Trend & Challenges of Food Ingredient Industry in Indonesia

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Indonesian Association of Food Technologist

UNIVERSITAS BAKRIE

Functional Beverage and Nutritious Food Summit 2016
25-26 August 2016, Guangzhou, China

The Indonesian Association of Food Technologists (IAFT)

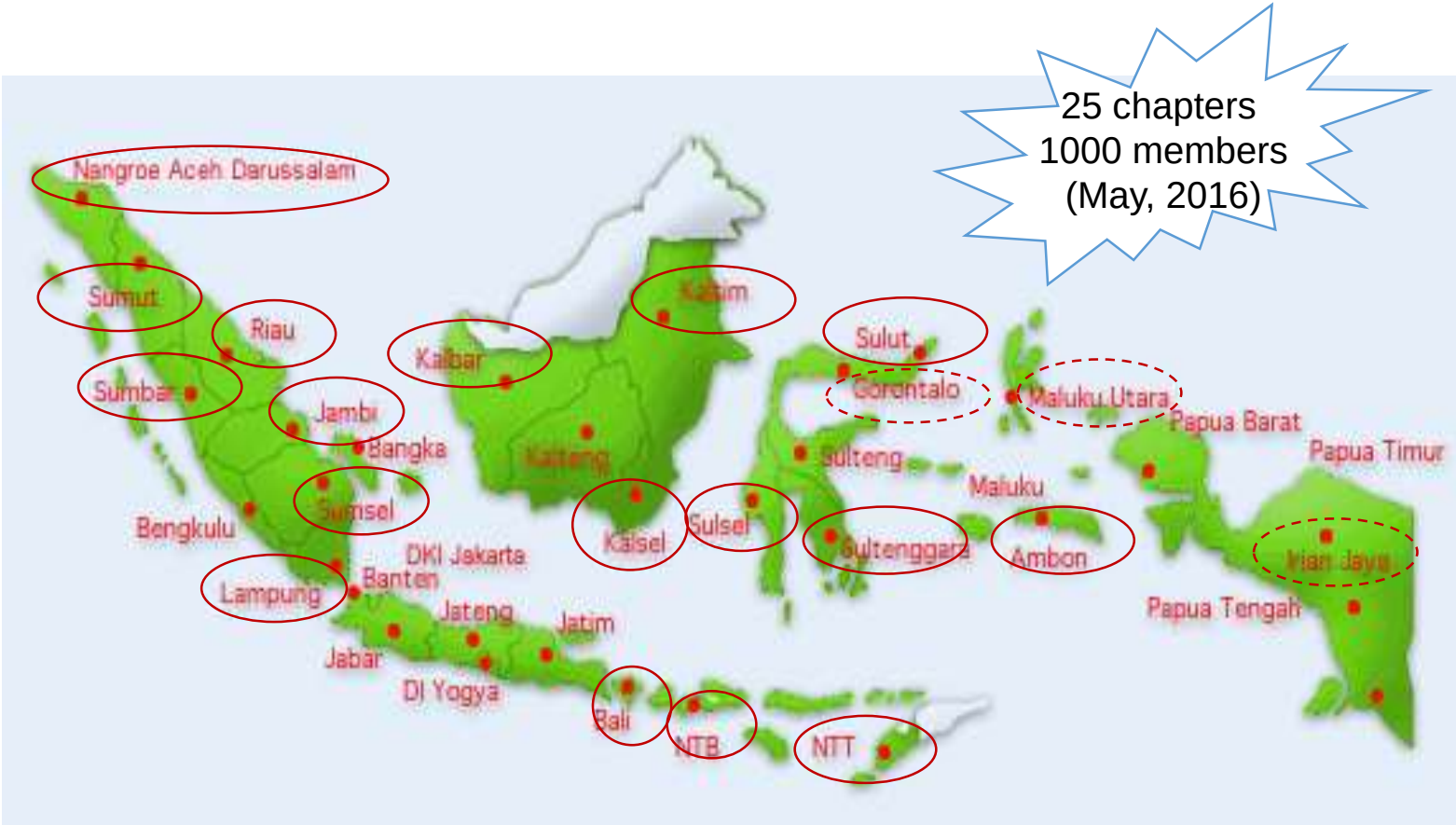
- IAFT was initiated on 1963 → activity 1967
- Academician, researcher, government, industry
- Member of The Federation of Institutes of Food Science and Technology of the ASEAN (FIFSTA) and International Union of Food Science and Technology (IUFoST)

- Advisory Board
- Central board (chairman, 4 vice chairman, secretary, treasure, divisions)
- Chapter board (chairman, secretary, treasure, divisions)

IAFT board 2014-2018

Indonesian Association of Food Technologist

The Indonesian Association of Food Technologists (IAFT)



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Patpi Indonesian Association of Food Technologist

AGENDA

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Indonesia
Potency

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Food
Ingredients

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Consumer's
Trends

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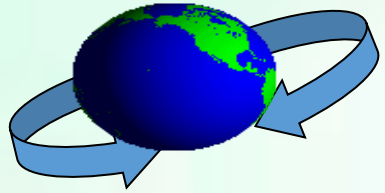
Challenges

An evolution in the Food Industry and Trade



Consumption

- World Population over 7 Billions
- Lifestyle changes
- More concern about **food safety, health, Halal,** **Double Burden of malnutrition, NCD**, etc
- Misleading information, Chemical phobia

Supply

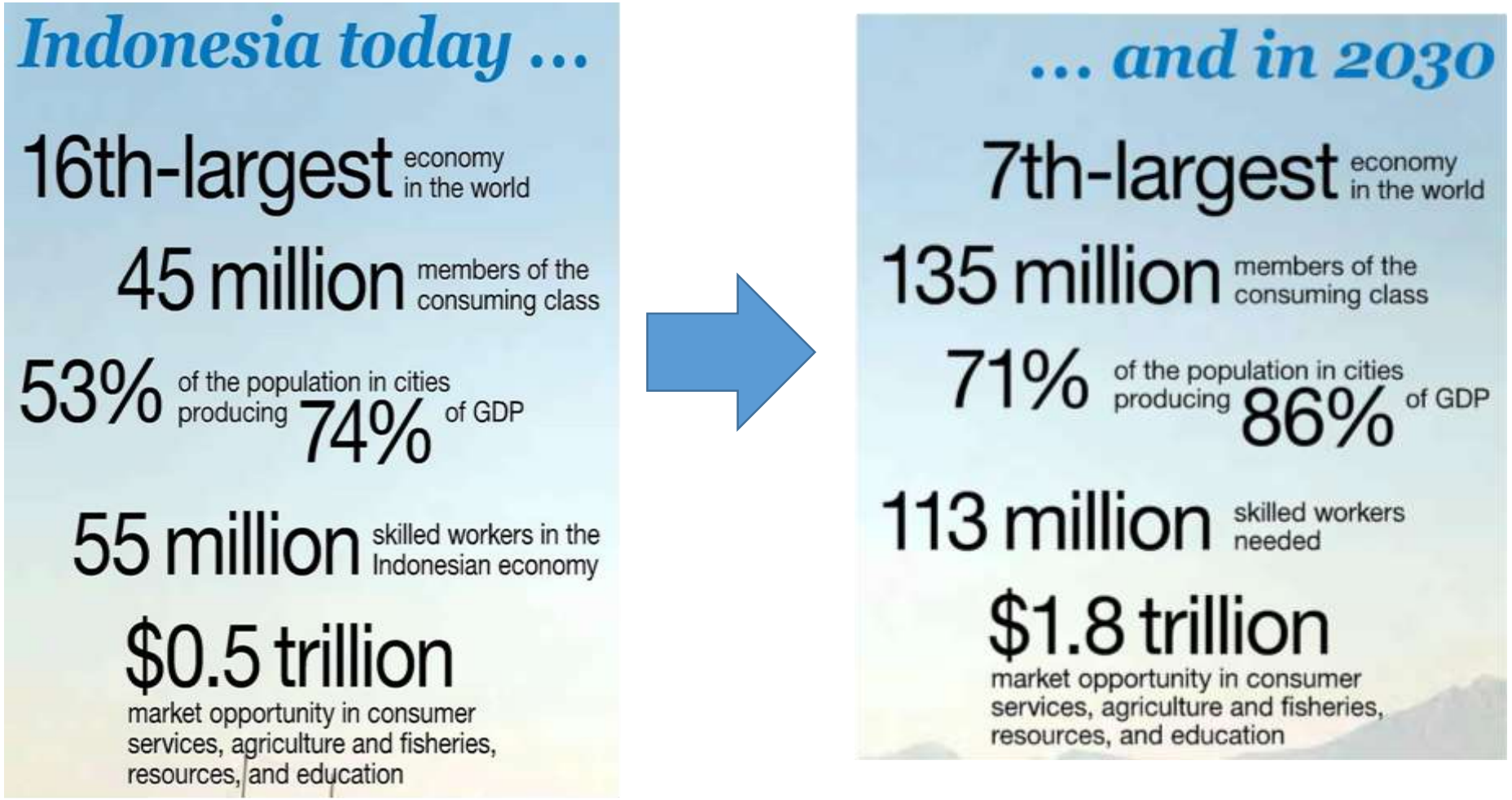
- Decreasing of agricultural land & natural resources Sustainability
- Era "cheap price" is over, related to global climate change, reduction of productive land, increasing demand of food & energy
- Competitiveness & struggling to reduce High cost economy

