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# ITP 506
# Issue Mutakhir
# Industri Pangan

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## *Current Issues & Development on*
## Food Technology/Food Process Engineering

Purwiyatno Hariyadi

## What is Food Science/Food Technology

IFT feeding the minds that feed the world www.ift.org

**Food Science**

Food Science is the discipline in which biology, physical sciences, and engineering are used to study the nature of foods, the causes of their deterioration, and the principles underlying food processing.

**Food Technology**

Food Technology is the application of food science to the selection, preservation, processing, packaging, distribution, and use of safe, nutritious, and wholesome food.



## What is Food (Process) Engineering?

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- *Food engineering is a broad field that is concerned with the application of engineering principles and concepts to the handling, manufacturing, processing and distribution of foods.*
- *This relatively new branch of engineering encompasses the knowledge required to design processes and systems for an efficient food chain extending from the producer to the consumer*
- (R P Singh, Professor of Food Engineering, University of California at Davis)

## What is Food (Process) Engineering?

IFT feeding the minds that feed the world

www.ift.org

- *Food process engineering is concerned with feasibility and practicality, that is, will something work and how much will it cost?*
- *Food engineers are educated to analyze, synthesize, design, and operate complex systems that manipulate mass, energy, and information to transform material and energy into useful form*
- (Valentas, Levine and Clark, 1991).



## History of Food Science/Food Technology

IFT feeding the minds that feed the world

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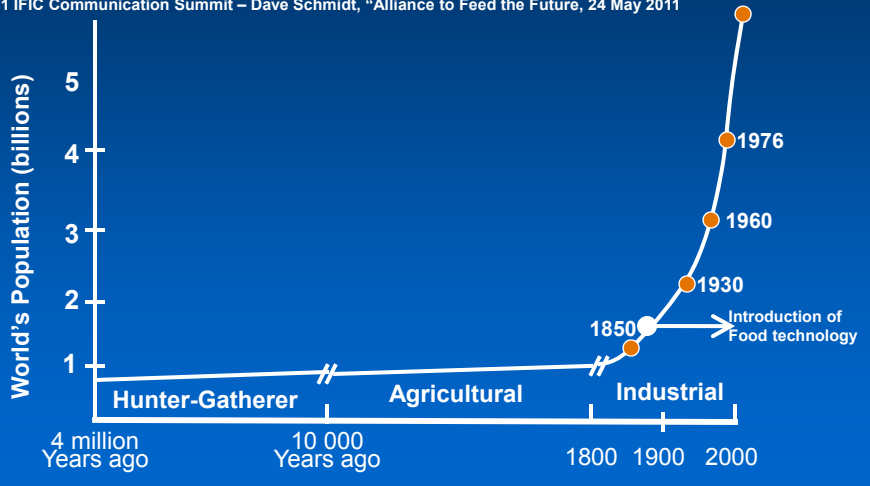
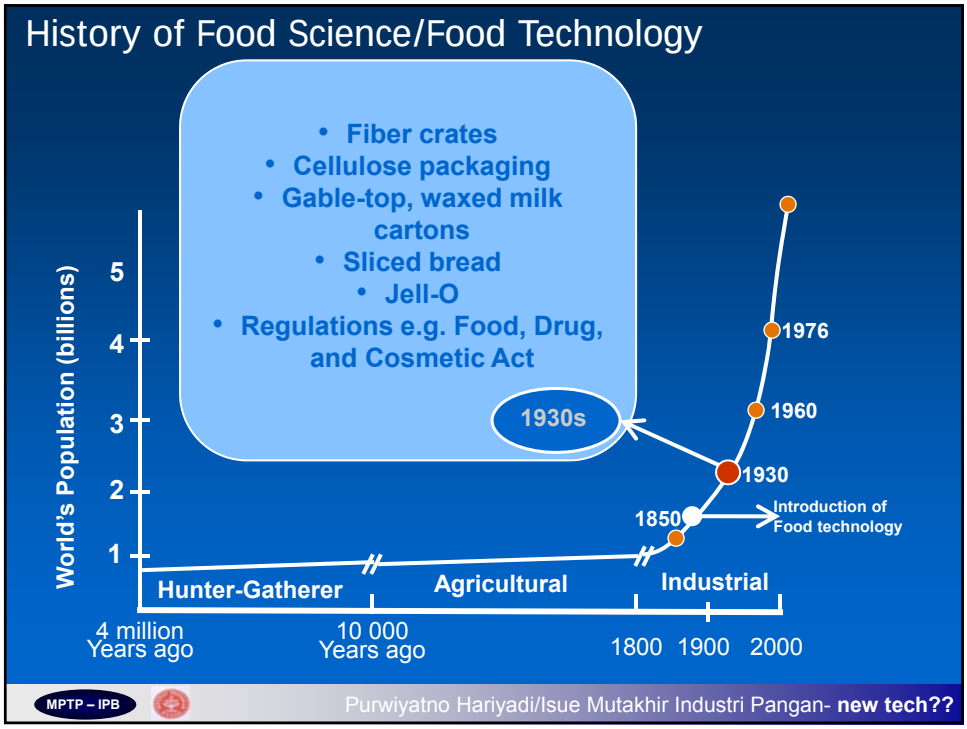
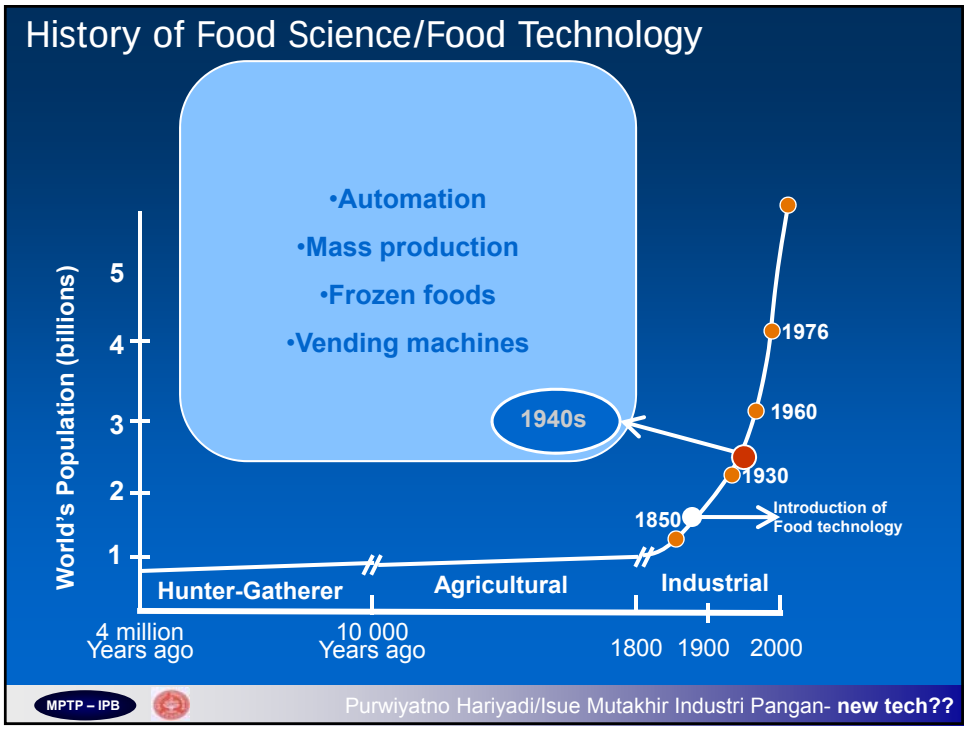
Ref.: Original C.J.K. Henry, Proc. Nutrition Soc 56:855-863, 1997;
2011 IFIC Communication Summit – Dave Schmidt, "Alliance to Feed the Future, 24 May 2011




