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Determinant Factors Toward Staple Food Diversification: Evidence from Indonesia Context

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Abstract: The decreasing of paddy wetland area continually and the growing of the population should have to force Indonesian people to decrease dependent on the rice. The research aims to reveal the tendency of eating style change and to identify variables lead staple food diversification. The survey described the socio-economic characteristics which included age, education and monthly income and socio-psychological aspects which consist of social interaction, cultural adaptation, food innovativeness and motivation. The data was collected during February to September 2015 in slum-urban dwellers in Jakarta. The regression model analysis pointed out the food innovativeness was determinant factor toward change pattern of eating.

Key words: Tendency of food diversification, socio-economics and socio-psychological characteristics, innovativeness, determinant factor, Jakarta

INTRODUCTION

Paddy wetland conversion in Indonesia, population growing and strongly dependent upon rice as staple food has mostly brought the country to a critical point. Based on 1983 Agricultural Census (AC), the amount of Indonesian rice wetland is 16,704,272 ha. But the land area is continuously decreasing to 16,704,272 in 1993 and 14,139,895 ha in 2003. The 2013 AC highlighted alarming data that Indonesia has lost almost half of paddy field compared to 1983 AC. For more clear, the rest of paddy land in Indonesia is 8,685,888 ha according to 2013 AC or loss of 8,013,384 ha that means 267, 279 ha of paddy land loses per year compared to the data gained in 1983 AC (NDPB, 2013). Meanwhile, the Indonesian population has continuously been growing. In 1983, the Indonesian inhabitant is 158.1 million. The amount has been increasing every year to become 161.6 million in 1984, 165.2 million in 1985, 168.7 million in 1986, 172.2 million in 1987, 175.6 million in 1988 and jumped to 255,461,686 people in 2015. At the end of 2016, the number of Indonesian population is predicted to become 258, 704, 986 people and for the next 3 years in 2019 the amount will come to 268,074,565 (Ritonga, 2015).

In the middle of food farmland shrinkage, the need of food consumption, especially of rice, continues to increase in line with population growth. Rice consumption in Indonesia is the highest in the world at an average of 139 kg of rice per capita per year, higher than Philippines who spent 131 kg of rice per year. Whereas the average world rice consumption is only 60 kg per capita per year (Jati, 2014). Referring to the experience of Cote d'Ivoire in the period of heightened tension doe to the military conflict between Northern and Southern territory and food supply chain disrupted from food surplus zone, Savane to the food minus southern territory, the food diversification is the main mitigation risk for the household to get food self-sufficiency (Faul *et al*., 2015). The food diversification of course benefits for food security, nutrition and health; secure source of income, employment and high value products and resilience for farming system and environment service (FAO, 2012). The food diversification related to biodiversity which includes the variety of plants, terrestrial animal and marine and aquatic resources (species diversity), along with the variety of genes contained in all individual organism (genetic diversity) and the variety of habitat and biological community (ecosystem diversity). Biodiversity is essential for humanity, providing food, fiber, fodder, fuel and medicine in addition to other ecosystem services (Hunter and Fanzo, 2013).

For Indonesia, the food diversification is strongly possible. Food Security Agency (FSA) (AFS, 2012), Ministry of Agriculture reported that Indonesian people in 2011 consumed maize 55.43 kg per capita per year, cassava 43.81 kg per capita per year and sweet potato 7.86 kg per capita per year. To cultivate cassava, sweet potato and maize, Indonesia has 11,949,727 ha dry land more than wetland area which is 8,132,345 ha in 2012. In addition, Indonesia has also unused land which

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is about 14,252,383 ha statistics of agricultural land (CADIS, 2013). However, in Indonesian context, the question is how to decrease the acute dependence on rice as a single staple food? The consumption of cassava, sweet potato and corn is merely as a food supplement, it is not the staple food. Therefore, the food diversification for Indonesia should have to change the manner of people eating. Based on the facts, this paper aims to reveal the potential tendency of decreasing the dependency of rice and to identify variables lead potential change of consumption pattern, especially for food vulnerable people in urban community. The study hoped will get useful not only for Indonesian policy but also for the countries that get experience paddy wetland transformation.