Trade

- Liberalization Tariff is on going , unbalanced & sometimes unfair
- **Food Regulation more stringent & NTMs increased, related to Food Safety and Quality Standard**
- Eco-friendly products. (APEC 2012) (max 5% Tariff)
- **Food Fight: Impact of Politic**
- Advances in technology : Support innovation and competitiveness
- Development of IT: Interconnected and easier to access information

World's No. 4 largest population (252.164,800 , BPS 2015)

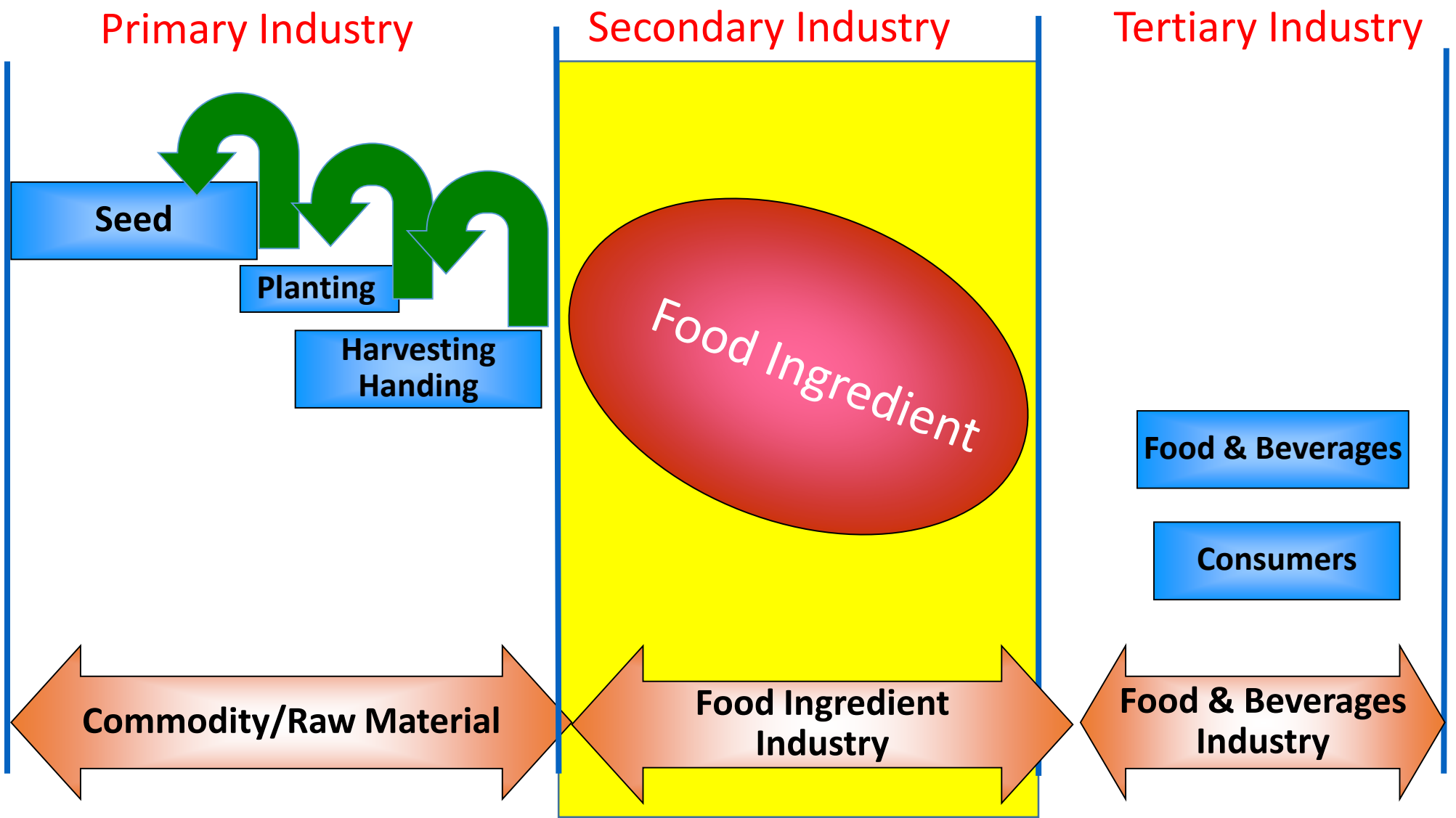
Indonesia has a great protential in the development of Ingredients based on indigenous resources



Source: McKinsey Global Institute

The demographic bonus and the rise of a new consumer class in 2025 (Basri, 2011); Young people at the start of their careers buy more cars, houses, furniture, and food as well, where older age groups consume less and save more.

Relation between Farming – Food/Beverages Industry



Food Ingredients?

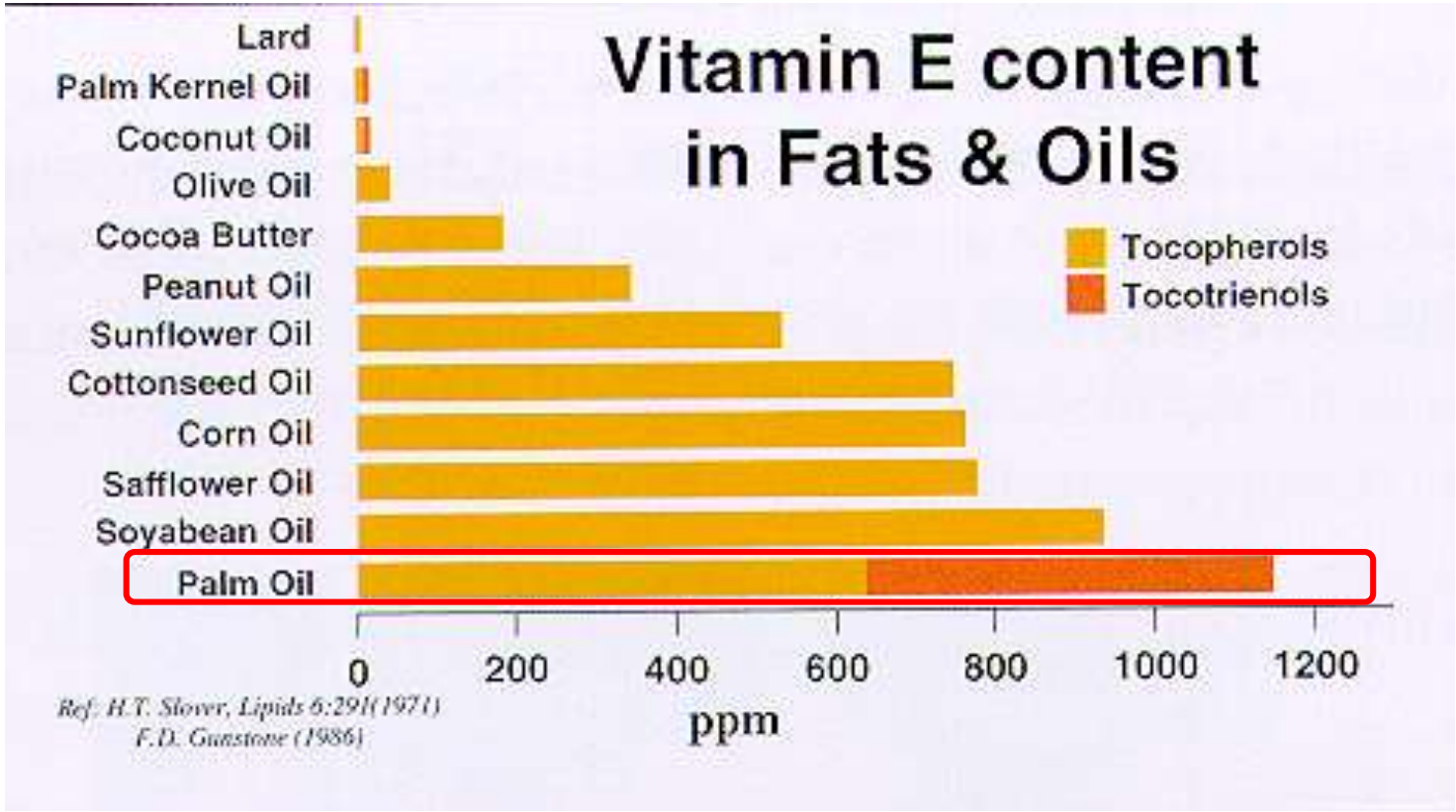
- Processing Aids
- Sensory Ingredients
- Textural ingredients
- Health Ingredients :
  - food Ingredient with the health benefits
    - Health-promotion, or
    - Disease prevention

EXAMPLE OF Potential Ingredient OF INDONESIA :

Tocotrienols

Potential local resource :

Tocotrienols comprise one half of the vitamin E family that includes the better-known tocopherols, and can be found in various foods, most prominently palm oil.



