



## **Dynamics of Food Consumption Patterns and Its Implications On Agricultural Commodity Development**

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### **INTRODUCTION**

Concerning the Food Law No. 18/2012, there is a mandate for the central and local government to improve fulfillment of food consumption in both of its quantity and quality. For Indonesia, rice is a national strategic commodity and it is not only a staple food for the majority people, but also as an economic commodity, which absorbs millions job opportunities, especially in rural areas. Instabilities of rice supplies and price give some consequences not only on economic activities but also on social and political stability in Indonesia (Subejo, 2014).

In addition, they are also obliged to actualize food consumption diversification to meet community's nutritional needs and to support their healthy, active, and productive life. To be able to respond and execute the mandate, a study related to food consumption patterns is urgently needed, regarding the facts that during the last 10 years there have been some changes not only related to food production and availability, population, and welfare, but also food habits. Food consumption is one of the entry points and a subsystem to stabilize food security. By identifying food consumption pattern, we are able to formulate food policies mainly those related to how much and what kind of food to supply domestically.

The general objective of the research is to analyze changes in consumption patterns and its implications for agricultural commodity development. In particular, the objectives of the research were to: (1) analyze dynamics of food consumption pattern changes including food expenditure structure, energy and protein consumption, prevalence of food insecure households, food diversification, participation level and level of food consumption; (2) estimate price and income elasticity of major food commodities for domestic food production planning and food import management; and (3) formulate policy recommendations diversification and food insecurity eradication.

The main activity of the research is to analyze the consumption patterns using Susenas (National Socio-Economic Survey) data sourced from the Agency for National Statistics (BPS). To capture the changing consumption patterns, this study uses Susenas data for two-year points of 2002 and 2014. The analysis was in a span of about 12 years and it was expected to see some changes in the consumption patterns. This study was conducted in four

provinces, namely West Java, Yogyakarta, West Sumatra, and East Nusa Tenggara. From every province, one district was purposively selected to represent local staple food pattern, the density of population, and the prevalence of food insecure households.

## MAIN FINDINGS OF THE STUDY

### Dynamics in food consumption pattern

During the period 2002-2014, the share of food expenditure decreased mainly in rural areas and for medium income class. The pattern was similar in the study sample provinces. Over a 12-year period, the allocation of household expenditures for non-food needs increased (Table 1).

Table 1. Share of household expenditure by region, 2002 – 2014

Expenditure	Share of expenditure by region (%)								
	Agregat			Urban			Rural		
	2002	2014	Change	2002	2014	Change	2002	2014	Change
Food	52.6	51.0	-1.6	46.5	45.3	-1.2	62.7	58.1	-4.6
Non food	47.4	49.0	1.6	53.5	54.7	1.2	37.3	41.9	4.6
Total	100	100	0	100	100	0	100	100	0

Source: CBS, Susenas 2002 and 2014 (calculate)

The proportion between food and non-food expenditure is used as an indicator to determine the level of welfare or household food security. Quinonez *et al.* (2006) stated that the higher the share of food expenditure of a household, the more vulnerable the household. In more detail, according to Soekirman (2000), households with a proportion of food expenditure more than 60 percent can be categorized as food insecurity, but on the contrary, households with a proportion of food expenditure less than 60 percent are categorized as food-resistant.

However, when disaggregated by food groups, the highest increasing food/beverages expenditure share was for food away from home (FAFH) food/beverages consumption (4.4%), followed by betel + tobacco (1.2%), fresh fish/shrimp (0.9%), and tubers (0.7 %). In detail of household food expenditure by food group in Indonesia is presented in the Table 2.