History of Food Science/Food Technology
• Fiber crates
• Cellulose packaging
• Gable-top, waxed milk cartons
• Sliced bread
• Jell-O
• Regulations e.g. Food, Drug, and Cosmetic Act
1930s
World's Population (billions)
5
4
3
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
Agricultural
Industrial
4 million Years ago
10 000 Years ago
1800
1900
2000
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??


History of Food Science/Food Technology
•Automation
•Mass production
•Frozen foods
•Vending machines
1940s
World's Population (billions)
5
4
3
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
Agricultural
Industrial
4 million Years ago
10 000 Years ago
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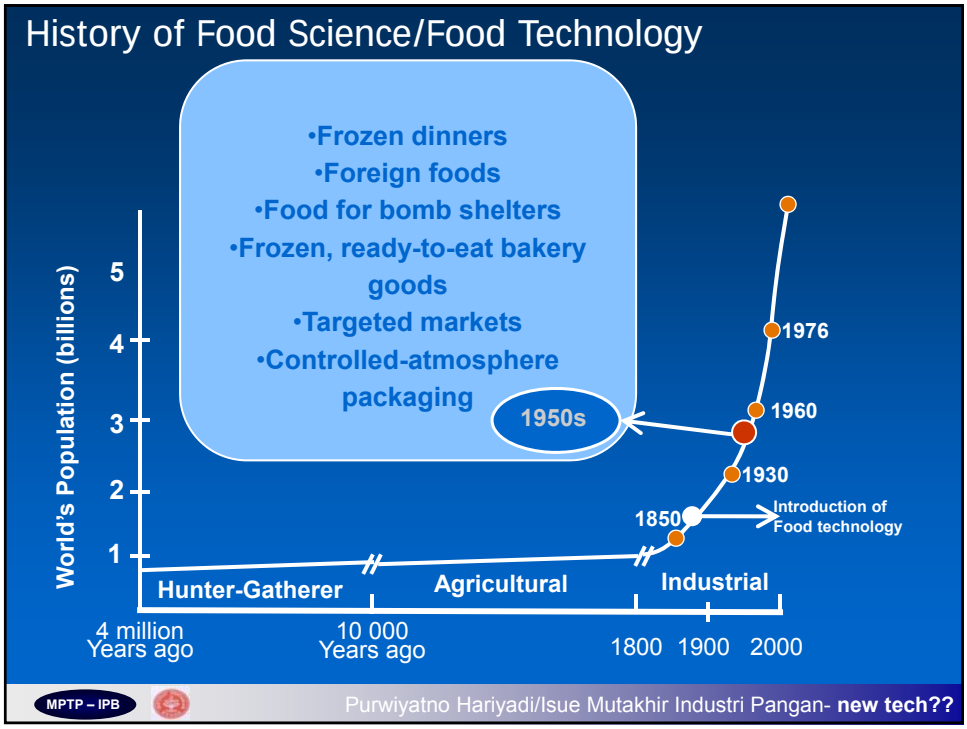
History of Food Science/Food Technology
•Frozen dinners
•Foreign foods
•Food for bomb shelters
•Frozen, ready-to-eat bakery goods
•Targeted markets
•Controlled-atmosphere packaging
1950s
World's Population (billions)
5
4
3
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
Agricultural
Industrial
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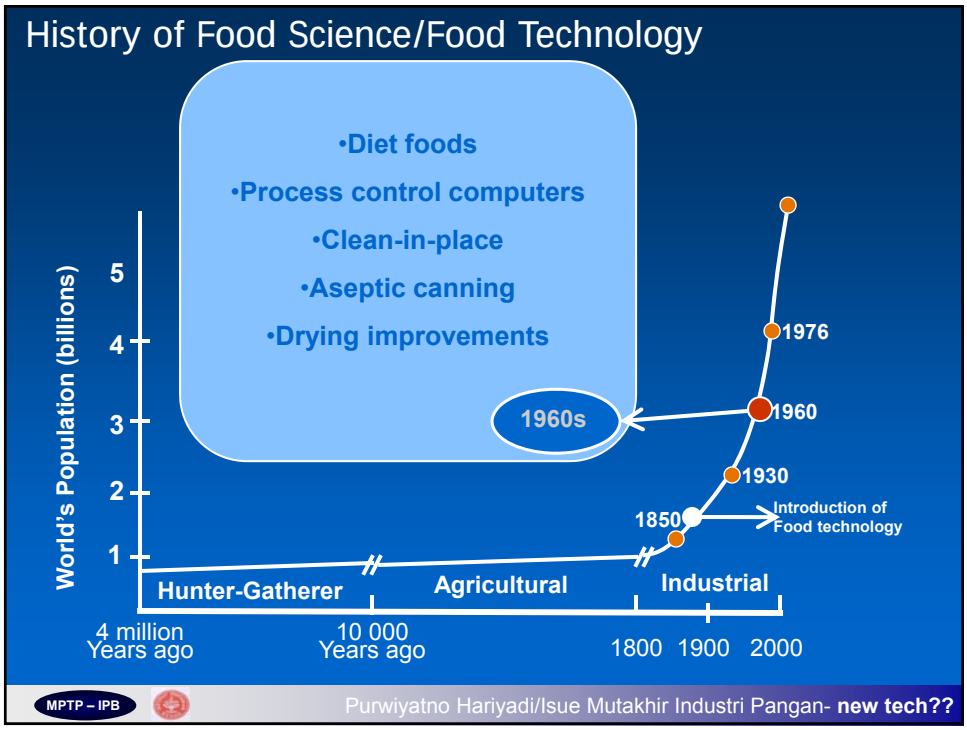
History of Food Science/Food Technology
•Diet foods
•Process control computers
•Clean-in-place
•Aseptic canning
•Drying improvements
1960s
World's Population (billions)
5
4
3
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
