Bringing Local Food to Global Market: A Food Technology Perspective

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Abstract. There are many local foods in Indonesia. With their uniqueness and their superiority especially in their functional characteristic, Indonesian local foods have a big economic potential, when it can be commercialised at national or even in international market. In the global market era, local foods must be able to be compete with other food products. Some technologies are still needed to increase their competitive power, such as product designing, packaging technology, as well as quality management. To support local foods development, strong government policy is required. Support for local foods research and development programs is necessary to provide technologies and products that are competitive and satisfy the preference of consumers. Simultaneously, intensive promotion of the products is also needed.

1. Introduction

Food is not only one of the most basic human needs, but also one of an important components that affect the income in a region. Increasing the production, distribution and purchase of local foods will strengthen regional economies.

In the global market era, local foods must be able to be compete with other food products. Globalization has seen most countries open their borders to foreign investment in the food and beverage industry, restaurants, supermarkets and agriculture. This situation creates opportunities and risks for small scale food producers and local foods. Markets provide an economic opportunity, but without effective governance local foods and local food production may find it difficult to survive.

Globalization has introduced western and convenience foods to Indonesia. This can be seen by the increasing number of Western restaurants in Indonesia. Agriculture and Agri-Food Canada report that Indonesia is the largest foodservice market among all ASEAN countries. Full service restaurants, fast food and street stalls/kiosks are the top three growth drivers for Indonesia’s foodservice market. International fast food brands, such as Fast Food Indonesia, continue to play a leading role in the foodservice market [1].

The shift from traditional cuisines to western convenience food is most apparent among young consumers in Indonesia. This needs serious consideration from the government because it poses a threat to the integrity of local foods.

One of the alternative concepts put forward in the era of free trade is food sovereignty. Food sovereignty should be part of an alternative food security paradigm which is embedded within conventional agricultural development. Such an approach will enable local food to participate in what is otherwise a highly competitive global market. Furthermore, to support local food sovereignty, local foods need to diversify and develop to create new product bases.
This paper describes and identifies opportunities and weaknesses for local Indonesian foods within a global food market.

2. Global market
Globalization and food intake are substantially interrelated, working through employment, incomes, prices and the market to influence food preferences. Globalization means bringing the domestic economy closer to the international economy in many ways. The rationale behind globalization and the liberalization of markets was to bring competition and efficiency into the economy through structural reforms. The process is expected to contribute to efficiency in the long term, greater employment, to increase incomes and improve overall prosperity [2].

Some of the most important trends associated with globalization include: (i) the rapid rise in trade, with an increasing export orientation; (ii) growth in the service sector, e.g. information and communication, finance and insurance, tourism and transportation; and (iii) borderless production and consumption.

Globalization impacts on the food system, resulting in the greater availability and diversity of food, although access to this food is by no means universal. Many of these changes are closely associated with urbanization, increasing incomes, market liberalization and foreign direct investment. Changes in the food system resulting from globalization as shown in Figure 1 [3].

Figure 1. Changes in the food system in globalization [3, modified].

Globalization is the activity of buying and selling goods and services in all the countries of the world. Generally, the concept views the world as one market and is based on identifying and targeting cross-cultural similarities. However, each market requires its own culturally adapted marketing strategies [4].

3. The potential of local foods
In Indonesia, local foods reflect cultural diversity. The variety of local foods depends on the source and culture of the region, including taste. Geographic conditions affect the variety of foods produced: in
Flores, East Nusa Tenggara, corn and sorghum are the staple foods, while in Papua, sago grows well, and in the coastal area like Makassar, fish products predominate.

Most of the local food in Indonesia is rich in condiments, with a good taste and nice smell emanating from the use of multiple spices. Rendang, gulai and many traditional foods from West Sumatera are affected by Middle Eastern culture, while East Indonesian food is heavily influenced by Polynesian and Melanesian cultures. In Indonesia, rendang and many local Padang food have been found to be acceptable in many areas than western Sumatera. Padang restaurants are found in almost all regions in Indonesia. Furthermore, through technological advances that increase the shelf life and ensure consumer safety, rendang, curry or fried rice can be packaged into products that have a high retail value.

The Foods Security Agency of the Ministry of Agriculture Indonesia notes the potential of 77 local food types as a source of carbohydrates, 26 types of beans, 389 varieties of fruit, 228 kinds of vegetables, 40 types of fruit drink, and 110 spices. The variety of local food resources should be promoted to enhance food security in Indonesia and to produce many products for the global food market.

