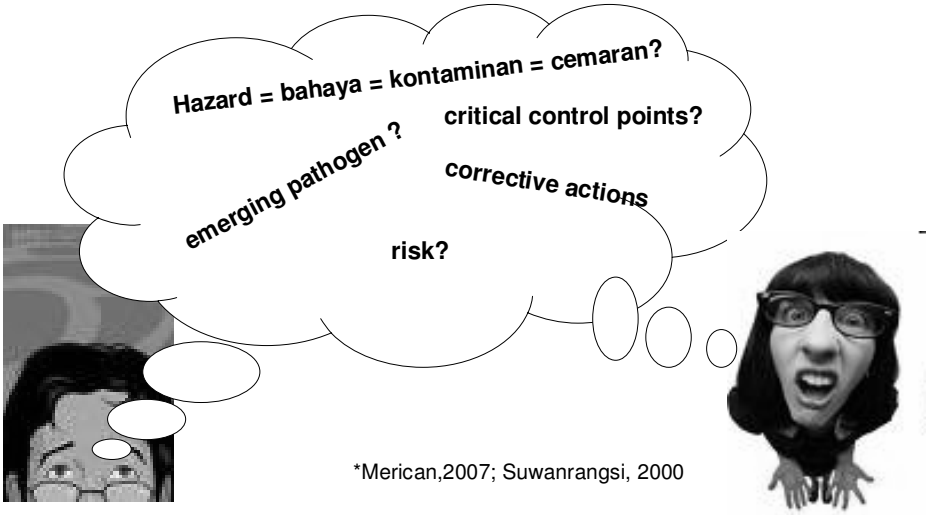
NADFC, 2009. Directory of Food Safety (in printing)

Finacial Constraints

Cost for GMP/HACCP in Turkey*	€	%
Building, ground and planning of the surrounding	12,176	42.17
Hygiene and sanitation	5,162	17.88
Insect control	3,400	11.78
Personal training	2,057	7,13
Calibration, maintenance and repairing	6,076	21,05

*Mutlu et al., 2005

Language Barrier



*Merican,2007; Suwanrangsi, 2000

Foods of Tradition

- Use of "now-known to be hazardous" materials in certain foods
  - borax in *gendar, lontong*
- Use of illegal colorant to replace plant extracts due to industrialization
  - certain types of kerupuk, tofu, snacks
- Known (toxic), illegal, but considered as specialty, local tradition

Attitude/Behavior

- Prevention is generally not internalized, not part of life style, perceived as costly : may not happen anyway! (i.e.bulb cover)
- GMP and HACCP will need time to be fully adopted in developing countries, just like any other preventive measures for safety

7 Problems and Confusions in Understanding GMP/HACCP

1. GMP/HACCP is a preventive approach to produce safe foods,external pressures (importers, need for certification) should not be the only reason to implement the system*
2. HACCP sometimes conflicts standards and or inspectors demand on (end product) testing
3. GMP is a Prerequisite Program for HACCP. HACCP plan will not be effective without GMP

*Franco, 2009

7 Problems and Confusions in Understanding GMP/HACCP

4. GMP is a **generic** requirement for food industry not for a product :
   A GMP specific for a product can be made as a guideline, but it is not necessary
5. HACCP is **specific** for each product, factory, processing line :
   A generic HACCP plan is only good as a reference, not to be used directly


7 Problems and Confusions in Understanding GMP/HACCP

6. Several standards (SQF, ISO 22000:2005 etc) integrate HACCP while introducing more (confusing) terms
7. The new metrics FSO/PO are not a replacement of GMP/HACCP , they should be built on a sound GMP/HACCP

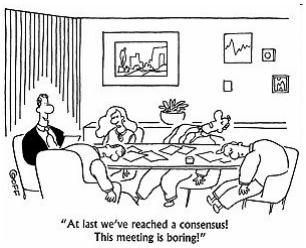

Problems in HACCP Development

- **Hazard Analysis**

- Not all materials or ingredients are included
- Insufficient knowledge of hazard, degree of severity, isolation frequency, risk or significance
- Control measures do not address why hazards occur because source of hazard is not well defined

Problems in HACCP Development

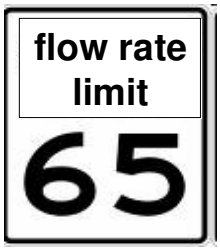
- **CCP determination**



- CCP is only applied at steps in which a control can be done to eliminate/reduce hazard to an acceptable level
- While a decision tree is helpful, CCP can be determined without it
- No specific numbers for a product or food industry is present
- "Too many CCPs" indicate poor compliance of PRP (GMP)