The successful of eating pattern change will broad the scope and the number of staple food and in turn it will strengthen food security and access. Referring to World Food Summit (SWAC and OECD, 2013; Uehara, 2012), food security includes: physical availability of food; economic and physical access to food; food utilization and stability of other three dimensions over times. The almost same definition is presented by Kuzmin (2016) which said by quoting Kostusenko that food security referred to a condition when all people always have a physical and economic access to safe and nutritious in quantities sufficient to meet their needs and preferences in food, required for an active and healthy life. In this context, FAO (2012) emphasized to produce more variety of food from the same area of land to strengthen global food security. FAO (2012) suggested developing food diversification by growing greener cities to contribute to urban food and nutrition security and promoting fruit and vegetable for health initiative.

However, the way of eating is part of personality which is not easy to change and needs a high persuasion by multiple approaches based on socio-economics and socio-psychological characteristics. By such a way, Japan has experienced to get successful in change the pattern of eating from the lack of carbohydrate and increasing a fat to energy ratio into national Food for Specified Health Uses (FOSHU) which is categorized into 8 groups of health: blood cholesterol, blood neutral fat, body fat, blood pressure, bone health, absorption of mineral, dental health and blood glucose (Uehara, 2012). For urban-slum dwellers, it needs specific variables to support the change of eating pattern. As a fundamental change of life style, it reminded us to the classic work by Lionberger (1962) and Rogers (1983) that socio-economic characteristics are a leading factor toward adoption of innovation. In this case, it consists of education level, age and monthly income. Education level represents space of life. By more high education is predicted to have better knowledge and awareness. Education is a determinant factor for life style (Feinstein *et al*., 2006). The age is related with the maturity in which it induces certain behavior (Hess, 2006). The young age affected more innovativeness (Rogers, 1983) and of course it is in solving problem of food issues. While the income represents the affordability which affected household behavior. For more specific, food security is determined by economic accessand the lack income will force to solve the problem of food self-sufficiency. The experience by Loizou *et al*. (2013) in developing variety of food products for Greek urban area convinced that age, education level, annual income and occupation significantly influenced the adoption of food diversification.

In addition, to explore the tendency of change in food and eating style, it needs socio-psychological approach, such as social interaction, cultural adaptation, food innovativeness and motivation. According to Hidalgo *et al*. (2006), Tai (2009) and Gueguen *et al*. (2009), social interaction is predicted to arouse certain behavior. In the case of primary consumption of motion picture (Hidalgo *et al*., 2006) suggested that the cultural product consumption has been affected significantly by information transmission about the observed value of the movie and it was yielded by the high level of social interaction. Tai (2009)'s expression by quoting the 1992, Noble Prize winner, Gary S. Becker, strengthened the relationship between social aspects and economic behavior. The consumption of the common goods is indeed influenced by social dimension. This is relevant with the correlation effect theory wherein individual in the same group tend to behave similarly because they have similar individual characteristics or face similar institutional environment (Tai, 2009). The same assumption is expressed by Gueguen *et al*. (2009) that human being has a desire to create affiliation and rapport when they interact with somebody else. Hypothetically, interaction is a predictor to food style change.

As a personality change, the decreasing dependence upon rice should be derived by the internal factor as an endogenous power. The cultural adaptation and motivation are two variables predicted to change the eating style and pattern. In the "rat psychological approach," Niv (2007) stated that motivation energized behavior. In the same logical framework, Locke and Braver (2008) pointed out that motivation which is defined operationally by reward-incentive, penalty-incentive induced behavior, brain activation and personal differences. Following the logics by Shieh (2014) in the case of mainland Chinese who studied in Taiwan that cultural adaptation is main factor to get learning

satisfaction. Cultural adaptation is defined as a process of person adapting to distinct cultural environment. Following Calliguri, cultural adaptation has been a new behavior, regulation and role of people accepting Foreign culture and integrating the homeland culture abroad (Shieh, 2014). While the satisfaction by following Lai is a psychological perception of individual demand or wishes being fulfilled. The operational definition of cultural adaptation is personal skill, people skill and perception skill. Path analysis model revealed a significant influence of cultural adaptation to satisfaction (Shieh, 2014).

Food innovativeness is another indigenous variable predicted to change the manner of eating Johnson *et al.* (2009) described innovativeness as characteristics of individual or organization. Joshua *et al.* (2011) identified that innovativeness related to the notion of openness to ideas and deals with culture and thinking in which it has a direct influence to produce innovation. Food innovativeness generally referred to create new products, processes or business system. According to Khan and Khan (2012) (WY), innovativeness is a "personality trait" which reflects eagerness to change. Innovativeness can be categorized into cognitive and behavior. In context of market and shopping, cognitive innovativeness is about making shopping decision by stimulating mind while behavioral refers to behave in certain way with respect to shopping without any attention. Chakrabarti (2008) highlighted that consumer innovativeness reflects a mental, behavioral and demographic characteristics associated with consumer willingness to adopt innovation where the adoption is in individual level.