Agricultural
Industrial
4 million Years ago
10 000 Years ago
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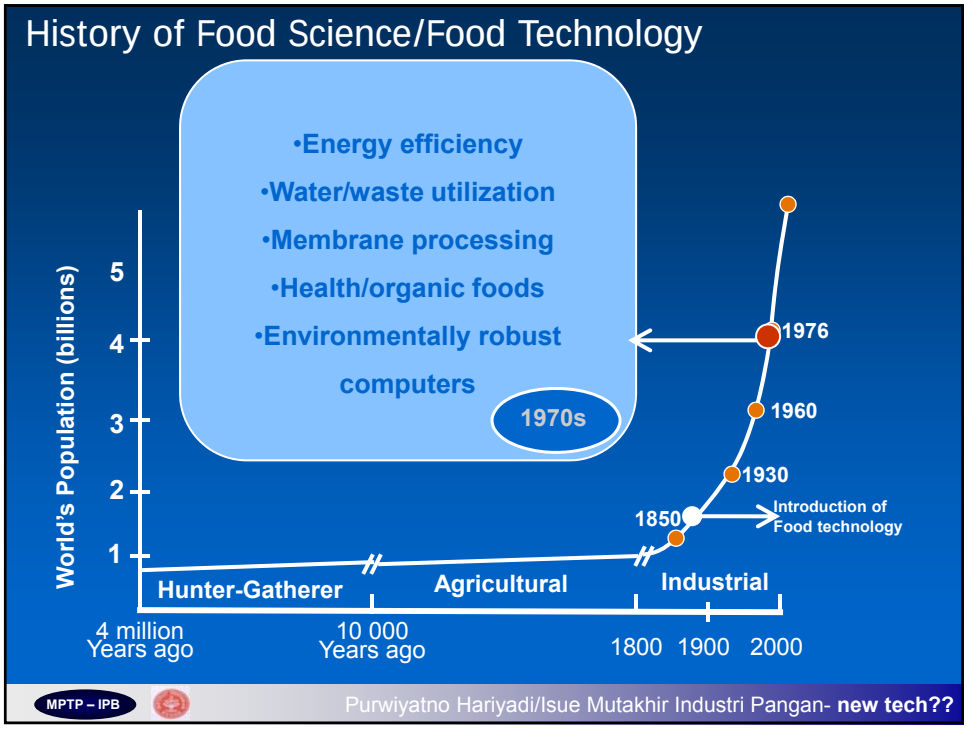
History of Food Science/Food Technology
•Energy efficiency
•Water/waste utilization
•Membrane processing
•Health/organic foods
•Environmentally robust computers
1970s
World's Population (billions)
5
4
3
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
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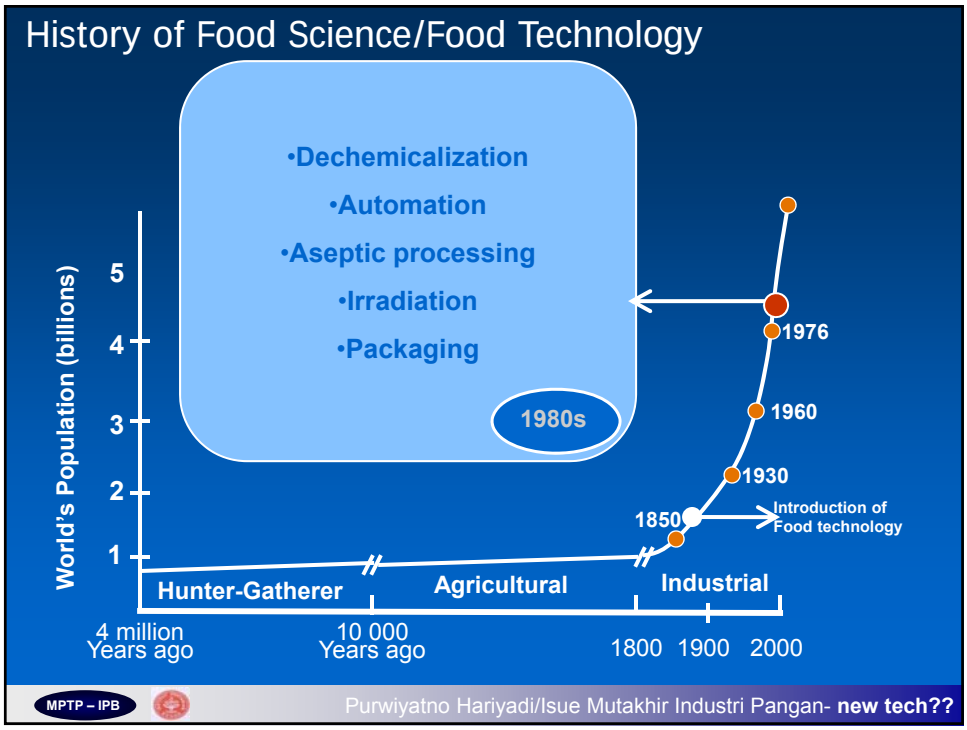
History of Food Science/Food Technology
•Dechemicalization
•Automation
•Aseptic processing
•Irradiation
•Packaging
1980s
World's Population (billions)
5
4
3
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
Agricultural
Industrial
4 million Years ago
10 000 Years ago
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1900
2000
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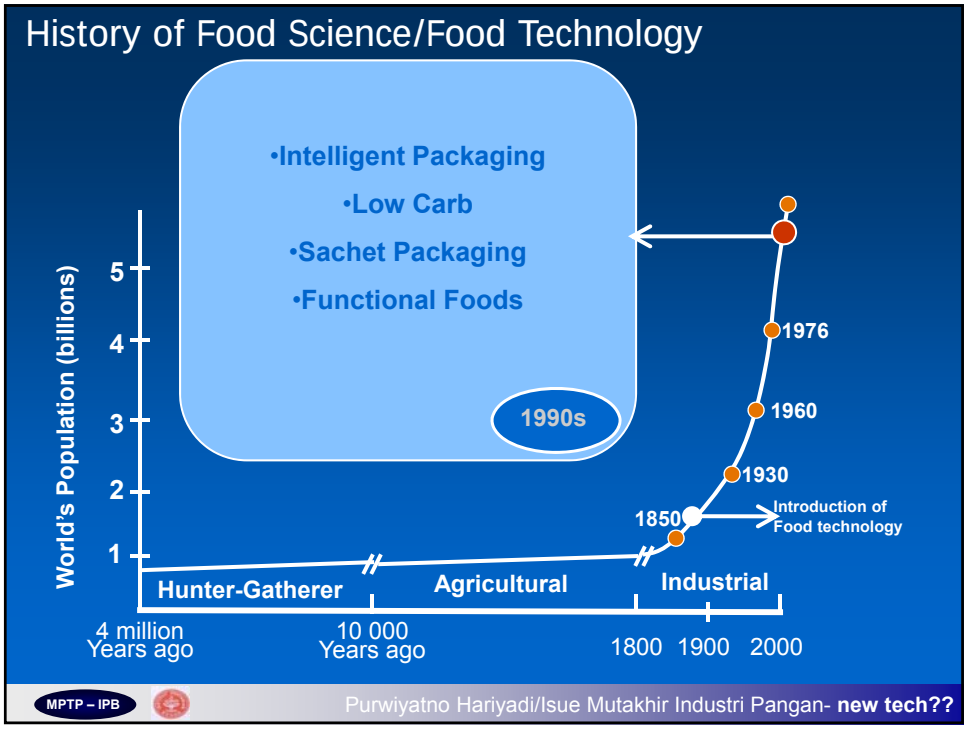
History of Food Science/Food Technology
•Intelligent Packaging
•Low Carb
•Sachet Packaging
•Functional Foods
1990s
World's Population (billions)
5
4
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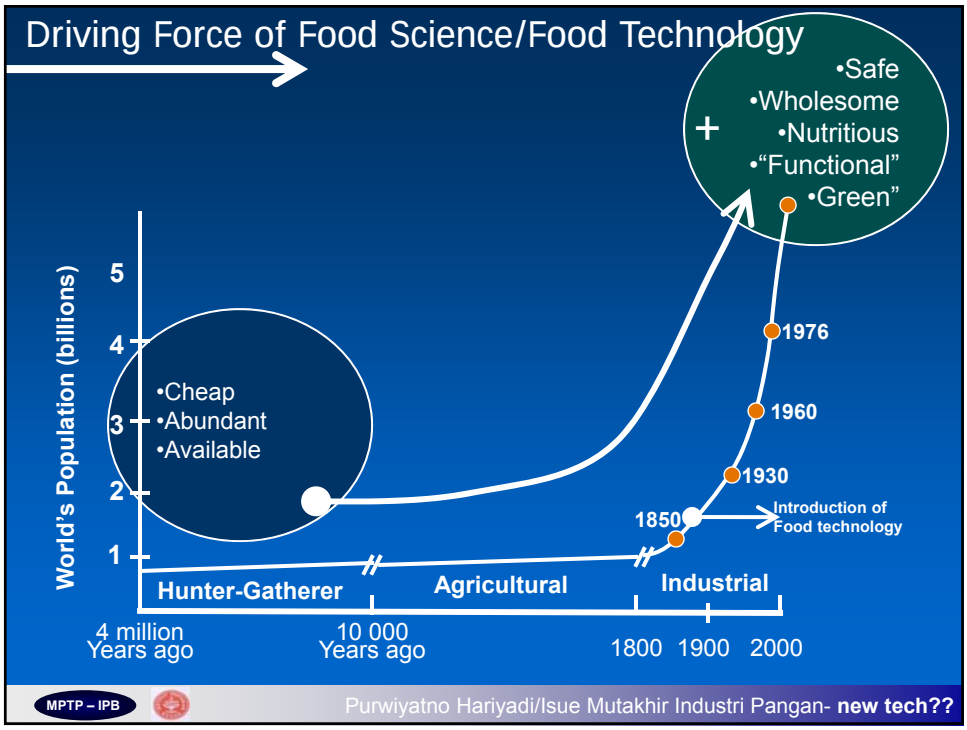
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
Agricultural
Industrial
4 million Years ago
10 000 Years ago
1800 1900 2000
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??