Table 2. Structure of Indonesian Household Food Expenditure by Food Groups, 2002 – 2014

Food Groups	Share of expenditure (%)		Changes (%)
	2002	2014	2002 - 2014
Cereals	19.4	15.2	-4.2
Tubers	1.1	1.8	0.7
Fish/Shrimp	9.0	9.9	0.9
Meat	4.8	3.6	-1.2
Egg	3.1	2.4	-0.7
Milk	2.4	2.9	0.5

Vegetables	8.1	8.4	0.3
Legumes	3.1	2.2	-0.9
Fruits	5.0	5.1	0.1
Oil + fat	3.8	3.5	-0.3
Beverages	4.7	3.8	-0.9
Spices	2.6	2.0	-0.6
Misellinous food	5.5	6.1	0.6
Processed food/beverages	16.1	20.5	4.4
Tobacco + betel	11.4	12.6	1.2

Source: CBS, Susenas 2002 and 2014 (calculate)

The level of household energy consumption decreased during the period 2002-2014, especially in rural areas for low-income class. Based on the food items, increased energy consumption occurred for FAFH food/beverages and tubers. Significant increasing energy share of food/beverages items occurred in West Java and Yogyakarta provinces. Table 3 showed the energy consumption level still did not meet the recommended standards in 2014. In contrast, protein consumption level, especially in urban for medium and high-income classes had already fulfilled the recommended standard (57g/capita/day). During this period, the share of animal protein consumption had increased (in rural areas were higher than urban areas), showing an improvement in household food consumption quality. The protein consumption level from grains and pulses declined during the period 2002-2014, in both rural and urban areas.

Table 3. The Change in energy and protein consumption by region in Indonesia, 2002 dan 2014

Expenditure	Energy and animal protein Consumption								
	Agregat			Urban			Rural		
	2002	2014	Change	2002	2014	Change	2002	2014	Change
Energy (kcal/cap/day)	2089	1980	-109	2052	1966	-86	2118	1990	-128
Protein (gr/cap/day)	57.6	57.0	-0.6	59.3	60.0	0.7	56.2	54.8	-1.4
Share of animal protein (%)	21.3	26.0	4.7	24.0	27.1	3.1	19.1	25.2	6.1

Source: CBS, Susenas 2002 and 2014 (calculate)

The proportion of food-insecure households increased over the period 2002-2014 and the increase in the proportion was higher in rural areas for low and medium income classes. The highest increase of food-insecure households took place in East Nusa Tenggara (10.5%), followed by West Sumatera (6.0%). Conversely, the decrease in proportion of food-insecure household food occurred in Yogyakarta (7.7%).

The diversification of food consumption also increased during the period 2002-2014. The increase was higher in households in rural areas for low-income households. Increasing consumption diversification of vegetables and processed food took place for all household segments in both urban and rural areas and all income classes. Increasing fruit consumption diversification occurred for urban households at the medium and high-income class. On the contrary, there was a declining figure for consumption diversification of carbohydrate-source food as well as vegetable protein-source food for all segment households. However, the decrease in animal protein-source food diversification only occurred on households in urban areas with medium and high-income class.

The consumption participation rate of rice was still high and reached 100 percent, meaning that rice remained the staple food of nearly all communities whether rich or poor, living in urban and rural areas. Based on the level of participation, the role of maize as a staple food in rural areas for low-income group had been decreased. The participation rate was still relatively high for soybean in the form of tofu and tempeh were popular foods not only as side dishes but also as snacks consumed by most people. Among the animal-source foods, the highest consumption participation rate was for fish and eggs then followed by chicken meat and beef.

The high level of rice consumption participation made it the highest consumption participation as compared to other carbohydrate-source foods. However, rice consumption declined from 104 kg/capita in 2002 to 92.3 kg/capita in 2014. The decline in consumption also occurred for corn, soybean, wheat, sugar, and beef. In contrast, there were increases in consumption of cooking oils, chicken meat, eggs, fish, onions, and peppers. The higher the household income class, the higher the food consumption levels were. This trend was the same for all community elements both in urban and rural areas for both aggregate national and provincial level.

### **Changes in price and income elasticity for major food commodities**

In general, the estimated parameters of the AIDS model were significant. The estimation of time as a dummy variable showed that the model analysis differed significantly between time (2002 and 2014). This was a strong indication that there had been a change in the dynamics of consumption level related to the difference in times, regions, and income groups during the period 2002-2014.