3.1 Maintaining raw material characteristics

One opportunity to bring local foods to the global market is by promoting the functional value of local foods. This is related to the increasing demand among consumers for healthy foods and the functionality of local foods. Previous research has identified the functionality of local foods from their bioactive compounds (Table 1).

| Bioactive compounds          | Bioactive compounds          |
|-----------------------------|-----------------------------|
| Tempeh                      | Isoflavones                 |
| Purple sweet potatoes       | Anthocyanins                |
| Red sweet potatoes          | β-carroten                  |
| Arrowroot                   | Low GI                      |
| Gembili                     | Dioscorin, diosgenin,       |
|                            | inulin                      |
| Mangosteen                  | Xanthones                   |
| Mango                       | Caotenoid                   |
| Red Fruit (Pandanus coccideus) | Anthocyanin, catechins, tannins, Gallic acids |
| Pomegranate                 | Anthocyanin, oryzanol       |
| Black rice                  | Antioxidant, anticancer     |
|                            | Anti hyperlipidemia,        |
|                            | hyperglycemia, and for      |
|                            | cancer prevention [10]      |

Tempeh is one local food with functional value that is recognized globally. Tempeh is a fermented soy food product bound together by a dense mycelium of fragrant white *Rhizopus* mould into compact cakes [11, 12]. Originating from Java, Indonesia, tempeh was traditionally considered as inferior food, often associated with the lower-class [13]. However, with many research results proving the functional value of tempeh, interest in tempeh has been gathering momentum, with new product development occurring in many countries such as the USA, Japan and European countries. One of the reasons for the recognition of tempeh as a global food is because of its high functional value, for it has a good nutritional content (protein, vitamins, and minerals) and contains bioactive components such as isoflavones.
Many local foods in Indonesia have good nutritional value and biologically active compounds. The problem is information about these foods have not been reached the global consumer because of limited promotion and dissemination.

Local tubers such as arrowroot and sweet potatoes have a lot of functional value. Arrowroot has starch that is of benefit for diabetics, and sweet potato, with a high flavonoid content, has antioxidant properties that are beneficial in preventing inflammation and cancer.

Local tubers may also be utilized for the production of gluten free flour. Gluten free flour is useful for people who have immune sensitivity to gluten. Gluten enteropathy or Celiac disease (CD), is caused by an inappropriate immune response to dietary wheat gluten or similar proteins of barley or rye. Persons with CD are unable to consume some of the most common products including breads, baked goods and other food products made from wheat flour [14]. Gluten free flour based on local tubers can be processed into many product as a substitute for wheat flour.

3.2 Problem/weakness
In terms of raw materials, local foods are region specific, with varying amounts of production occurring for each commodity and each region. Some commodities are still available in small quantities, such as arrowroot and gembili. In the case of local tubers, the cost of processing is quite high due to low yield with conventional technology. Another problem for tubers is the sensory appeal of final products. Local tubers generally have a distinctive flavor, aroma and appearance that often persists when processed into derivative products. In addition, the development of local tubers into flour-based food products such as noodles, pastas and bakery products requires some modification of the starch through proteins and or emulsifiers. Product development and diversification is still limited and based on conventional technologies such as steaming, boiling or frying.

Lack of technology is also found in horticultural production. Indonesia has many sources of horticultural products such as fruit and vegetables. Some exotic fruits like mango, snake fruit and mangosteen have good distinctive flavors and also high functional value. The prospects for these commodities in the global market is promising, however the lack of fresh handling and processing technology means the market for these commodities is still limited because of the short shelf life.

Aspects of safety and quality have not been considered in processing. Conventional processing of local food seldom considers standards of hygiene and sanitation and the final product is not uniform in appearance, taste or nutritional content.

Many local foods in Indonesia have functional properties, but the scientific evidence on the functionality is not yet available. Some local foods have been researched, but the results have not been published, hampering the globalization process for local food.

Lack of the packaging and labelling of local food is one weakness in bringing them to the attention of the global market. The case of Indonesia, local food products are generally packed using very simplistic techniques and materials, without any information or labelling and food safety aspects are seldom considered.