Research objective: In the light of theory, the research aims to identify socio-economic and socio-psychological characteristics contribute to the tendency of eating pattern change.

MATERIALS AND METHODS

Sample and research location: The research is a survey which tries to conclude the parameter of population on the basis of sample characteristic (Neuman, 1994; Kalof *et al.*, 2008). The sample was housewife taken from slum urban dwellers by the stratified random sampling technique in Jakarta on the basis of Slovin formula (Husein, 2001). The sample size by 0.1 error probability is 200 housewives in each of five districts of Jakarta. Referring to Rasch Model which suggested that 200 is a minimum sample size, the number of research sample is sufficient (Chaiwichit and Wichian, 2016). Data collection was conducted during February to September 2015.

Variable and operational definition: The tendency of eating pattern change which is a satisfaction feeling by cassava, yam and maize is dependent variable and the socio-economic characteristic (age, education and monthly income) as well as the socio-psychological characteristics (social interaction, cultural adaptation, food innovativeness and motivation) are independent variables to predict the expected change of eating pattern. The social interaction is frequency of meeting, communication and cooperation with non-rice staple food eaters. The cultural adaptation is an ability of people to customize with various culture and food. The food innovativeness is an inclination to create a new and various foods and try to taste. While the motivation is an internal drive to decrease the dependency upon rice.

Measurement and rank of variable: The measurement of three socio-economic variables is operated by interval scale and by three level of Likert scale for four socio-psychological characteristics. Based on the Likert scale, the range of tendency of eating pattern change and the socio-psychological characteristics are as following: (Sitopu, 2014).

Range: The highest score of Likert scale, the lowest score of likert scale, the used Likert scale. Based on the formula, the range of tendency of eating pattern change, social interaction, cultural adaptation, food innovativeness and motivation level is 5-1/3 = 1.3. Consequently, the variables of socio-psychological characteristics and the tendency of eating pattern change are categorized into the lowest (1.0-2.3), moderate (2.4-3.7) and high (3.8-5.0).

Data analysis: To identify the determinant variable toward the tendency of eating pattern change, the research adopted the multiple regression analysis in which the regression model is:

$$Y = a+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7+e$$

Where:

Y = Tendency of eating pattern change
X_1 = Age
X_2 = Education level
X_3 = Monthly income
X_4 = Social interaction
X_5 = Cultural adaptation
X_6 = Food innovativeness
X_7 = Motivation

RESULTS AND DISCUSSION

The tendency toward non-rice staple food: The non-rice staple food in this case is cassava, maize and yam as commonly found and easily cultivated in Indonesia. The tendency is a frequency of cassava consumption, maize and yam; the satisfaction to consume the three non-rice

Table 1: Tendency toward non-rice staple food

		West Jakarta		North Jakarta		East Jakarta		South Jakarta		Central Jakarta	
Tendency	Score	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage
High	2.4-3.0	37	18.5	76	38.00	76	38.0	16	8.0	40	20.0
Moderate	1.7-2.3	147	73.5	115	57.50	115	57.5	47	23.5	60	30.0
Low	1.0-1.6	16	8.0	9	4.50	9	4.5	137	68.5	100	50.0
Total		200	100.0	200	100.00	200	100.0	200	100.0	200	100.0

Table 2: Distribution on the basis of social and economy

	West Jakarta		North Jakarta		East Jakarta		South Jakarta		Central Jakarta	
Characteristics/Category	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage
Age (A) (years)										
21-40	145	72.50	151	75.5	123	61.5	92	46.0	182	91.0
41-60	55	27.50	46	23.0	77	38.5	107	53.5	12	6.0
>60	0	0.00	3	1.5	0	0.0	1	0.5	6	3.0
Total	200	100.00	200	100.0	200	100.0	200	100.0	200	100.0
Education Level (EL)										
Elementary school	1	0.50	13	6.5	5	2.5	36	18.0	3	1.5
Junior high school	3	1.50	30	15.0	4	2.0	28	14.0	13	6.5
Senior high school	90	45.00	108	54.0	75	37.5	112	56.0	89	44.5
Diploma	30	15.00	23	15.5	40	20.0	10	5.0	35	17.5
University graduated	76	38.00	26	13.0	76	38.0	14	7.0	60	30.0
Total	200	100.00	200	100.0	200	100.0	200	100.0	200	100.0
Monthly Income (MI)										
IDR<2 500,000	40	20.00	44	22.0	45	22.5	100	50.0	64	32.0
IDR 2 500,000-3,500,000	75	37.50	75	37.5	54	27.0	70	35.0	50	25.0
IDR 3 500,000-5,000,000	39	19.50	60	30.0	59	29.5	30	15.0	49	24.5