The own price elasticity of the analyzed food items showed negative values. It was consistent with the economic theory which stated that food is a normal good. The price elasticities for most food commodities such as rice, soybean, beef, cooking oil, eggs, fresh fish, onions, and wheat were likely to decline from 2002 to 2014. Meanwhile, the increase in price elasticities (and remains) in the period 2002-2014 were experienced by corn, chicken, sugar, processed fish, and chili.

Declining price elasticity value for rice from -0.64 in 2002 to -0.571 in 2014 showed that rice remained to be the major household essential goods. In general, the own price elasticity in rural areas was higher than that in urban areas. This showed that the purchasing power of households in rural areas was lower than in urban areas. According to the income classes, the own price elasticity for the low-income class was generally higher, followed by the medium-income class and high income class.

The income elasticity indicated positive values for both in aggregate, by region (rural, urban), and income classes (low, medium, high). In general, the income elasticities for all commodities were inelastic in 2002 and 2014, except for corn in 2002, which was elastic. Changes during the period 2002-2014, the aggregate values of the income elasticity tended to decrease for all kind of commodities, except soybean and chicken meat that slightly increased.

The increasing income elasticity of wheat from 0.552 in 2002 to 0.633 in 2014 needed to be examined thoroughly. It indicated that the demand for wheat in the future would increase along with the community's average income improvement. This would imply that in the future dependency on imported goods would be higher. It needed an anticipation to increase the availability of locally produced food which could substitute wheat flour.

The cross-price elasticity among analyzed commodities marked positive or negative, depending on the relationships among the food types. The cross-price elasticity values were generally inelastic, both in the aggregate, by region (rural, urban), and income classes (low, medium, high). The cross-price elasticity for the period 2002-2014 changed that varied

among commodities. The estimation results indicated that rice as a staple food was complementary to all types of analyzed commodities, except it was a substitute for corn.

Another interesting finding that needed government's attention was the complementary relationship between rice and wheat flour. It was supported by the facts found in the study sites that wheat flour-based processed foods were side-dishes of rice. The aggregate rice-wheat flour cross-price elasticity value in 2002 amounted to -0.021 and then it rose to -0.037 in 2014. The cross elasticity of rice-wheat flour value increase was due to increasing household's consumption participation rate for wheat flour during the period 2002-2014.

### **Food diversification development**

Indonesia has vast and various food sources, including carbohydrate-source food such as tubers, sago, and grains. However, the results of the analysis showed a decrease in food consumption diversification for carbohydrates-source food. Therefore, it is necessary to set a program on local resource-based and culture-based food production development in every province so that it would make food and local food products available and easily accessible in local markets continuously at an affordable price. The results of the rice consumption food level analysis showed a decrease. However, the results of the cross-elasticity of rice-wheat flour estimations showed a changing relationship toward complementary. It meant that households reduced rice consumption level on one hand, but on the other hand, households also consumed rice and wheat-flour based processed food at the same time. To reduce the dependence on imported wheat flour, it needs some serious efforts of the government to diversify non-wheat flour-based food.

The community members need to be facilitated to increase their knowledge and focusing on urban households of high-income and middle-income classes. It is very important that the food consumption should not only be the focus on merely taste aspects and purchasing power but also meet the principles of various types, nutritious, balanced, and safe (B2SA).

Increasing consumption diversification of processed food should be done for all household segments (by region and by income class). The processed food available in markets must meet health standards. Therefore, it is necessary for facilitating and monitoring the processed food industry both among households and SMEs.

### **Development of food commodities**

Food self-sufficiency program should not only focus on production aspect, but also on food affordability, accessibility, utilization, and consumption diversification aspects. Food policy through an integrated program from upstream to downstream; from the production-processing-distribution-consumption should be on the basis of various local resource-based foods. The results of the analysis that showed the high rice income elasticity was in accordance with the program to improve rice production conducted by the government. However, considering that the other main food income elasticities were also high, the planning of food production should also be conducted in proportion to the demand, including the provision of food sources of animal protein.

The government efforts to increase rice, corn, and soybeans (*Pajale*) production should continuously adapted to the potential development of the land and existing cropping patterns. Indonesian rice production in 2015 was estimated to be 75.40 million tons of unhusked rice or 47.30 million tons equivalent of rice (BPS, 2016). Total rice production in Indonesia is projected to increase at 3.40% annually over the period of 2001 - 2015, largely due to annual increase in harvested area of 1.79%, and the annual increase in rice productivity of 1.61%.