Driving Force of Food Science/Food Technology
•Safe
•Wholesome
•Nutritious
•"Functional"
•Green"
+
•Cheap
•Abundant
•Available
World's Population (billions)
5
4
3
2
1
1976
1960
1930
1850
Introduction of Food technology
Hunter-Gatherer
Agricultural
Industrial
4 million Years ago
10 000 Years ago
1800 1900 2000
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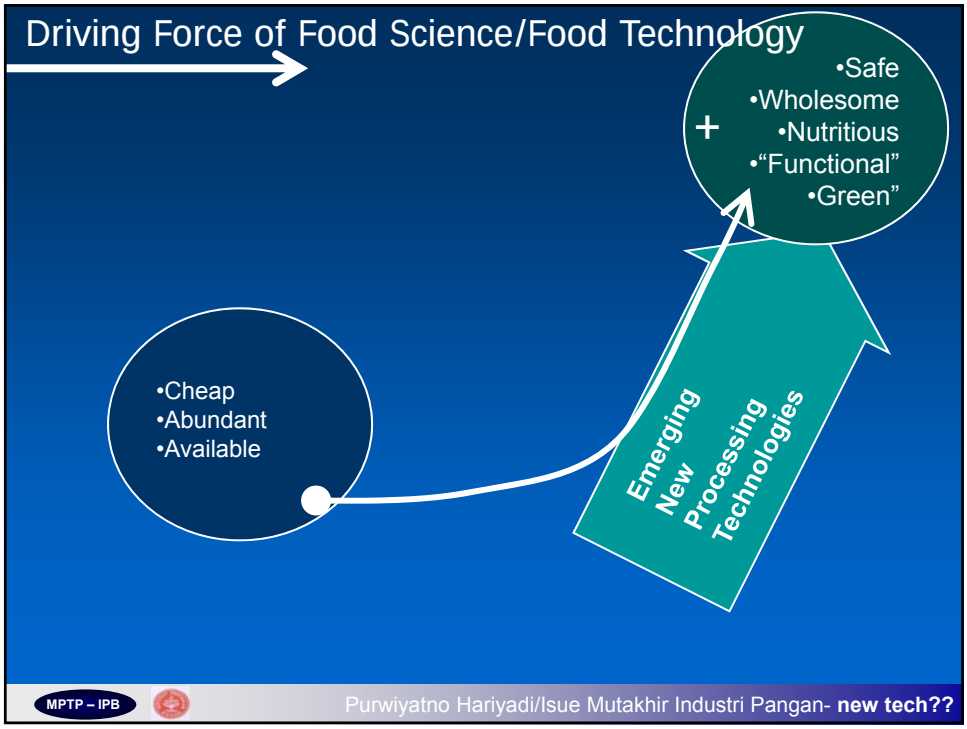
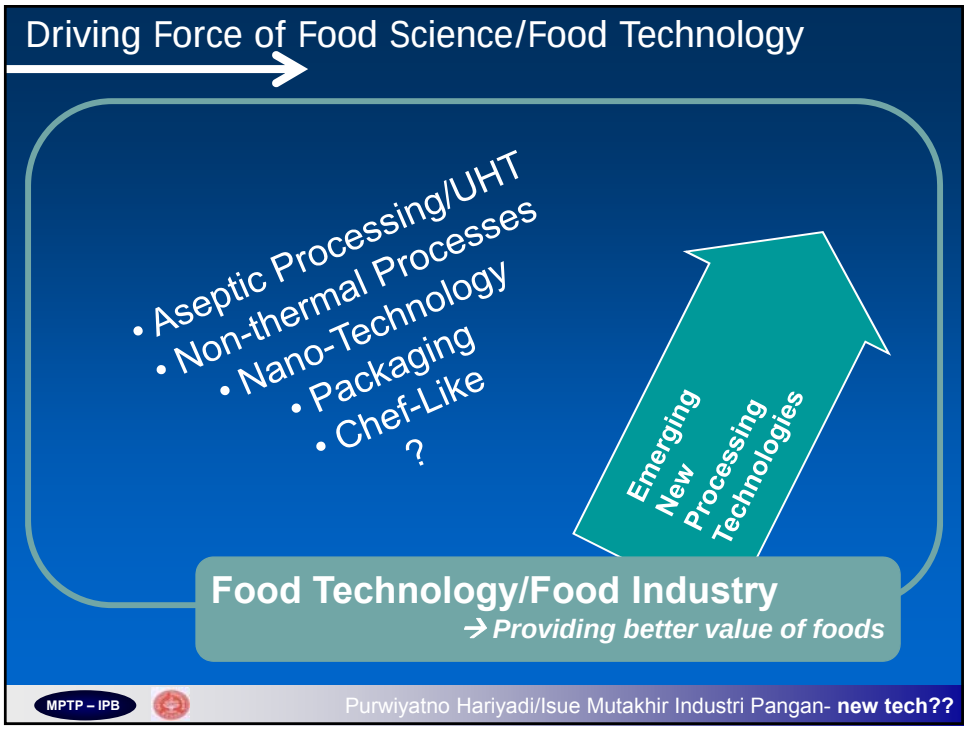