staple foods without rice; more frequent and merely consuming the non-rice staple food. By such indicators, the majority of respondents are in moderate position in which it means they are sometimes more frequent to consume non-rice staple food and feel satisfaction without rice (Table 1). In the light of facts, it is potential to decrease dependency on rice but it needs proper and frequent persuasion.

The socio-economic characteristics: On the basis of age, the majority of respondent is young housewife (Table 2). About the education level, >45% got senior high school certificate and many of them got university degree, graduate as well as diploma program. By relatively high education level, respondents have probably got awareness about the importance of staple food diversification to get food security and self-sufficiency. But in contrary, the rice consumption for the Indonesian people is a status symbol and a habit which closed to someone's personality and of course it is strongly difficult to change. By this argument, hypothetically, the education level will not influence the tendency of rice-need decreasing and dependency upon the paddy products.

The tendency of decreasing demand of rice is also strengthened by monthly income. The majority of respondents earn less than IDR 3, 500, 000 (Table 2). The small income hypothetically will force the people to solve the problem of household economy by changing the way of eating from high dependent upon rice to less dependent on the rice because the price of rice is relatively high compared to the price of non-rice staple food.

The socio-psychological characteristics: The frequency of social interaction hypothetically induces the people to customize the non-rice staple food and will probably influence the tendency of rice-need decreasing. However, the majority of the respondent has a moderate social interaction (Table 3). The housewife who has high social interaction as well as the respondents who has lower social interaction with non-rice staple food eaters is relatively small less than one third of the whole slum urban dweller community. The data leads to assume that the contribution of social interaction to the tendency of eating pattern change in the case of Jakarta slum community is small or even the absence of its contribution. But, the influence statistically needs to convince and it is one of the research's aim.

The cultural adaptation in which the housewives customize with other culture and variety of foods are also assumed to induce the rice-need decreasing. The ability of cultural adaptation is relatively high based on field research data. More than half of respondents at least in four parts of Jakarta, are customized with various culture and food (Table 3). By the fact, the cultural adaptation is strongly predicted to decrease the rice staple food. However, the exact conclusion needs a strong statistical analysis and will be done in the next part of the study. The matter that should be emphasized to explore the

Table 3: Distribution based on socio-psychological characteristics

		West Jakarta		North Jakarta		East Jakarta		South Jakarta		Central Jakarta	
Variable/Category	Score	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage
Social Interaction (SI)											
High	2.4-3.0	52	26.0	60	30.0	53	26.5	22	11.0	65	32.5
Moderate	1.7-2.3	131	65.5	110	55.0	130	65.0	116	58.0	100	50.0
Low	1.0-1.6	17	08.5	30	15.0	17	8.5	62	31.0	35	17.5
Cultural Adaptation (CA)											
High	2.4-3.0	136	68.0	65	32.5	123	61.5	102	51.0	130	65.0
Moderate	1.7-2.3	64	32.0	115	57.5	71	35.5	90	45.0	50	25.0
Low	1.0-1.6	0	0.0	20	10.0	6	3.0	8	4.0	20	10.0
Food Innovativeness (FI)											
High	2.4-3.0	123	61.5	80	40.0	108	54.0	111	55.5	110	55.0
Moderate	1.7-2.3	77	38.5	95	47.5	89	44.5	82	41.0	65	32.5
Low	1.0-1.6	0	0.0	25	12.5	3	1.5	7	3.5	25	12.5
Motivation (M)											
High	2.4-3.0	37	18.5	65	32.5	73	36.5	61	30.5	50	25.0
Moderate	1.7-2.3	147	73.5	60	0.3	112	56.0	101	50.5	80	40.0
Low	1.0-1.6	16	8.0	75	37.5	15	7.5	38	19.0	70	35.0