EXAMPLE OF Potential Ingredient OF INDONESIA :






Essential Oil

Essential oils are the volatile oils obtained through distillation of the botanical parts of plants such as leaves, flowers, seeds, or bark.



EXAMPLE OF Potential Ingredient OF INDONESIA :






Ingredients from exotic produce :

*Natural Extracts – **Tea Extracts***

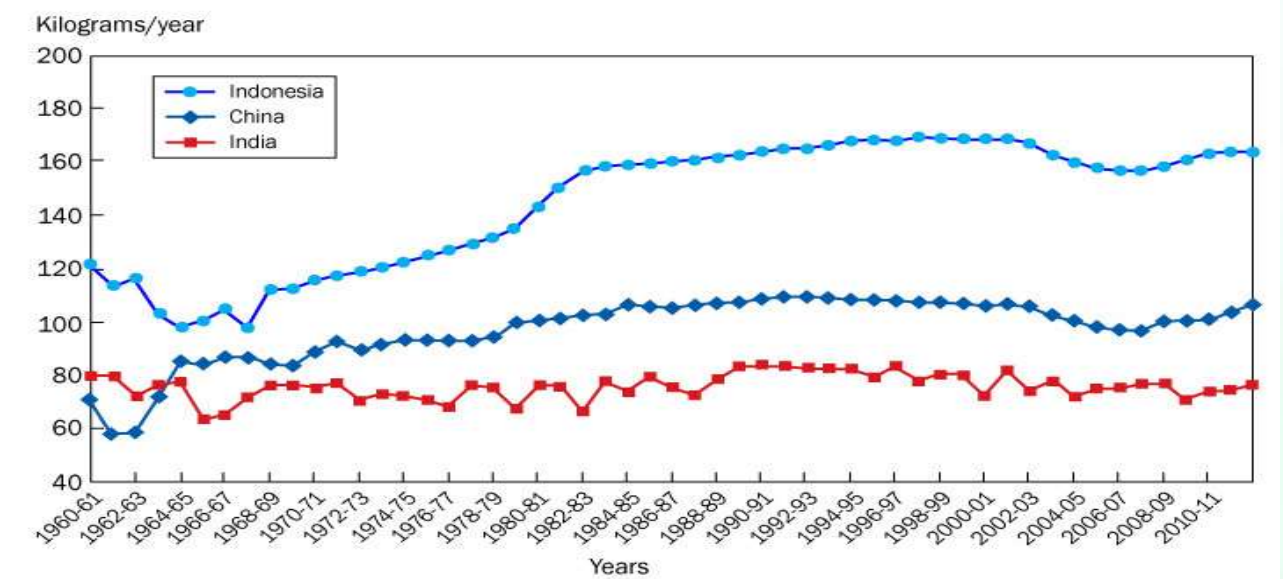


The healthful properties of green tea are largely attributed to polyphenols, an active ingredient that offers antioxidant and anti aging.

EXAMPLE OF Potential Ingredient OF INDONESIA :

Rice in Indonesia

- Rice plays a crucial role in Indonesia food security as well as overall political, economic, and social stability.
- Rice is a staple food in Indonesia
- The annual consumption of rice in Indonesia is 139.15 kg/capita/year.
- Rice is expected to have functionality in human health



Per capita rice consumption in the top three countries.
Data source: PSD online database (USDA) and FAOSTAT population database (FAO)

- Rice is used in traditional medicines as a remedy against inflammation, gastrointestinal ailments, hypercholesterolemia, diabetes, and skin diseases.
- Experimental and clinical evidence indicate that brown rice and bran oil reduce hypercholesterolemia and cardiovascular risk.
- The monacolin-rich red yeast rice regulates hypercholesterolemia
- The GABA-rich germinated brown rice has chemopreventive effects.

(Borland and Cornara, 2014)

There are many different types of rice, they contain different phytochemicals or ingredients, their function may not be identical.

- Black rice sold in China
- Two types black rice: glutenuous Indonesian black rice and Thai jasmine black rice

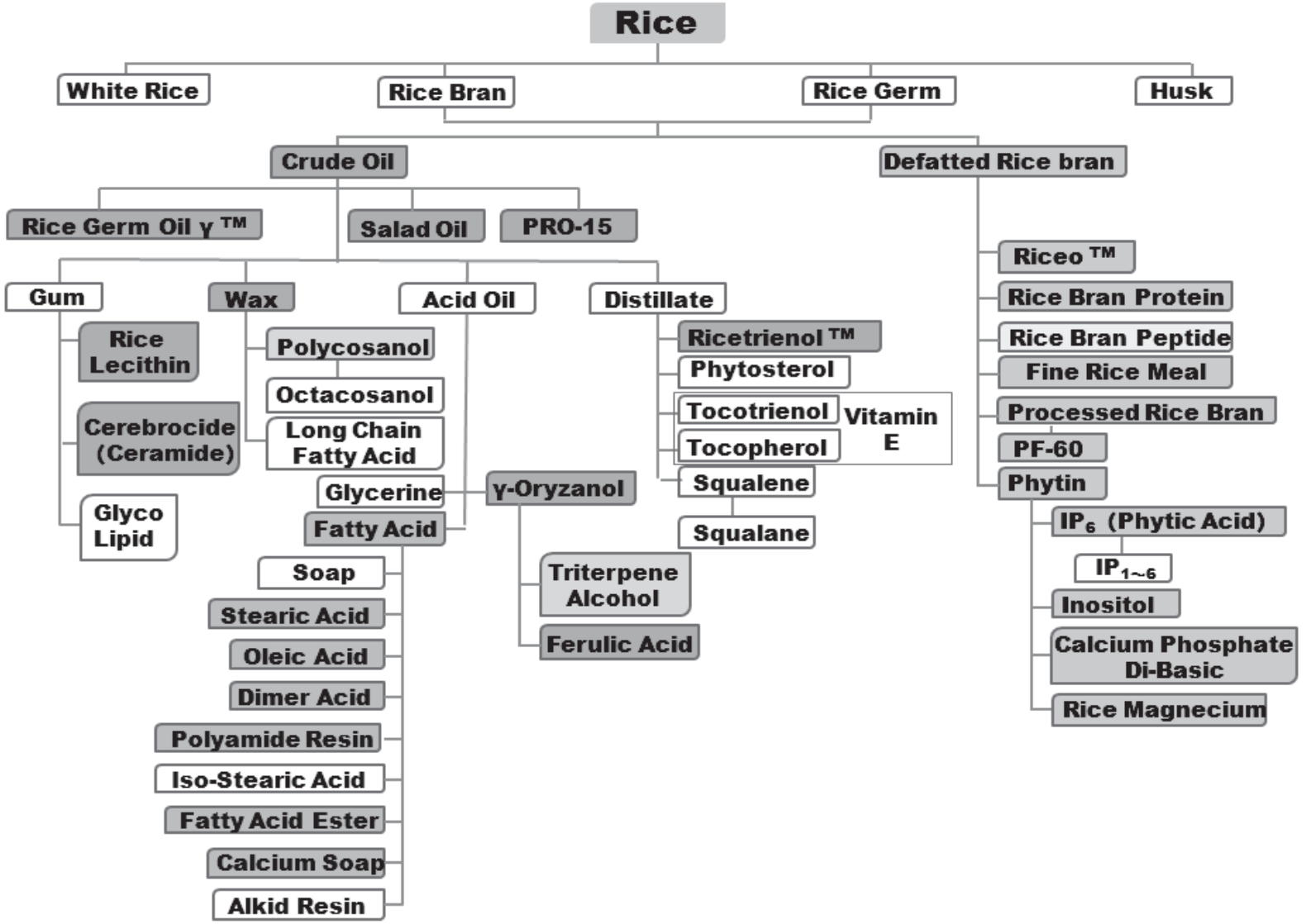
Wikipedia

Red rice

Dried grain red yeast rice. Fermented with *Monascus purpureus*

Wild rice

Non-glutenuous steamed black rice



(Hashimoto, 2014)

Phenolics present in Japanese rice (mg/100g)

	Unpolished	Polished	Germinated
1. Protocatechuic acid	0.037	0.013	0.052
2. Hydroxybenzoic acid	0.040	0.021	0.010
3. Chlorogenic acid	0.033	0.028	0.039
4. Vanillic acid	0.072	0.032	0.066
5. Caffeic acid	0.020	0.025	0.049
6. Syringic acid	0.030	0.010	0.026
7. 6’-O-feruloylsucrose	1.089	0.026	0.270
8. p-Coumaric acid	0.098	0.020	0.118
9. 6’-O-sinapoylsucrose	0.417	0.032	0.132
10. Ferulic acid	0.330	0.070	0.485
11. Sinapinic acid	0.020	0.005	0.321
Total	2.186	0.281	1.459

(Nakamura and Kayahara, 2014)

EXAMPLE OF Potential Ingredient OF INDONESIA :

Rice bran

Paddy Production:

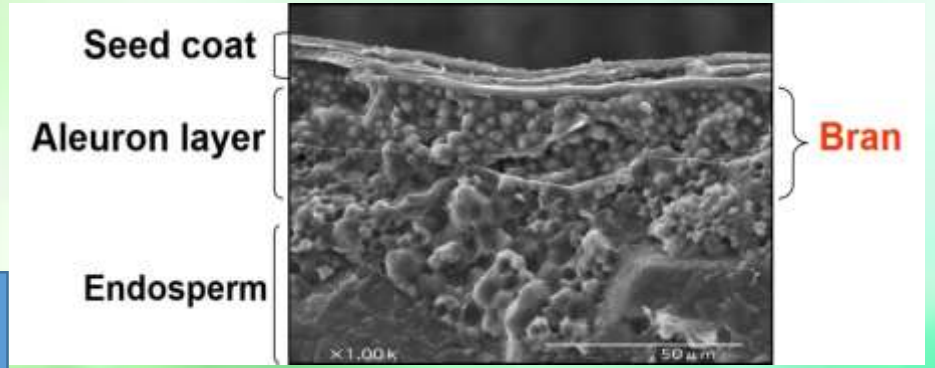
70.85 Million ton
(BPS, 2015)

1. Rice
2. Husk
3. Rice bran

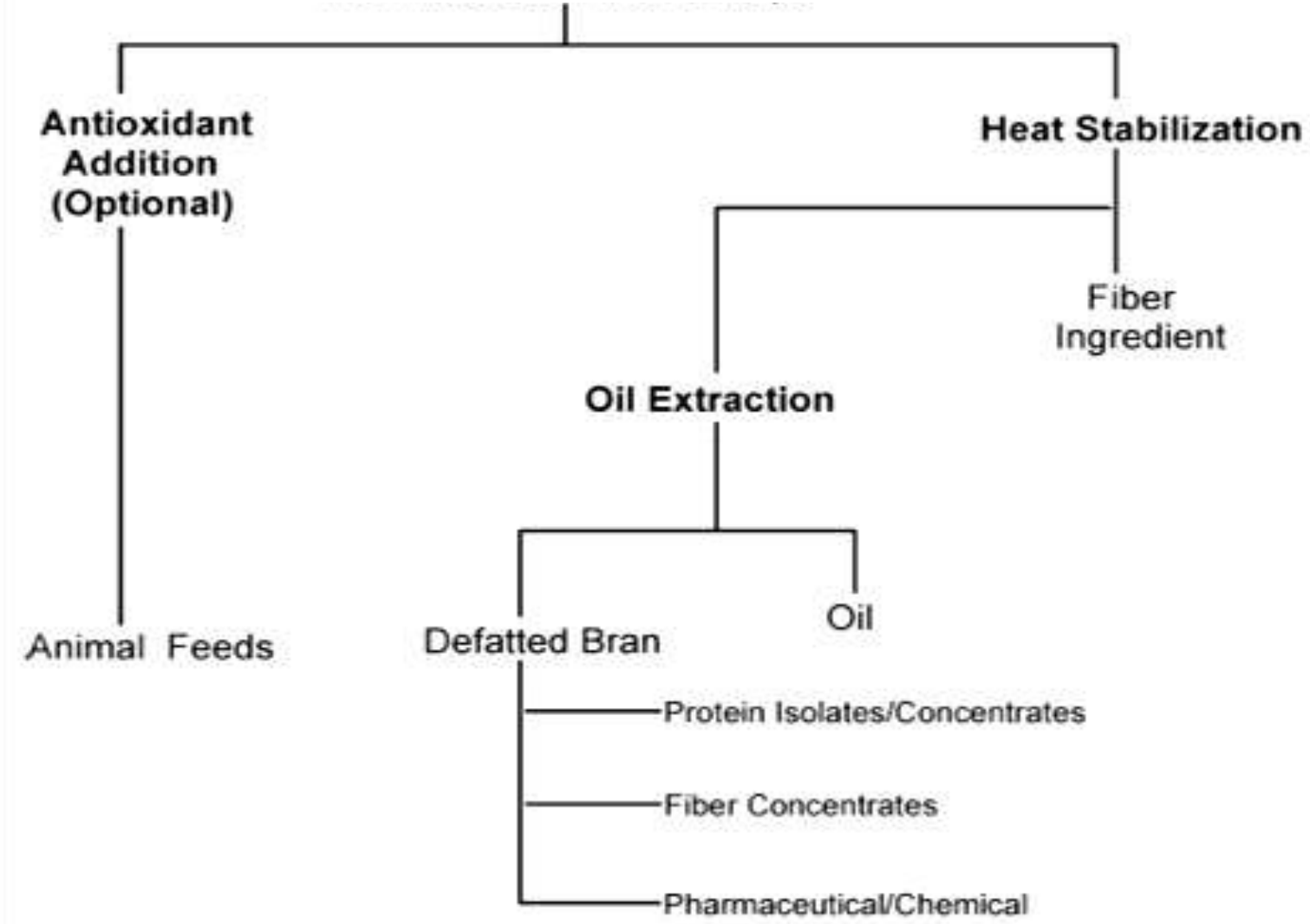
Total: 8-10% from paddy

Feed

Food/Health Ingredient



Rice bran



Processing and utilization of rice bran (Mazzo, 1998)

Potential Ingredient of rice bran

Carotenoids
0.9–1.6 ppm

α-Carotene
β-Carotene
Lycopene
Lutein
Zeaxanthine

Tocopherols/Tocotrienols
(Vitamin E) 210–440 ppm

α-Tocopherol
β-Tocopherol
γ-Tocopherol
δ-Tocopherol
α-Tocotrienol
β-Tocotrienol
γ-Tocotrienol
δ-Tocotrienol
Desmethyl Tocotrienol
Didesmethyl Tocotrienol

Polyphenols
305–390 ppm

Ferulic acid
α-Lipoic acid
Methyl ferulate
p-Coumaric acid
p-Sinapic acid
Quercetine
Isovitexin
Proanthocyanidins
Caffiec acid
cinnamic acid

Other antioxidants
(ppm)

Inositol (1100–1400)
Myoinositol (1000–1200)
Choline (930–1150)
Phytates (1500–1710)
Biotin (0.1–0.22)

Vitamin-B Complex
(ppm)

Niacin (370–660)
Pantothenic acid (36–50)
Pyridoxin (29–42)
Thiamin (22–31)
Riboflavin (2.2–3.5)

Phytosterols
2230–4400 ppm

β-Sitosterol
Campesterol
Stigmasterol
Δ5 Avinsterol
Δ7 Stigmasterol

Gramisterol
Citrostdienol
Obtusifoliol
Branosterol
28-Homotyphasterol
28-Homosteasteronic acid
6-Deoxycastasterone
β-Amyrin

Enzymes

Glutathione peroxides
Methionine reductase
Superoxidase dismutase
Polyphenol oxidase

γ-Oryzanols
2200–3000 ppm

Cycloatenyl ferulate
Campesteryl ferulate
Stigmasteryl ferulate
β-Sitosteryl ferulate
24-Methylene cyclartanyl ferulate

Phospholipids

Phosphatidylcholine
Phosphatidylethanolamine
Lysophosphatidylcholine
Lysophosphatidylethanolamine

Polysaccharides

Cycloartenol ferulic acid glycoside
Diferulic acid complex
Diferulic acid + 3 Glucose + 2-Calcium complex

Amino Acids

Arginine (10800 ppm)
Histidine (3800 ppm)
Methionine (2500 ppm)
Tryptophan (2100 ppm)
Cystein (336–448 ppm)
Cystine (336–448)

Minerals

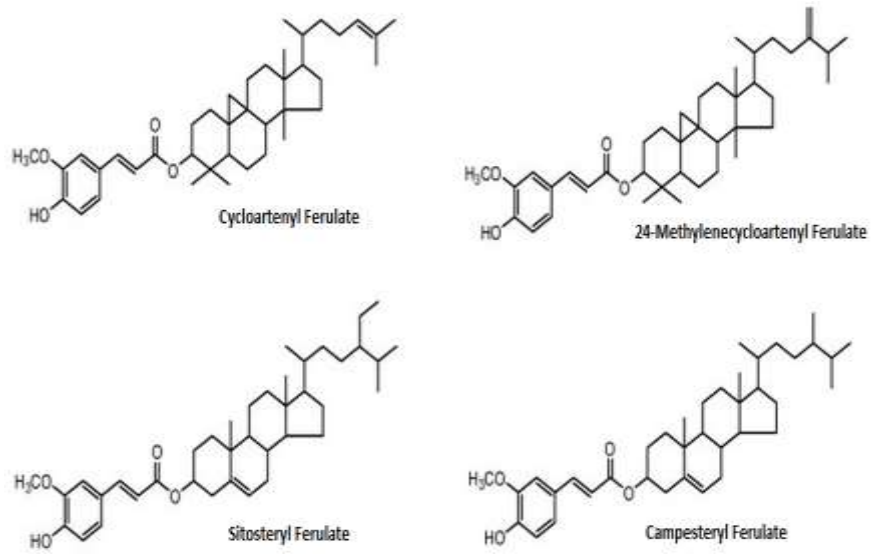
Magnesium (6250–8440 ppm)
Calcium (303–500 ppm)
Phosphorous (14700–17000 ppm)