Driving Force of Food Science/Food Technology
•Safe
•Wholesome
+
•Nutritious
•"Functional"
•Green"
•Cheap
•Abundant
•Available
Emerging New Processing Technologies
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??


Driving Force of Food Science/Food Technology
• Aseptic Processing/UHT
• Non-thermal Processes
• Nano-Technology
• Packaging
• Chef-Like
?
Emerging New Processing Technologies
Food Technology/Food Industry
→ Providing better value of foods
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??

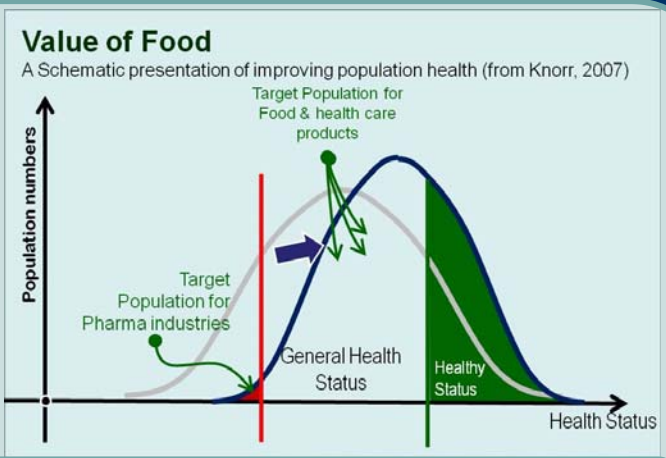
## Driving Force of Food Science/Food Technology

- Memperpanjang keawetan (*long shelf life*)
- Ketersediaan lebih lama
- Mudah (*convenience*)
- Penampakan lebih baik
- Tekstur lebih baik
- Flavor lebih baik
- Gizi lebih baik
- Aman - mikrobiologi, kimia, fisik, psikologis
- ????