Meanwhile, total rice consumption grew at 0.90% per year solely due to population growth, as per capita consumption is projected to decline by 0.06% annually over the baseline (Wailes and Chavez, 2012).

Therefore, in the pursuit of achieving *Pajale's* production targets, there should give no negative impacts to the existence of other crops such as local foods and other commodities. The all three commodities could be grown at the same time if the government also pays attention to the output prices and marketing. Currently, farmers are reluctant to plant corn, especially in areas not affiliated to feed industries because of corn marketing difficulties. Besides, corn prices are not competitive. Similar disincentives also being faced by farmers in producing soybean. Therefore, the government should also provide incentives policies to support corn and soybean production through pricing and marketing policies. The National Agency for Logistic Affair (*Bulog*) and Regional Government Enterprise (BUMD) or certain private companies designated by the government should accommodate agricultural products at a price level that would be beneficial for farmers.

To meet the increasing demand for animal protein, due to the increasing household's income, the production of animal protein sources such as beef, chicken meat, eggs, and fish should also be increased. However, due to the high consumption participation rate of chicken meat and eggs, in contrast to relatively low beef consumption participation rate, chicken and eggs supply should be prioritized by the government. Moreover, there is a tendency of the community that beef demand would be so high at certain times such as at the time of religious holidays, not continuously as occurred all the time for chicken meat and eggs. Efforts to improve fish availability were conducted by improving fish farming and fishing pattern management including setting the use of fishing gears, which were suitable for local fishermen. There were many things to be conducted, such as supervision in manufacturing processed fish or salted fish and salted anchovies so that the products would have more appropriate quality and give no negative impact on human's health.

In spite of their role as spices in cooking, the participation rates of onion and red chili were almost 100 percent which means that they belonged to household's major needs. Effort to provide onion was primarily done by providing onion seeds considering that the onion seeds price is relatively expensive and is concentrated in Java (e.g. Brebes Regency). Onion seed development should be executed in more spread out areas because onion consumers are also spread throughout the region. For red chili pepper and cayenne pepper, the production increase is conducted by building chili zoning region in each province. The Program on Sustainable Food House Region (KRPL) which was developed by the government to encourage every household to meet their own needs of vegetables including chili should continue. Each household is encouraged to plant chili especially cayenne pepper which is relatively easier to maintenance than red chili pepper.

Cane sugar and cooking oil are also needed by almost everyone, so that the government should make some efforts to meet the needs. They can only be produced by food industry. Therefore, the government should continue to improve regulation, supervision, and monitoring the supply and the price of cane sugar and cooking oil, especially at the consumer's level.

## CONCLUSION AND IMPLICATION

The results of the food analysis at consumption level showed a decrease in rice consumption. However, the results of the rice-wheat flour cross-elasticity estimation showed a changing relationship toward complementary. It means that on one hand households reduce consumption of rice, but on the other hand, households consume rice and wheat-flour based processed foods. To reduce the dependence on imported wheat flour, it needs some serious

government's efforts to diversify the non-wheat flour-based foods, especially those of local-source based foods, such as roots, tubers, and sago.

The study implies that policies to eradicate food-insecure household should focus on:

**(1) *Development of local resource-based food supply.***

Food reserves can serve (a) as one of the instruments to address the temporary problem of food scarcity, especially in an emergency condition, (b) as food aid to address the problem of chronic food insecurity, and (c) to maintain a certain stability of food prices. At the household level, it should be done by utilizing yards or dry land by planting various types of food crops, so that these plants serve as living food reserves.

**(2) *Increasing purchasing power through their generating income improvement.***

The income generating program should vary among regions according to the resources, skills, assets, and business characteristics. Income generating program may include, among others, job creation as labor-intensive, facilitation of business support, and skills enhancement.

**(3) *Local food-based food aid should not always be in the forms of rice.***

Food aid should not only be conducted by the government but also by private sector through CSR funds and community care.

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