Qureshi *et al*. 2002. J Nutr Biochem. p. 175-187

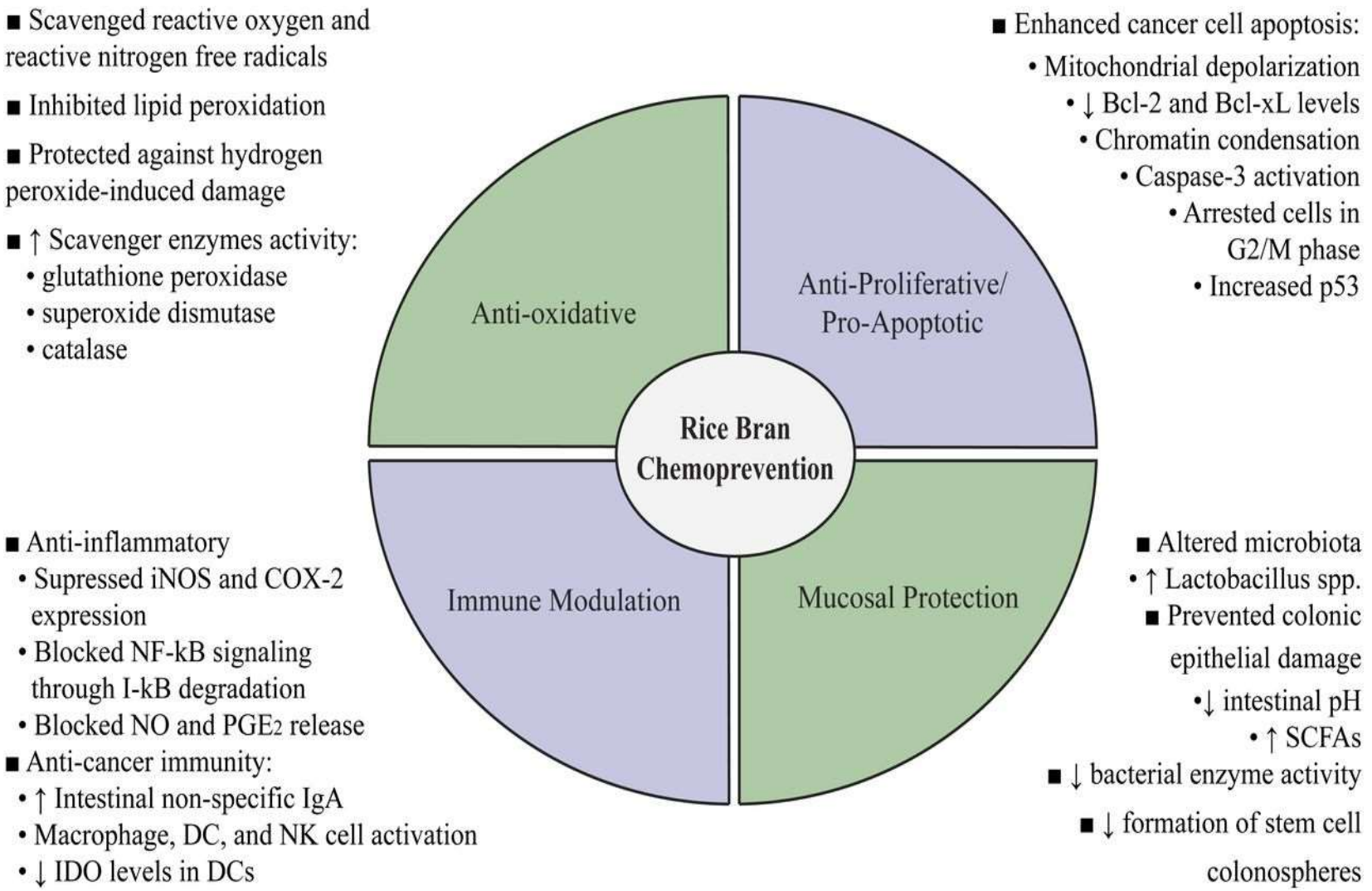
- The rice bran constituent γ-oryzanol has been intensively investigated for cholesterol regulation and antioxidant/anti-inflammatory activities.
- Rice bran derivatives and other products are used for dermatologic and cosmetic applications.
- Rice bran fraction high containing ferulic acid have hypotensive, hypocholesterolemic, and hypoglycaemic activity.
- Pharmacologically relevant compounds could be extracted from rice bran

(Ardiansyah et al., 2006; Burlando and Cornara, 2014)

γ -oryzanol



Chemopreventive mechanisms of action associated with dietary rice bran and brown rice bioactive components.



Henderson A J et al. 2012

Fatty acids composition of rice bran

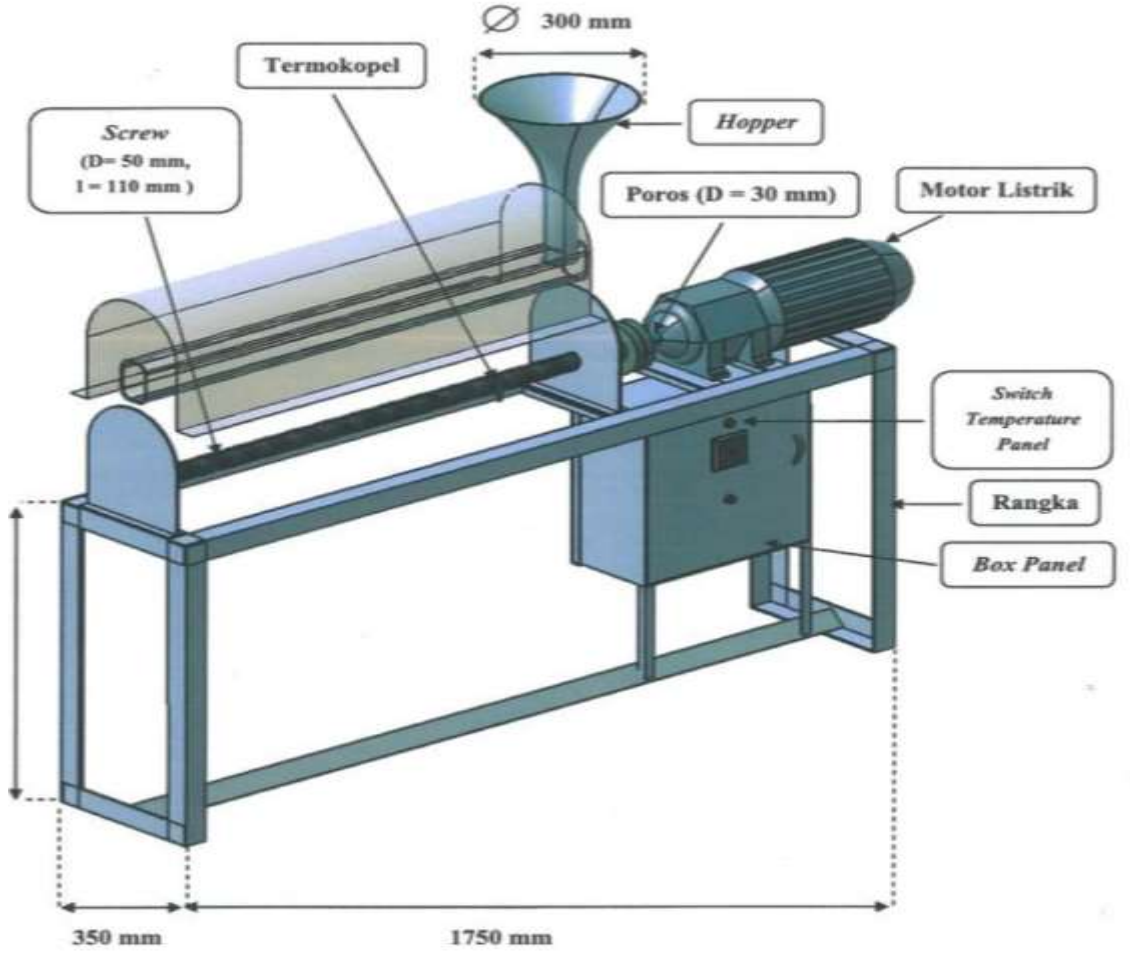
Varietas	Komposisi asam lemak (%)								
	C14:0	C16:0	C16:1	C18:0	C18:1	C18:2	C18:3	C20:0	C20:1
IR 64	0.48	21.17	0.20	2.23	40.47	32.72	1.39	0.63	-
Ciherang	1.15	22.61	0.20	1.92	37.71	33.96	1.31	0.68	-
Pandan wangi	0.88	25.65	0.25	1.89	32.93	34.90	1.42	0.58	0.40
Sintanur	0.91	26.84	0.24	1.87	32.18	34.71	1.46	0.61	0.36

(Budijanto, 2010)

Several heating methods to inactivate lipase in rice bran have been reported.