**Food Technology/Food Industry**
***→ Providing better value of foods***

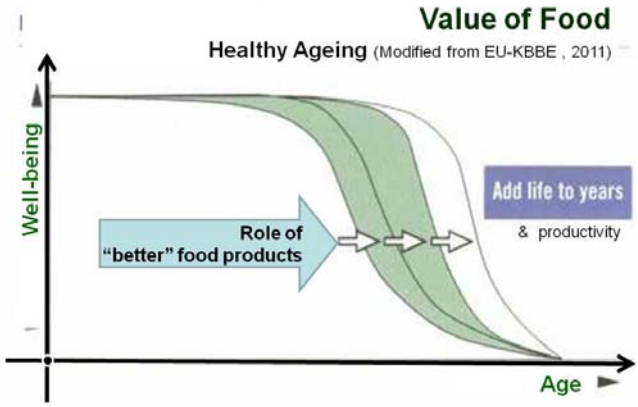


## Driving Force of Food Science/Food Technology




**Food Technology/Food Industry**
***→ Providing better value of foods***

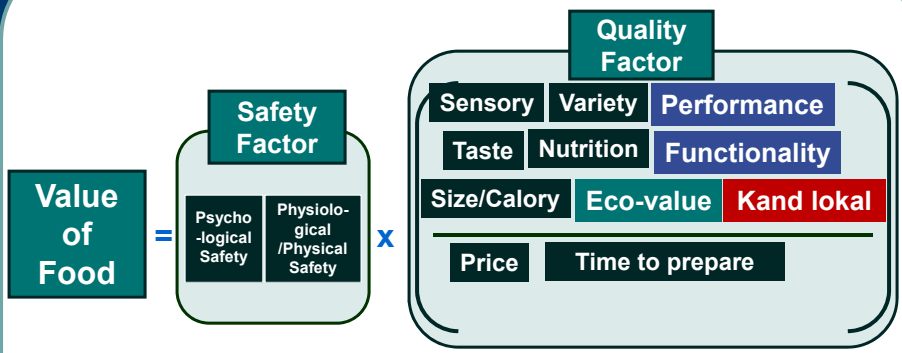
## Driving Force of Food Science/Food Technology