Problems in HACCP Development

- **CL establishment**



CL should be easy to check/test for the specific product

Do not use other's (i.e importing countries) CL

A microbiological limit for a CL is only applicable when rapid test is available

- CL should be justified and validated
- When new metrics of food safety management are available, FSO,PO,PC can be used to determine CL

Problems in HACCP Development

- **Monitoring Procedures**
  - Monitoring shall be planned for all CCPs
  - Monitoring does not comprise all the necessary components :

    what

    who

    how

    where

    when

  -

Problems in HACCP Development

- **Corrective actions**

Corrective actions shall consist of

- preventive aspects (*corrective action* in ISO 22000 : 2005) and
- steps to correct the source of deviation (*correction* in ISO 22000 : 2005)

Problems in HACCP Development

- **Verification**

- Verification should be made to check whether all HACCP principles have been applied appropriately
- All critical limits have to be validated
- Audit has to be regularly carried out to check whether implementation has been done correctly

Problems in HACCP Development

- **Documentation**

- Documentation shall be planned and maintained
- Documents are reviewed routinely for improvement
- Documentation should be used to pin point trends and problems in product processing

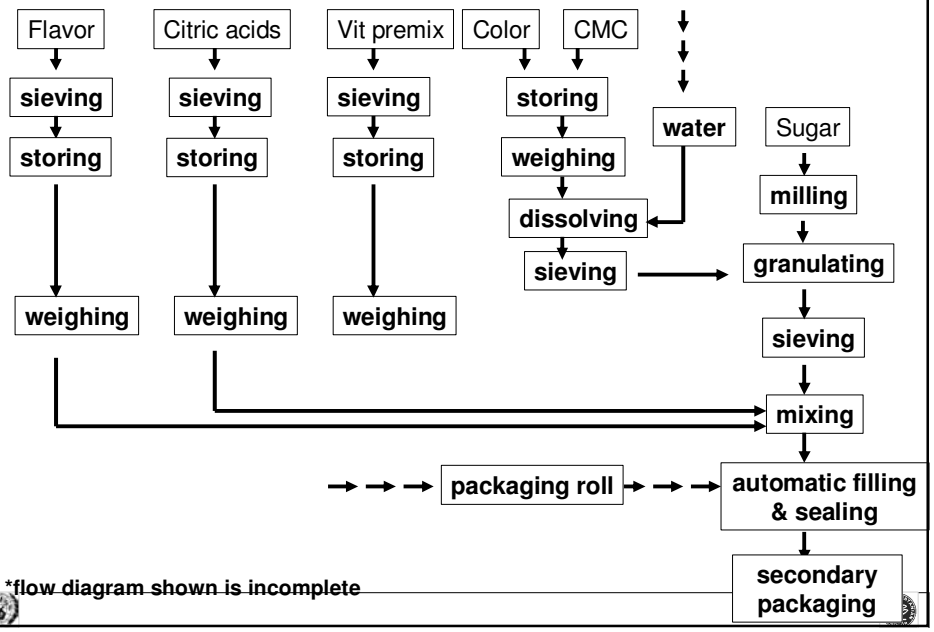
Case Study 1

Development of a HACCP plan for Instant drink powder*, a popular schoolchildren beverage

- Scope of work : GMP review, HACCP plan development
- HACCP plan development found CCPs related to physical hazards
- Product has low aw, high sugar, low risk for microbiological hazard
- Physical hazards from grinding was the main concern

****EC-ASEAN, 2005 (not all info shown here was published)***

Flow Diagram of Instant powder drink Production*



*flow diagram shown is incomplete

Development and Implementation of HACCP plan for Instant Powder Drink

- Hazard analysis suggested that physical hazards from grinding had to be controlled
- Best way was to install a metal detector post filling to assure absence of unwanted metal
- Suggestion was made to the management for a successful HACCP implementation