- Randall *et al* (1985), reported that heat treatment is practical and inexpensive method to deactivate lipase in fresh rice bran immediately after milling.
- Microwave heated rice bran showed that FFA content only slightly increased during 4 weeks of storage at 25 ^{o}C (Tao, 1993).
- Randall *et al* (1985), using a temperature of 125-135 ^{o}C for 1-3 seconds with a single screw extruder.
- Twin screw extruder was used for rice bran stabilization. The method has successfully inactivated rice bran lipase which was shown by only 1.48 % increase of FFA. However, more energy is needed in the operation, so the method is less suitable for small rice milling units (Budijanto, 2010).

Three conveyor temperatures (100 ^{o}C, 120 ^{o}C, and 140 ^{o}C) and two screw rotation speeds (15 Hz and 25 Hz) were applied. The samples were coded according to the given treatments (**A100**=screw speed 15 Hz, 100 ^{o}C, **A120**= screw speed 15 Hz, 120 ^{o}C, **A140**=screw speed 15 Hz, 140 ^{o}C, **B100**= screw speed 25 Hz, 100 ^{o}C, **B120**=screw speed 25 Hz, 120 ^{o}C, **B140**=screw speed 25 Hz, 140 ^{o}C).



Single screw extruder

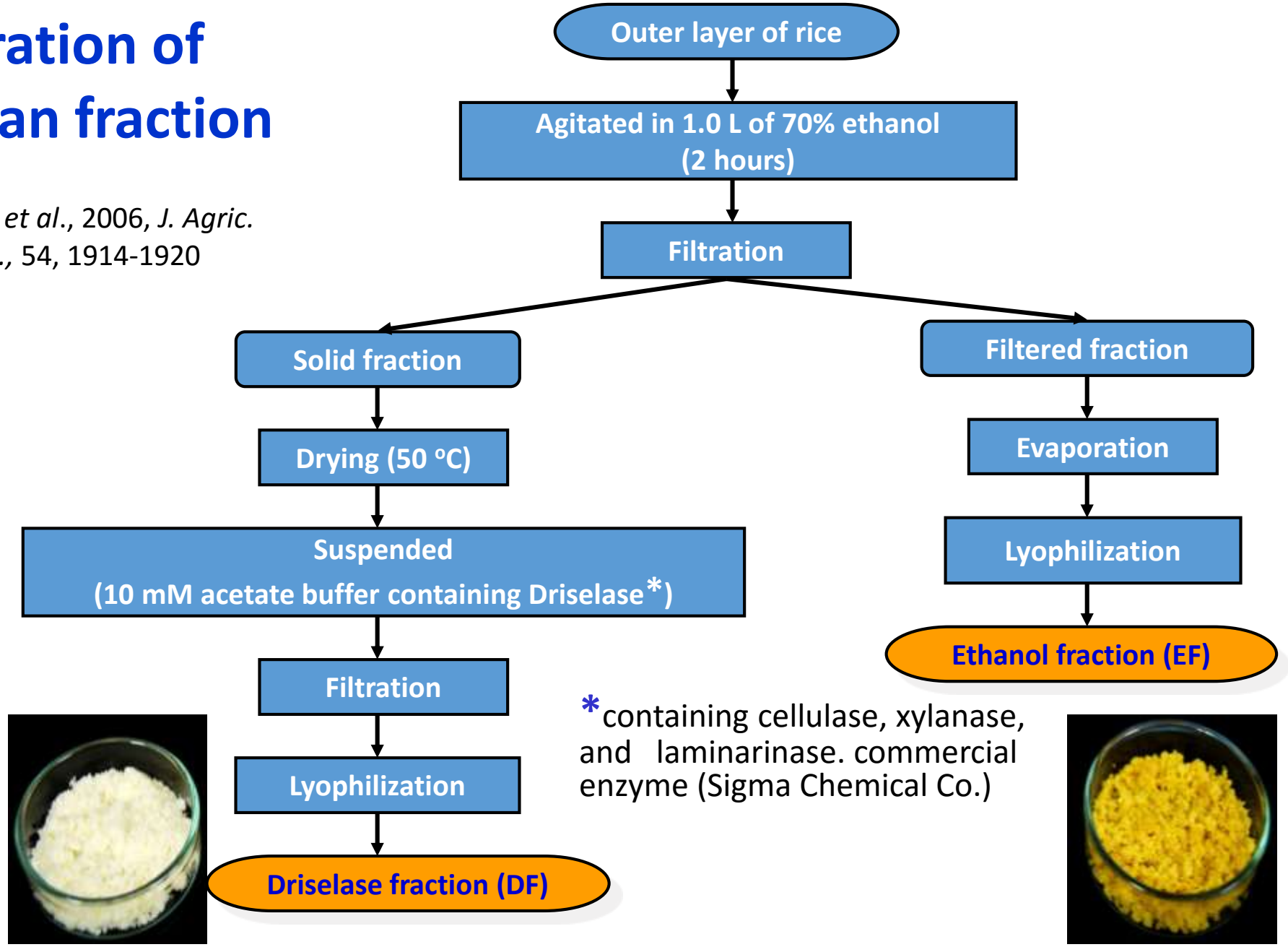
(Kurniawati et al, 2014)

FFA, γ-oryzanol, and α-tocopherol content in rice bran during 2 weeks storage at 37°C (Kurniawati et al, 2014)

Sample	FFA Content (%)	Increased FFA (%)	γ-oryzanol content (µg/g)	Decreased γ-oryzanol (%)	α-tocoferol content (µg/g)	Decreased α-tocoferol (%)
Control	39.9 ± 0.7	44.5	2408.0±5.0		242.1±6.3	
A100	6.8 ± 1.2	12.1	2025.8±63.5	18.9	228.0±6.9	5.5
A120	3.9 ± 0.3	8.5	1871.4±12.1	22.3	230.7±4.7	4.7
A140	3.1 ± 0.2	8.3	1571.8±22.8	34.3	227.8±7.0	5.9
B100	4.5 ± 0.2	10.2	1807.2±7.1	25.0	236.9±0.9	2.2
B120	2.7 ± 0.1	7.8	1793.4±64.9	25.5	227.5±1.8	6.1
B140	3.1 ± 0.3	7.6	1766.8±75.0	26.6	192.8±2.2	20.4

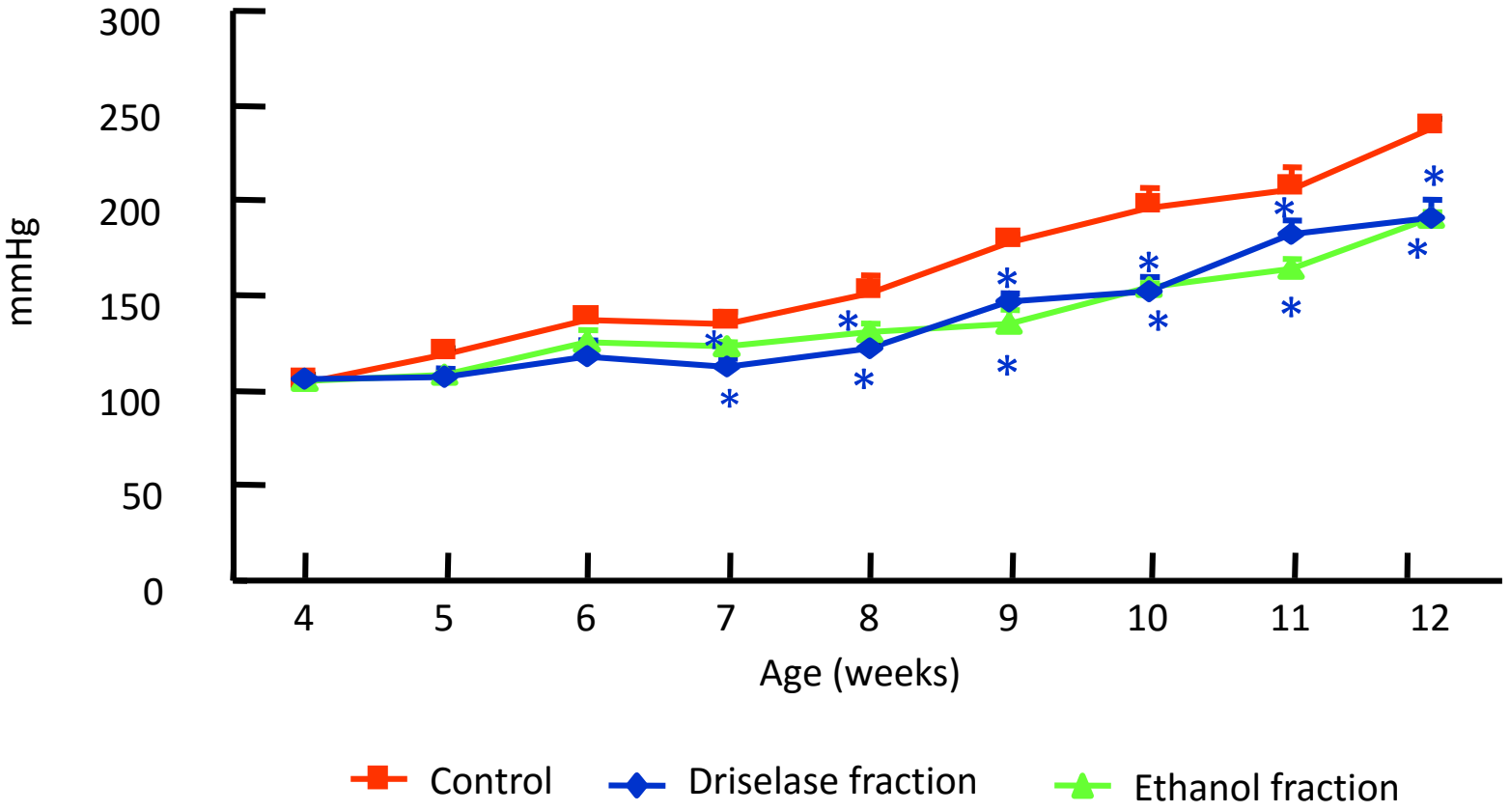
Preparation of rice bran fraction

Ardiansyah *et al*., 2006, *J. Agric. Food Chem.,* 54, 1914-1920



*containing cellulase, xylanase, and laminarinase. commercial enzyme (Sigma Chemical Co.)