4. Global food consumer’s need and wants
Today consumers are complex, with different expectations of price and quality. Bringing local food to the global market need consumer preference and trust. Previous research explained that to gain consumers preference and trust, food should be safe, of good sensory appeal and be healthy (Figure 2.)
4.1 **Quality and food safety**
Quality and food safety are components that give consumers confidence with food products. In this case, standardization of the product is an important component to promote safety and quality. The importance of food standards safeguard the health of consumers by: (1) providing confidence in the food system (from farm to table); (2) enabling consumers to make informed decisions concerning the food they purchase; (3) to differentiate different food products; (4) to communicate product quality and safety to consumers; and (5) to provide a competitive strategy to enhance product marketing (standards provide opportunities for companies who use them for competitive advantage). There are three kind of standards, namely process standards, product standards and information standards. Process standards specify how the product should be produced, product standards explain the characteristics of the product, and information standards are concerned with labelling and other communications that go with the products.

4.2 **Sensory appeal**
Food choice is a complex function of sensory characteristics (taste, smell and texture) combined with the influence of non-sensory factors, including food-related expectations and attitudes, health claims, price, ethical concerns, and mood. It has long been recognized that at an individual level, taste or sensory appeal, likes and dislikes, and sheer habit are all relevant in making a food choice [16]. Previous research shows that consumers are generally very concerned about intrinsic food characteristics, the most important being taste followed by natural content of the food. The least important intrinsic characteristics of food for consumers, even though still relatively important, are the number of calories and fat content, as well as easy preparation and the time needed to prepare food [16].

4.3 **The importance of aesthetic, packaging and labelling**
The role of packaging as the marketing tool is dependent on the food product [17]. Packaging not only protects the product, but the design and performance of the packaging influences the consumers preference to buy the product. The most important function of packaging and labelling of food is to give...
information to the consumers. Packaging must be attractive and informative. With packaging, the food safety attributes, quality and functionality can be promoted. The use of a nutritional fact panel on food products is not only a desired tool for public administrators but is also demanded by consumers because consumers want to know what they’re eating[18]. Labels create consumer trust, ensure authenticity that the product has been inspected by a relevant institution and provides additional and trustworthy information on food quality and safety.

Labels also support product advertising. Previous research shows that advertising according to healthfulness and taste influences the consumer’s choice (Figure 3).

**Figure 3.** Factors that affected to the consumer’s choice.

5. **Improvement in food industry**

In an effort to meet the needs of consumers, innovation and improvement in the food industry is needed. Innovation must be able to deliver what consumers want, enable technology and what is marketable (Figure 4).

**Figure 4.** Innovations needed in improving the food industry.

In improving the food industry, several things that need to be considered are raw material production technology, processing technology, packaging technology and management systems.
5.1 Raw material production technology
The sustainability of the food industry is determined by the ability to procure raw materials. Local of sources are often constrained by the season, so the availability, continuity and sustainability cannot be guaranteed. Besides that, the quality of the product must be supported by raw materials that are consistent in quality and standardized. In this case GAP must be carried out properly. Time delivery and price competitiveness also need attention. Another thing that is also very important are regulations and government policies that support sustainable raw materials and create a business friendly environment.

5.2 Processing technology
In food processing technology, several aspects that need to be improved are design and product description, consistence in quality of raw materials, optimizing process variables, usage of proper equipment, and operator competence.

There is a need to evolve and redesign traditional unit processes and technologies by applying innovations and novel techniques, or procedures. The development of new products that have a present value, attractive, safe and healthy need to be developed. In addition, with the development of instant and durable products, the development of eco-friendly packaging and attractive labeling are also required.

5.3 Packaging technology
Packaging is one of the most important processes to maintain the quality of food products for storage, transportation and consumption. The functions of packaging are protection, containment, information and convenience [19]. According to experts, the definition of packaging should contain the following [17]:
- protection of a product during storage and transport operations as well as during its use and, in some cases, protection of the environment against possible harmful effects of the product;
- simplification of production, transport and sale as well as use of products;
- necessary information about a product, above all about its consumer usefulness;
- psychological impact on a potential customer through appropriate presentation of a product.

We should try to recycle packaging when we can and use biodegradable packaging. Packaging can be made of glass, plastic, cardboard, steel or aluminium. Packaging also includes labeling – nutrition facts, composition, certification (GMP, HACCP, Halal), expiry date, etc.

5.4 Management system
A management system is needed to maintain consumer satisfaction. Quality management systems (QMS) are indispensable in every sector of the food industry to ensure safe, quality food for the consumer [20]. Implementation of quality management systems includes material standards, process standards (include: equipment), operator standards, and record keeping (documentation).

In the production sector, management of raw materials should be improved. Production and productivity should be improved with applying Good Agricultural Practices (GAP) including the provision of superior seeds, particularly suitable in addressing climate change and pest-resistant problems and diseases. Continuity of processing product should be improved with applying Good Manufacturing Practices (GMP) so that the product are of good quality and safe. Food safety can be controlled through the HACCP concept.