Table 4: Variables toward staple food diversification

	West Jakarta		North Jakarta		East Jakarta		South Jakarta		Central Jakarta	
Variables	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.	Coe	Coefficient
A	-0.030	0.263	-	-	-	-	-	-	-0.095	0.341
EL	-0.345	0.003**	0.033	0.757	-	-	-	-	-0.181	0.186
MI	0.107	0.462	0.155	0.527	-	-	-	-	-0.593	0.017*
SI	0.188	2.122*	-0.492	0.004**	0.083	0.385	0.033	0.729	-0.104	0.341
CA	-0.096	0.433	-0.315	0.004**	-0.102	0.258	0.161	0.123	0.530	0.000**
FI	0.096	0.000**	0.321	0.000**	0.282	0.001**	-0.159	0.031*	0.439	0.000**
M	0.038	0.390	0.358	0.000**	-0.160	0.873	-0.640	0.000**	0.139	0.083

*Significance; **very significance; A: Age; EL: Education Level; MI: Monthly Income; SI: Social Interaction; CA: Cultural Adaptation; FI: Food Innovativeness; M: Motivation

variable decreases the rice dependency is the inclination to create innovatively a new and various foods and try to taste. The cassava, sweet potato and maize for food innovator could be a raw material to create special dish. The effort to develop the non-rice staple food of course, needs creator of food, creator of taste and flavor. The field research finding leads us to feel confidence to encourage the food diversification. Table 3 pointed out the high level of food innovativeness of urban community. More than a half of the respondents could be categorized in to the food innovator and creator.

Finally, to develop the non-rice staple food, the motivation is an important "key word". The changing of habit needs a high motivation. As a common assumption based on numbers of the research, the motivation is an energizer of power which has an ability to push to get success in developing and adopting new idea and practice. But unfortunately, the majority of housewives in Jakarta slum urban dweller do not have a high desire to change the manner of eating (Table 3).

Determinant factor toward staple food diversification: The previous description about socio-economic and socio-psychological aspects raised the critical question about determinant variables toward a tendency of eating style change as the aim of the research. By multiple regression analysis, the research tried to answer the question. From the three variables of socio-economy, the age, education level and monthly income, the ability of earning brings out the significant influence toward food diversification in Central Jakarta while the education grade contributes significantly but negatively toward the change of eating behavior, especially in West Jakarta in which it means the more higher education grade induced toward higher dependence upon rice.

The four variables of socio-psychological aspect, consisted of social interaction, cultural adaptation, food innovativeness and motivation should be fully considered. In the light of multiple regression analysis, the social interaction contributed toward the tendency of eating behavior change significantly in West Jakarta and strongly significant in North Jakarta. In line with the above finding, the cultural adaptation and motivation induces strongly significant to decrease the acute dependence upon rice, especially in North Jakarta and also the motivation contributes strongly significant in South Jakarta. Finally, the food innovativeness is the main variable contributed strongly significant toward staple food diversification as it is proved in five parts of Jakarta (Table 4).

Based on the research finding to develop staple food diversification, it needs to expand food innovativeness within broader community and supported by proper neighborhood, excellence communication and good cooperation within part of society. The field school model as the miniature of society could be adopted and specially designed to develop food innovativeness from the traditional raw material of cassava, maize and yam. The field school proved more effective to disseminate knowledge and practical innovation within socio-economic diverse society (Maman *et al*., 2015). The basic principle of field school which is originated from integrated pest management farmer field school is an adult education method which let participants to make a creation and decision by themselves. The field school methods of extension could be implemented in health promoting, participation enabling and innovation disseminating (Anandajayasekeram *et al*., 2007). Food innovativeness is part of new practice and idea that could be developed by field school method.

CONCLUSION

The eating style change would probably easier, not within the poor urban society and the lack of household income and also it is not in the higher level education society but it strongly aroused probably in food innovativeness within the slum urban housewives. The education level which is part of socio-economic characteristics, significantly but negatively contributed to the tendency of staple food diversification, indicated that the more higher education induced high dependent upon rice staple food.

The food innovativeness is a main variable toward staple food diversification but it should be supported by frequent social interaction (frequent communication, good neighborhood and close relationship) with non-rice staple food eater, cultural adaptation and strengthened by high motivation. The filed school model of extension education could be adopted to promote food creator community, using the traditional raw material of cassava, maize and sweet potato as a miniature of social interaction, cultural adaptation and high motivation development to decrease high dependent upon rice staple food.

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