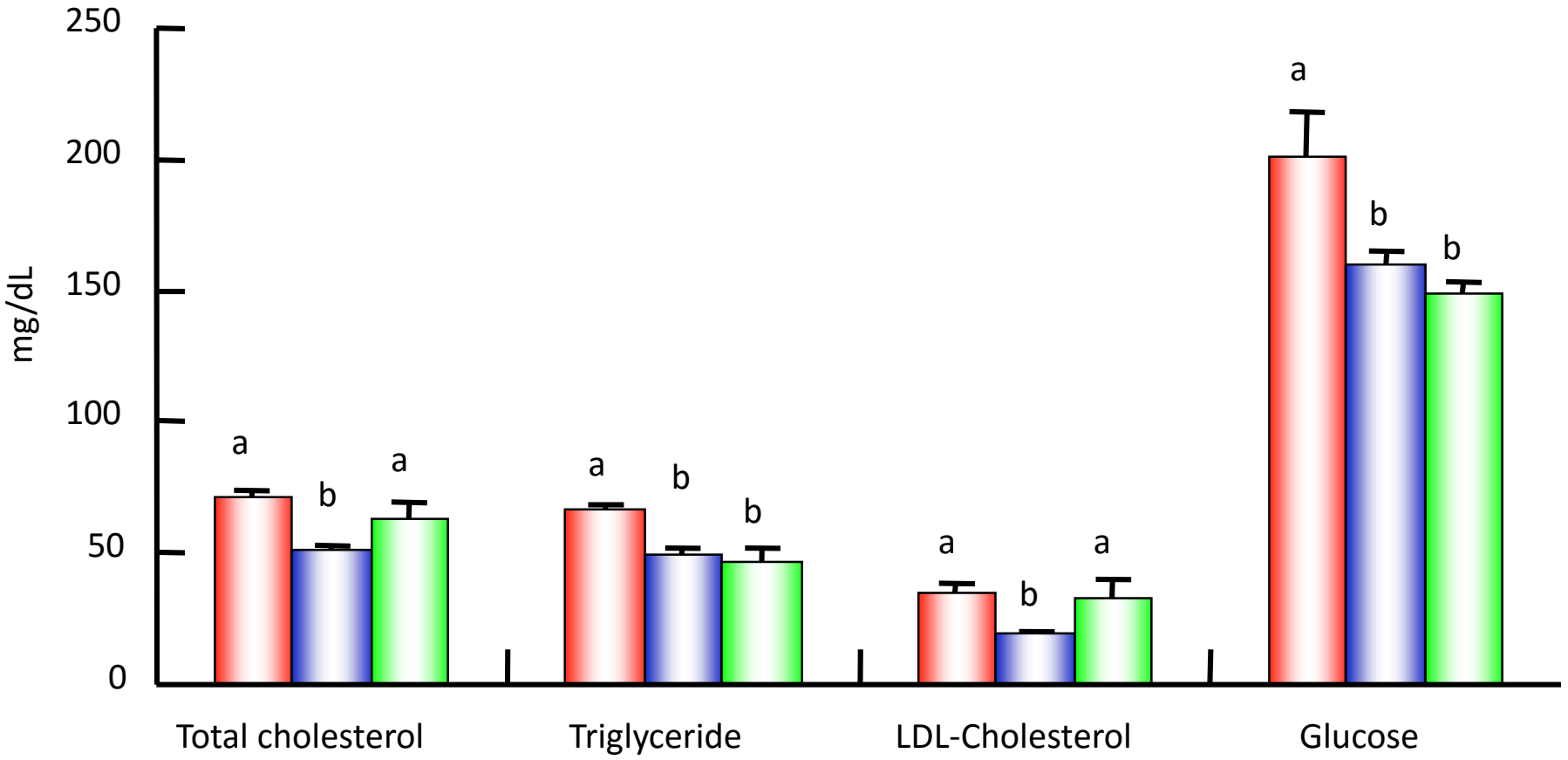
Systolic blood pressure



Ardiansyah *et al*., 2006, *J. Agric. Food Chem.,* 54, 1914-1920

Different letters represent significant difference ($P<0.05$); means ± SE, n=6

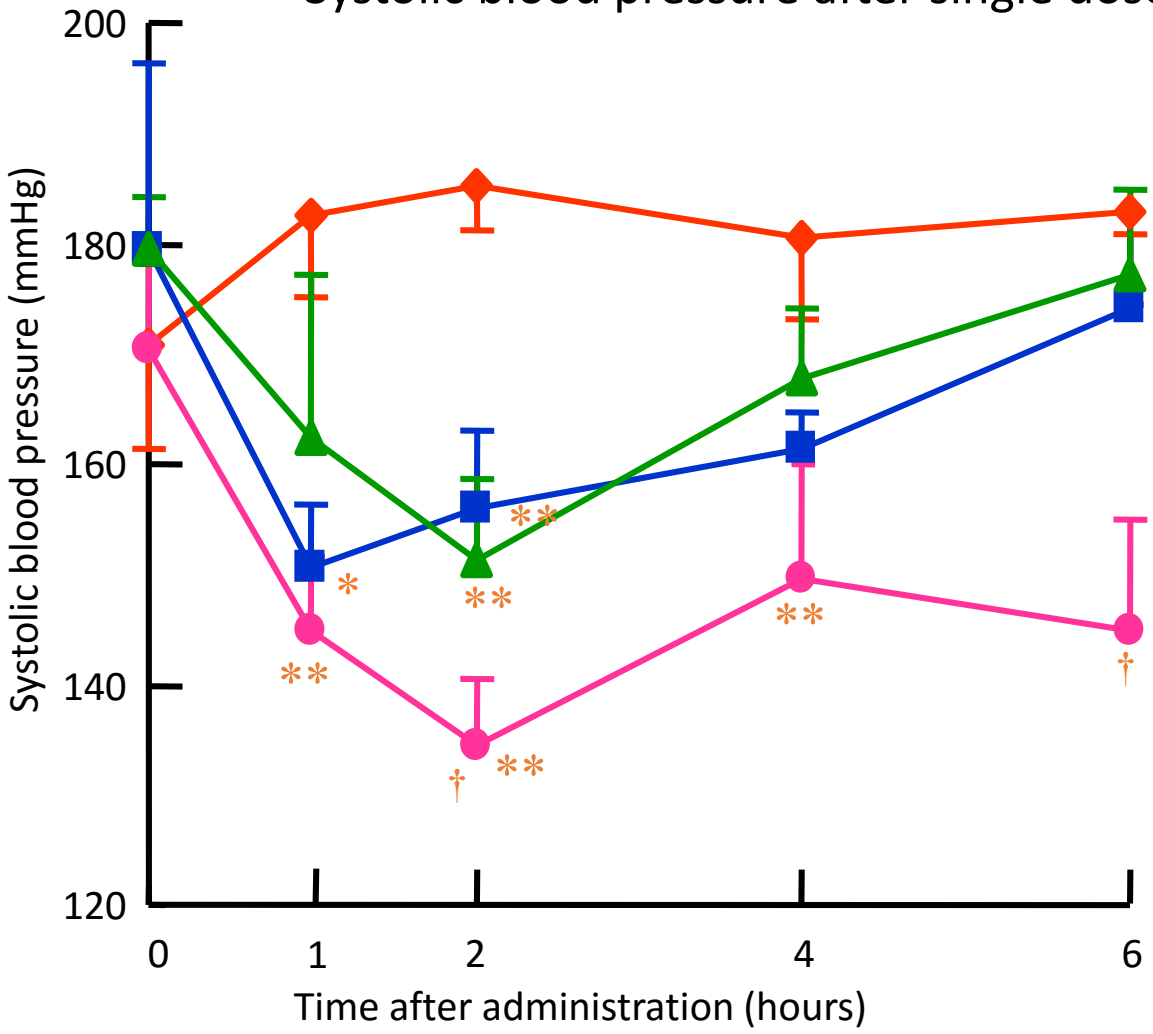
Plasma lipid and glucose levels



Different letters represent significant difference ($P<0.05$); means ± SE, n=6

Ardiansyah *et al*., 2006, *J. Agric. Food Chem.,* 54, 1914-1920

Systolic blood pressure after single dose of oral administration



6 weeks of SHRSP

Feeding with AIN 93 (M) diet for 6 weeks

Oral administration after 16 h of fasting

Measurement of BP and blood sampling (0, 1, 2, 4, and 6 h)

Control (water)

DF (2 g/kg BW)

FA (9.5 mg/kg BW)

Captopril (ACE inhibitor) (5 mg/kg BW)

＊($p < 0.05$) vs Control

＊＊($p < 0.01$) vs Control

† ($p < 0.05$) vs DF/FA

（means ± SE, n=4-5）

TEMPE
from Indonesia to the world

•Tempe is a popular Indonesian traditional food made by fermenting soybean with *Rhizopus oligosporus* fungi.