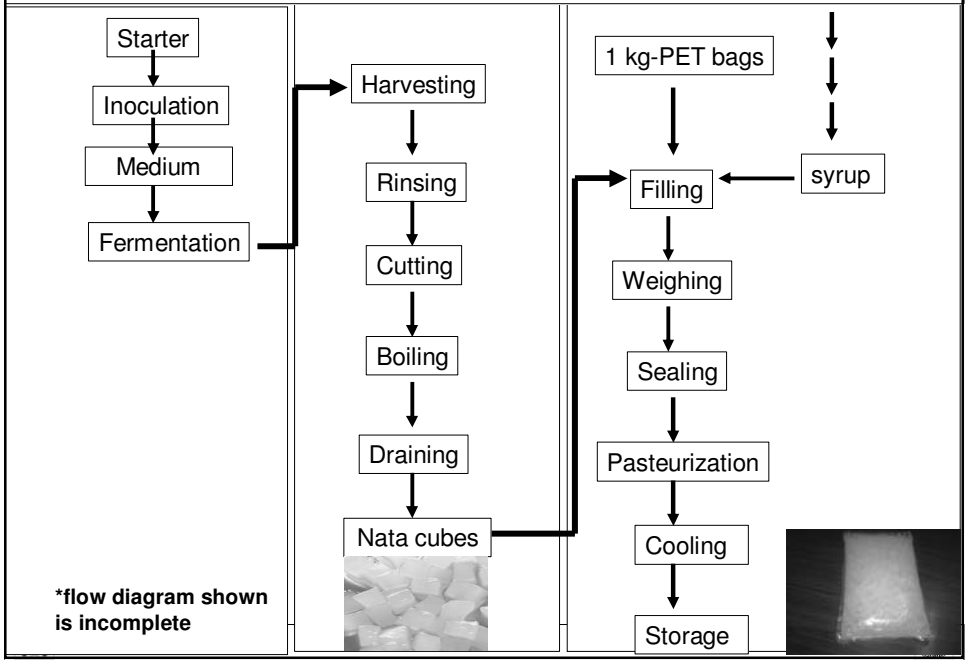
Case Study 2

Development of a HACCP plan for nata de coco*, a popular RTE dessert, made from cellulose produced by A. xylinum

- Scope of work : GMP review, HACCP development and implementation
- HACCP plan development found CCPs related to physical and biological (quality) hazards
- Product has low pH, high sugar content, pasteurized :not likely to have surviving vegetative pathogens
- Spoilage and physical hazards (from employees) are the main concerns

EC-ASEAN, 2005 (not all info shown here was published)

Flow Diagram of Nata de Coco Production*



Development and Implementation of HACCP in nata de coco production

- **September 2004 - June 2005**

  Implementation of GMP/ HACCP decrease the amount of rejected products due to physical hazard (product loss) from 14,43% to 5,32% (9,11%), equal to US$ 43.000

http://ec.europa.eu/food/training/haccp_en.pdf

Case Study 3

- Evaluation of results of two independent studies in frozen shrimp production in industry A and B
- Evaluation was based on :

  (1) study on " profile of human pathogens in shrimp obtain from Java" – industry A (2001-2005)*

  (2) "application of technology and food safety management for frozen shrimp – industry B" (2006)**

*Dewanti-Hariyadi, et al., 2005
** Dewanti-Hariyadi, et al., 2006

Case Study 3

	Industry A	Industry B
GMP Implementation		
- facilities	yes	yes
- equipment	yes	yes
- workers	yes	yes
- process control	control of raw material from middlemen not implemented	yes
HACCP		
- plan	available	available
- implementation	ND*	yes
Salmonella findings		
- in raw materials	high**	low***
- in products	20% reduction of raw materials	low***

ND=no observation made
**up to 5/5 samples taken
***no analysis was made

Case Study 3 : Import Refusal*

No	Food Manufacturer	Number of cases
1	Industry A	20
2	PT. BPA	20
3	PT. SGF	15
4	PT.ABS	15
5	PT. GGW	9
6	PT. WAP	8
7	PT. MMA	8
8	PT.STP	7
9	PT. SDFI	6
10	PT. KM	6
11	PT. ASFSE	6
12	PT. K	6
13	PT. MIS	5
14	PT. LMP	4
15	PT.SKA	4
16	PT. AP	4
17	PT. MMP	3
18	PT. BMI	2
19	Industry B	2
20	PT.DLM	2
21	PT.MMI	2
22	PT.SAT	2
23	PT. PMM	1
24	PT. PK	1
25	PT. CTS	1
26	PT.MCFI	1
27	PT.SBT	1
28	PT. RC	1
29	PT. KT	1
30	PT.SS	1
Total		**164**

***Nov 2004 – April 2005**

http://www.fda.gov/ora/oasis

Conclusions

- Several constraints for implementing GMP/HACCP can not be solved by industry only : lack of potable water-cold chain-finance
- Continuous food safety education to overcome personal/community/cultural problems
- Problems of GMP/HACCP needs to be addressed during HACCP plan development and disseminated to top management, operators and officials/inspectors

Thank You