6. Closing
Globalization is an integration of social, cultural, economic and political order at a local, regional and national level into a global market. In the food sector, globalization impacts directly on the food system. There is need to bring local food into the global market. To support the globalization of local food, strong government policy is required. Indonesia will only become a player in the world market if local products can compete. In this case, support for research and development institutions is necessary to
provide technologies and products that are competitive and satisfy the desire of consumers. The connectivity of each factors in bringing local food to the global market as shown in the Figure 5.

**Figure 5.** The connectivity of each factors in bringing local food to the global market.

7. References

[1] Chen Mengchaow. 2016 Food service profile: Indonesia Global analysis report. Agriculture and Food-Agri Canada.

[2] Vepa S S. 2004. Impact of globalization on the food consumption of urban India. Globalization of food system in developing countries: impact of food security. The FAO technical papers.

[3] Kennedy G, Guy N, and Prakash S. 2004. Globalization of food systems in developing countries: a synthesis of country case studies. Globalization of food systems in developing countries: impact on food security and nutrition. FAO Food and Nutrition Paper.

[4] Gauri Pervez and Philip Cateora. 2013. International Marketing. Edinburgh business school Herriot-watt University.

[5] Meni V and L. C. Ming. 2016. Tempeh and Other Fermented Soybean Products Rich in Isoflavones. *Fermented Foods in Health and Diseases Prevention*. 453-474. DOI: 10.1016/B978-0-12-802309-9.00019-4.

[6] Soka, S., Suwanto, A., Sajuthi, D. and Rusmana, I. 2015. Impact of tempeh supplementation on mucosal immunoglobulin A in Sprague Dawley Rats *Food Science and Biotechnology* 24(4), 1481-1486. https://doi.org/10.1007/s10068-015-0191-z.

[7] Mulyawanti I, Slamet B, and Sedarnawati Y. 2016. Formulation optimization and microscopic structure of gluten free pasta based on purple sweet potato puree and mung bean flour. *Agritech* 36:15-22.

[8] Hatmi R U and Djafer T F. 2014. Keragaman umbi-umbian sebagai pangan fungsional. *Prosiding Seminar Hasil Penelitian Tanaman Aneka Kacang dan Umbi*. 950-960.

[9] Gutierrez-Orozco and Mark L. 2013 Biological activities and bioavailability of mangosteen xanthones: A critical review of the current evidence. *Nutrients* 5:3163-3183; doi:10.3390/nu5083163.
[10] Pratiwi R and Yekti A P 2017 Black rice as functional food in Indonesia Review article. *Functional Foods in Health and Disease* 7(3): 182-194.

[11] Ogawa Y, Seiji T, Keisuke T. 2004. An original habitat of tempeh molds. *Mycoscience* 45:271–276. DOI 10.1007/s10267-004-0180-1.

[12] Shurtleff. W and A. Aoyagi 1984 *History of Tempeh: A fermented soyfood from Indonesia*.

[13] Shurtleff. W and A. Aoyagi. 2007 *History of Tempeh A Special Report on The History of Traditional Fermented Soyfoods* A Chapter from the Unpublished Manuscript, History of Soybeans and Soyfoods: 1100 B.C. to the 1980s.

[14] Susanna S and P. Prabhasankar. 2013. A study on development of Gluten free pasta and its biochemical and immunological validation. *LWT - Food Science and Technology* 50: 613-621.

[15] Privitera D, Francesco S N. 2015. Globalization vs. local. The role of street food in the urban food system. *Procedia Economics and Finance* 22:716 – 722.

[16] Brečić R, Zeljka M, and Merija C. 2017. Importance of intrinsic and extrinsic quality food characteristics by different consumer segments.

[17] Wyrwa J and Anetta Barska 2017 Packaging as a Source of Information about Food Products. *Procedia Engineering* 182:770 – 779.

[18] Gracia A and Tiziana de-Magistris 2016 Consumer preferences for food labeling: What ranks first?. *Food Control* 61:39e46.

[19] Sen Chandani and MadhuswetaDus 2016 *Trends in food packaging technology* In book: Food Process Engineering: Emerging Trends in Research and Their Applications, Chapter: 1, Publisher: Apple Academic Press (AAP) / CRC Press, pp.1–24.

[20] Filipovic, I., B. Njari, L. Kozacinski, Ž. Cvrtila Fleck, B. Miokovic, N. Zdolec, V. Dobranic 2008 Quality management system in food industry *Conference paper* 465-467.