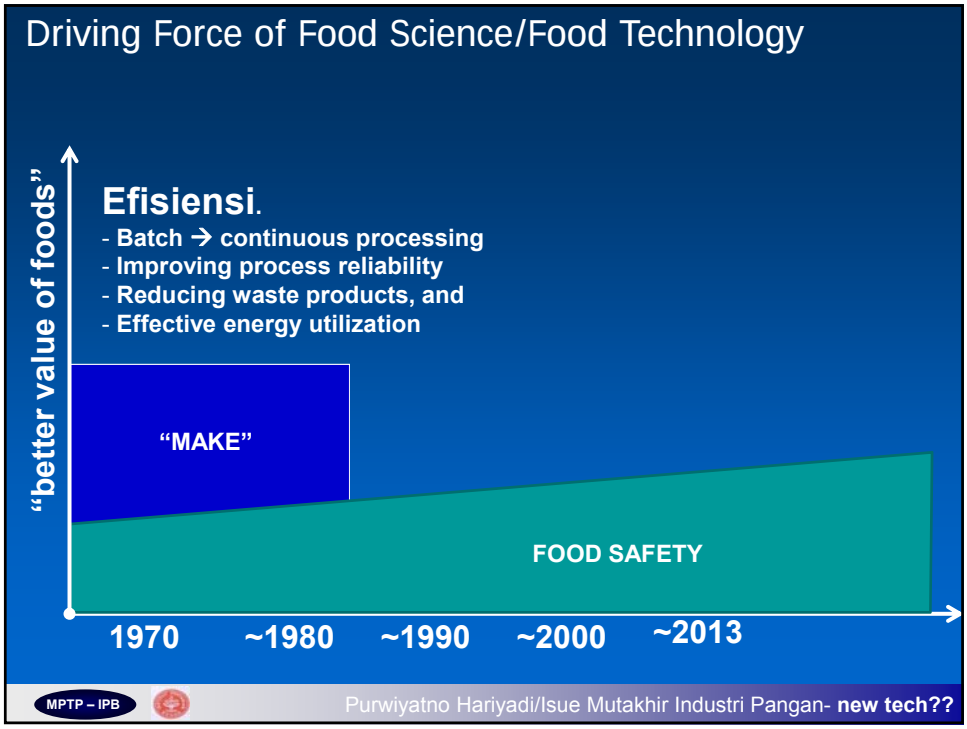

**Food Technology/Food Industry**
→ *Providing better value of foods*

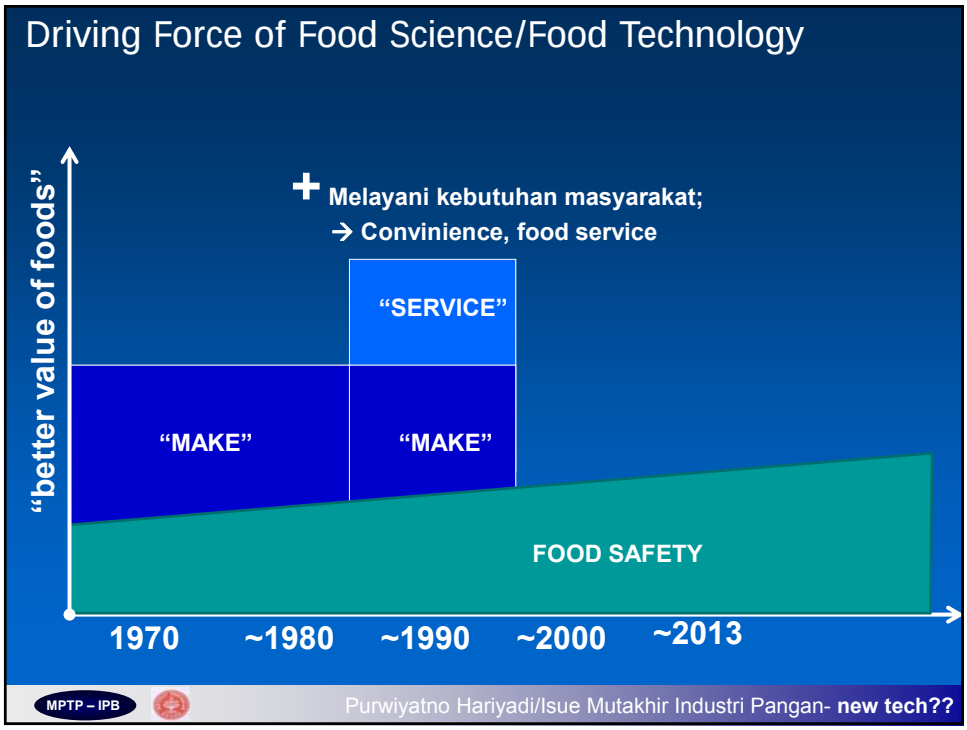


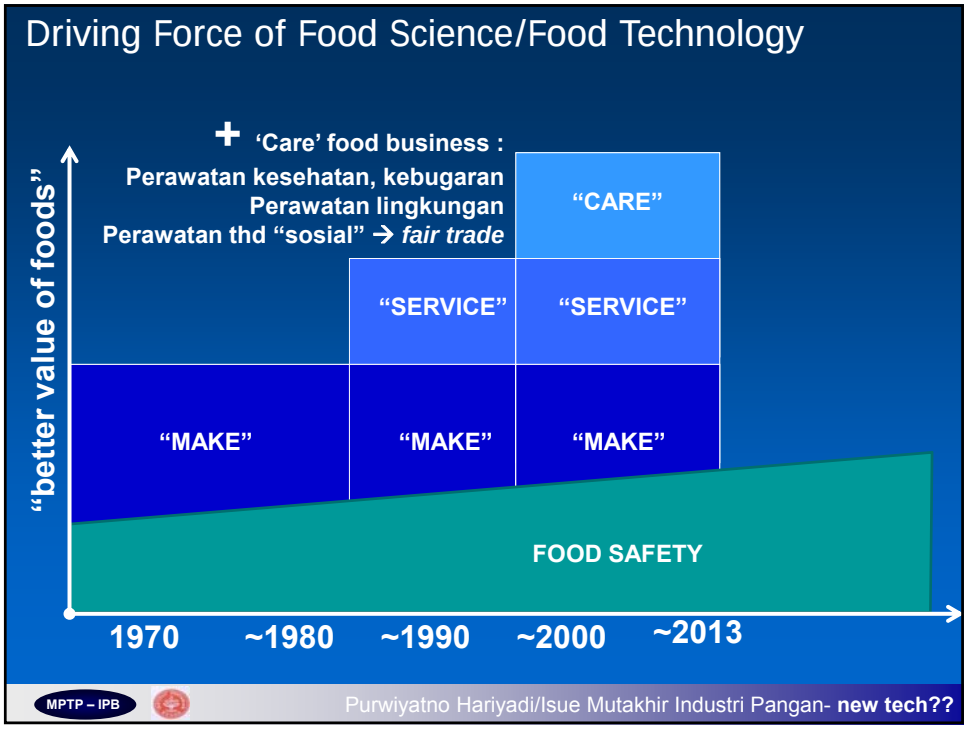
## Value of Foods

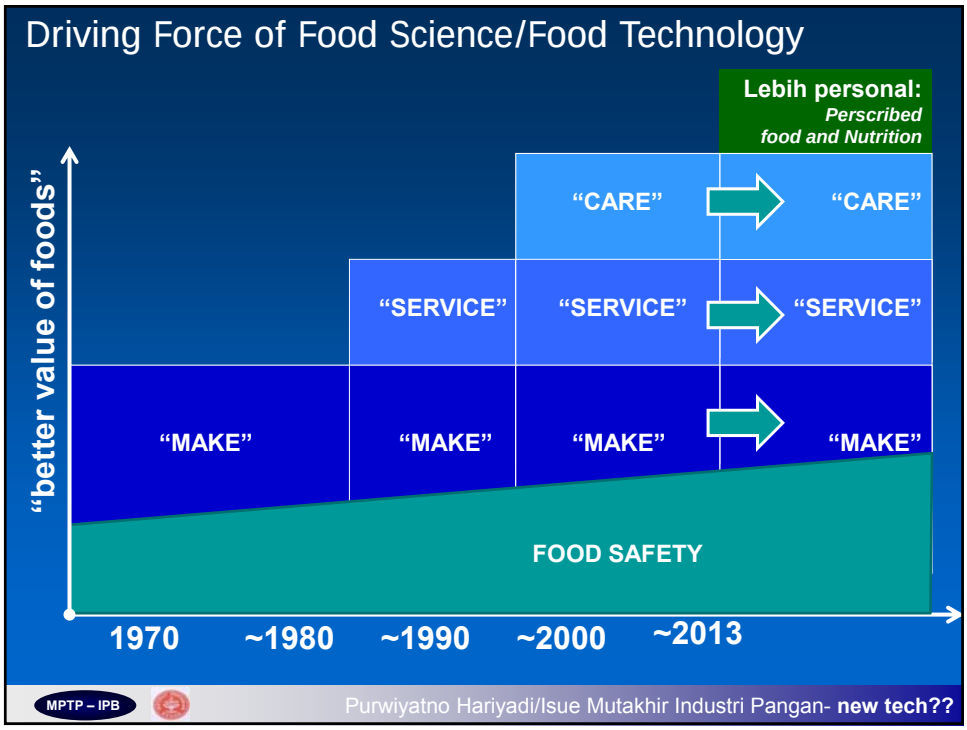



**Food Technology/Food Industry**
→ *Providing better value of foods*


Driving Force of Food Science/Food Technology
"better value of foods"
Efisiensi.
- Batch → continuous processing
- Improving process reliability
- Reducing waste products, and
- Effective energy utilization
"MAKE"
FOOD SAFETY
1970
~1980
~1990
~2000
~2013
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??


Driving Force of Food Science/Food Technology
"better value of foods"
+ Melayani kebutuhan masyarakat;
→ Convinience, food service
"SERVICE"
"MAKE"
"MAKE"
FOOD SAFETY
1970
~1980
~1990
~2000
~2013
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??


Driving Force of Food Science/Food Technology
+ 'Care' food business :
Perawatan kesehatan, kebugaran
Perawatan lingkungan
Perawatan thd "sosial" → fair trade
"better value of foods"
"CARE"
"SERVICE"
"SERVICE"
"MAKE"
"MAKE"
"MAKE"
FOOD SAFETY
1970
~1980
~1990
~2000
~2013
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??


Driving Force of Food Science/Food Technology
Lebih personal:
Perscribed
food and Nutrition
"better value of foods"
"CARE"
"CARE"
"SERVICE"
"SERVICE"
"SERVICE"
"MAKE"
"MAKE"
"MAKE"
"MAKE"
FOOD SAFETY
1970
~1980
~1990
~2000
~2013
MPTP – IPB
Purwiyatno Hariyadi/Isue Mutakhir Industri Pangan- new tech??