• In Indonesia tempe is consumed as a protein-rich meat substitute by all economic groups.

•Tempe is getting popular around the world.

Tempe

Fermented Soybean Originated From Indonesia

Manuskrip Serat Centhini Memuat Kata "Tempe"

- The earliest known reference to ***tempe*** is found in the *Serat Centhini* manuscript.
- The story in the manuscript is set in the reign of Sultan Agung (1613-1645) and the descriptions purport to be of that time, so it is possible that ***tempe*** existed in Java in the early 1600s.

(Shurtleff and Aoyagi, 2011)

Health Benefits

- **Increase nutritional value** (increase soluble protein and lower lipid content, Low in sodium, source of folic acid)
- **Increasing of vitamins content** : thiamine(B-1), riboflavin (B-2), Niacin(B-3), pantothenic acid, pyridoxine (B-6), biotin, folacine, cyanocobalamine (B-12) and vitamin A
- **Changing fat soluble vitamin and provitamin** (forming caroten and ß-caroten, produce ergosterol, and tochopherol)
- **Reduce phytic acid**
- **Digestion starch, stacchyose, raffinose and sucrose** in soybean
- **Increase the availability of isoflavones**
- **Produce the free radical scavenger, SOD (Superoxide dismutase)** which have a defence system to protect the cells against the action of free radicals

Astuti *et al*., 2005; Kapti *et al.*, Denter *et al*., 1998

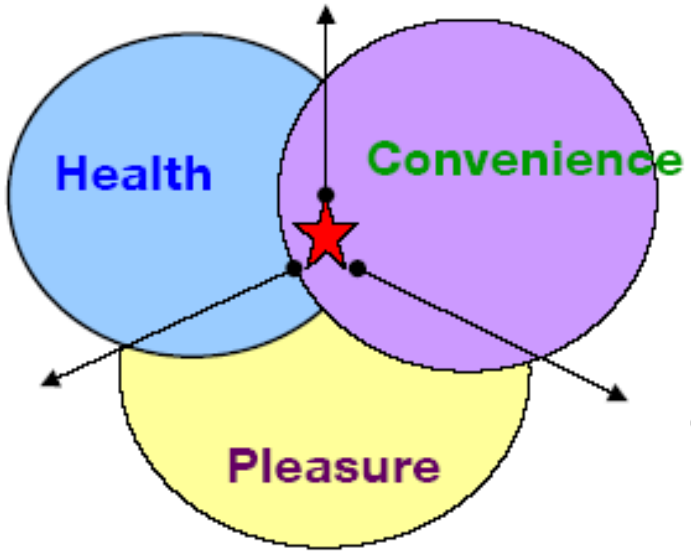
Consumer's Trends

Consumer Priorities: Health - Convenience - Pleasure

'Efficient Nutrition'
- Fast but nutritious

'Health awareness'

- More information
- Advanced Tecnologies
- More evidence for claims
- Physical, Mental & Beauty



'Time/control factor'
- Mobility
- individual consumption
- Time and quality of preparation
- availability

'Guilt-free indulgence'

Low & light without compromising on taste & texture

'Convenience Plus'
- Convenience with restaurant quality and entertainment value

'The sensory experience'

- More fun & entertaining
- More ethnic & exotic tastes
- More premium & indulgent

Indonesian consumers: Attitude towards health

Indonesian consumers are shifting preference to healthier choices of foods

Increase in Indonesian consumer's ability to pay extra for better quality

Growing health consciousness among Indonesia's young population

Source: INA Magazine, Global Business Guide Indonesia

Indonesian consumers: Attitude towards health

Demand for herbal/traditional products continued to increase with a growing trend towards the use of natural materials in Indonesia

- **Rikesdas 2013: 59.12%** people in Indonesia have consumed *jamu*
- **15.7% household** in Indonesia keep traditional & herbal medicine at home
- Traditional & herbal medicine consumption in Indonesia appr. **28%**

Source: Euromonitor International, MetroTV News

Indonesian consumers: Attitude towards health

Consumers in Indonesia are starting to take a more preventative approach to healthcare

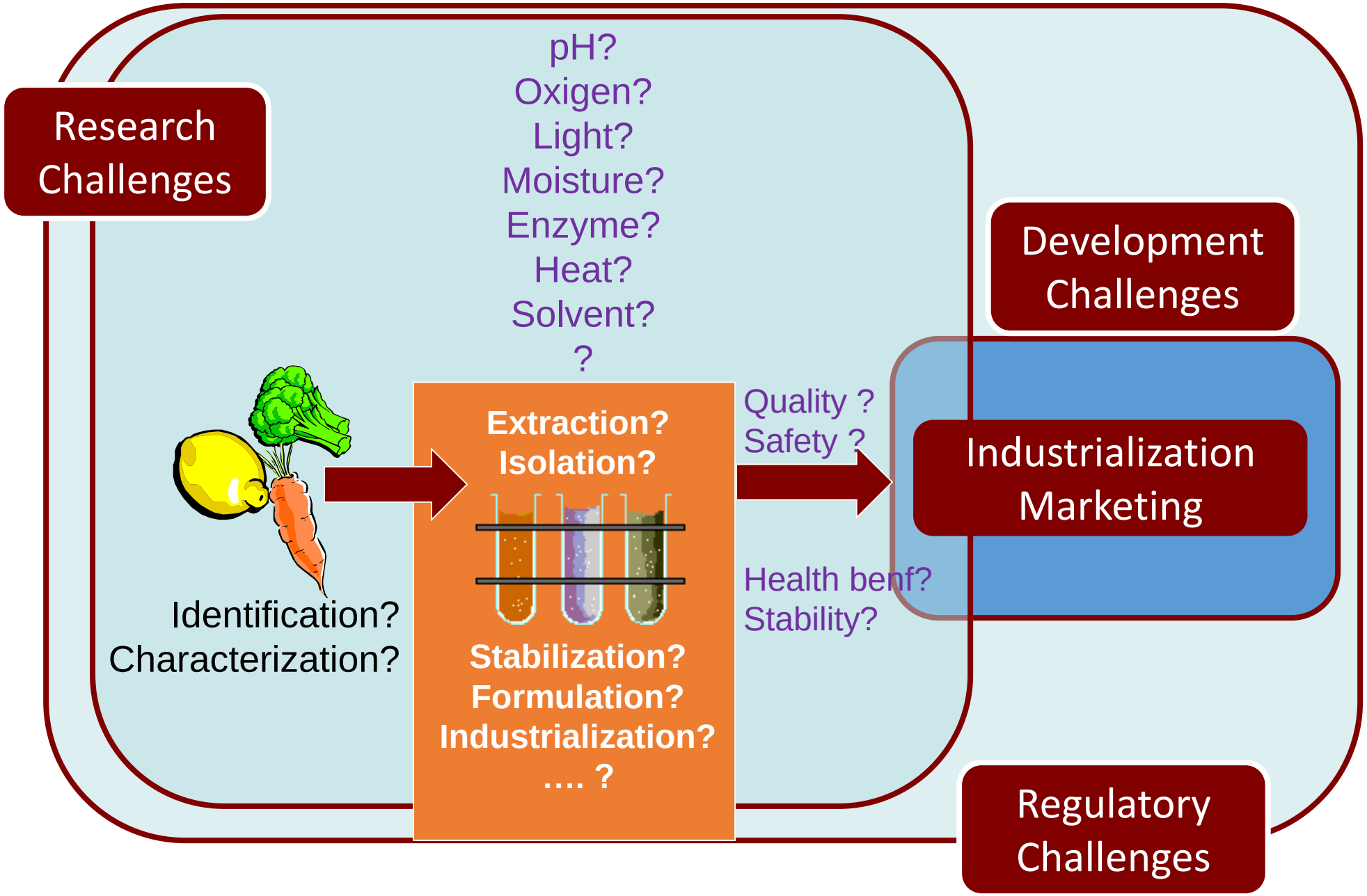
- Shown by increase sales of vitamins and dietary supplements
- Driven by the fear of epidemic diseases

Source: Euromonitor International

Challenges

1. Product development (critical factors)
2. Research and scientific evidences
3. Regulation
4. Consumers acceptance and commercialization strategy

Research, Development and Regulatory Challenges :



THANK YOU