## Case of Aflatoxin

**In 1997 the European Commission proposed a uniform/harmonized standard for total aflatoxins, setting the acceptable level of the contaminant in food products (European Commission, 1997).**

- **4 ppb in cereals, edible nuts, dried and preserved fruits, and groundnuts intended for direct human consumption, and**
- **10 ppb in groundnuts subject to further processing.**
- **0.05 ppb for Aflatoxin M1 in milk.**

**The harmonized standard for the European Union is tighter than those which have been applied in most member countries**

## Case of Aflatoxin

**Maximum allowable aflatoxin levels in Europe and Africa (ppb) [T. Otsuki et al. / Food Policy 26 (2001) 495–514]**

| Country | Commodity | Aflatoxin B1 | Aflatoxin Total |
|---|---|---|---|
| Austria | all foods | 1 | - |
| | milling and shelled products and derived food | 2 | - |
| Belgium | groundnuts | 5 | - |
| Denmark | groundnuts | 2 | 4 |
| | Brazil nuts | 2 | 4 |
| | dried figs | 2 | 4 |
| Finland | all foods | - | 5 |
| France | all foods | 10 | - |
| | groundnuts | 1 | - |
| | wheat meal | 3 | - |
| | wheat bran | 10 | - |
| | vegetable oils, cereals, wheat meal | 5 | - |
| Germany | all foods | 2 | 4 |
| | enzyme | - | 0.05 |
| Greece | nuts and edible seeds | 5 | 10 |
| | dried fruits | 5 | 10 |

# Case of Aflatoxin

**Maximum allowable aflatoxin levels in Europe and Africa (ppb) [T. Otsuki et al. / Food Policy 26 (2001) 495–514]**

| Country | Commodity | Aflatoxin B1 | Aflatoxin Total |
|---|---|---|---|
| Ireland | all foods | 5 | 30 |
| Italy | all foods | 5 | 10 |
| | dried figs | 5 | 10 |
| | spices | 20 | 40 |
| Luxembourg | groundnuts | 5 | - |
| The Netherlands | all foods | 5 | - |
| Portugal | all foods | 20 | - |
| | groundnuts | 25 | - |
| Spain | all foods | 5 | 10 |
| Sweden | all foods | - | 5 |
| United Kingdom | nuts, dried figs | - | 4 |
| | groundnuts, copra, palm-kernel, cotton seed | 20 | - |
| Norway (EEA) | all foods | - | 5 |
| | Brazil nuts | - | 5 |
| | mixed foodstuffs depending on animal | 50 | - |

# Case of Aflatoxin

**Maximum allowable aflatoxin levels in Europe and Africa (ppb) [T. Otsuki et al. / Food Policy 26 (2001) 495–514]**

| Country | Commodity | Aflatoxin B1 | Aflatoxin Total |
|---|---|---|---|
| Austria | all foods | 1 | - |
| Africa (average) | groundnuts | 14 | 44 |
| Codex | | - | 15 |

Source: FAO (1995)

## Case of Aflatoxin

| *Nation* | *Total aflatoxin standard in human food (µg/kg)* |
|---|---|
| Australia | 5 |
| China | 20 |
| **European Union (EU)** | **4*** |
| Guatemala | 20 |
| India | 30 |
| Kenya | 20 |
| **USA** | **20** |

## Case of Aflatoxin

BADAN PENGAWAS OBAT DAN MAKANAN
REPUBLIK INDONESIA

**C. JENIS DAN BATAS MAKSIMUM KANDUNGAN MIKOTOKSIN DALAM MAKANAN**

**1. Aflatoksin**

| No. | Jenis makanan | Batas maksimum (ppb atau mcg/kg) | |
|---|---|---|---|
| 1 | Susu dan minuman berbasis susu | $M_1$ | 0,5 |
| 2 | Susu fermentasi dan produk susu hasil hidrolisa enzim renin (*plain*) | $M_1$ | 0,5 |
| 3 | Susu kental dan analognya | $M_1$ | 0,5 |
| 4 | Krim (*plain*) dan sejenisnya | $M_1$ | 0,5 |
| 5 | Susu bubuk dan krim bubuk dan bubuk analog (*plain*) | $M_1$ | 5 |
| 6 | Keju dan keju analog | $M_1$ | 0,5 |
| 7 | Makanan pencuci mulut berbahan dasar susu (misalnya puding, yogurt berperisa atau yogurt dengan buah) | $M_1$ | 0,5 |
| 8 | Whey dan produk whey, kecuali keju whey | $M_1$ | 0,5 |
| 9 | Produk olahan kacang-kacangan | $B_1$ | 15 |
| | | Total | 20 |
| 10 | Produk olahan Jagung | $B_1$ | 15 |
| | | Total | 20 |
| 11 | Rempah-rempah bubuk | $B_1$ | 15 |
| | | Total | 20 |

## Case of Aflatoxin

Pergamon

Food Policy 26 (2001) 495–514

FOOD POLICY

www.elsevier.com/locate/foodpol

# Saving two in a billion: quantifying the trade effect of European food safety standards on African exports☆

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## Case of Aflatoxin

Pergamon

Food Policy 26 (2001) 495–514

FOOD POLICY

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Saving two in a billion: quantifying the trade effect of European food safety standards on African exports☆

**Abstract**

A growing concern over health risks associated with food products has prompted close examination of sanitary and phytosanitary standards in industrialized countries. This paper quantifies the impact of a new harmonized aflatoxin standard set by the EU on food exports from Africa. We employ a gravity model to estimate the impact of changes in differing levels of protection based on the EU standard, in contrast to those suggested by international standards. The analysis is based on trade and regulatory survey data for 15 European countries and nine African countries between 1989 and 1998. Our results suggest that the implementation of the new aflatoxin standard in the EU will have a negative impact on African exports of cereals, dried fruits and nuts to Europe. The new EU standard, which would reduce health risk by approximately 1.4 deaths per billion a year, will decrease these African exports by 64% or US$ 670 million, in contrast to regulation set through an international standard. 

*Keywords:* Agricultural trade; Sanitary and phytosanitary measures; Food safety; Aflatoxins; Health risks

## Case of Aflatoxin

Strict aflatoxin standards can have severe economic impacts

- "A World Bank study has calculated that the European Union regulation on aflatoxins costs Africa $670 million each year in exports of cereals, dried fruit and nuts. And what does it achieve? It may possibly save the life of one citizen of the European Union every two years…
  - **Surely a more reasonable balance can be found." --** ***Kofi Annan, former UN Secretary General***
- "Milder" calculation: $450 million annual loss to ALL food exporters if ALL nations harmonized to EU aflatoxin standard (Wu, 2004)

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