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Value perception and consumption of indigenous vegetables

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ABSTRACT

Awareness of safety and healthy food is continuously increasing nowadays. Indigenous vegetables are the one of many choices influencing on consumption decision making of local people because they are readily available food source in rural areas. Moreover, they are nutritious and have medicinal properties being beneficial in the treatment of various diseases. In fact, the more understanding of indigenous vegetables value of the consumers, the more utilizing them for their health. Thus, the purposes of this paper are to evaluate value perceptions of indigenous vegetables and to analyze factors affecting indigenous vegetable consumption of 300 samples in Sansai Luang sub-district, Sansai district, Chiang Mai province. The result indicates that the respondents have recognized the value of indigenous vegetables in the moderate level. Furthermore, the determinants dealing with health care concern, food expenses and medicinal properties perception have significantly positive effect on consumption whereas taste of vegetables has negative effect on it. The findings of this paper are useful for creating the campaign to enhance indigenous vegetables consumption bringing about healthy people in the selected area and helpful for expanding the similar promotion in other areas.

Keywords: Indigenous vegetables, value perception, consumption, composite index, ordered probit model

1. Introduction

Indigenous vegetables are local vegetables originated from particular areas and exhibited crucial parts of traditional diets and indigenous knowledge in rural communities (Nnamani et al., 2009; Lwoga et al., 2010; Dweba & Mearns, 2011). They are inexpensive and also rich sources of high quality nutrition and medicinal properties which are advantageous for the good health maintenance and disease prevention (Oniang'O et al., 2004; Nnamani et al., 2009). Rubaihayo (2002) suggested that indigenous vegetables represented genuine natural pharmacy of vitamins, minerals, and phytochemicals which was consistent with Tangkanakul et al. (2006) and Maisuthisakul et al. (2007) who suggested that some Thai indigenous plants exhibited a potential for use as natural antioxidants. Thus, they are powerful tools battle against malnutrition and diseases, and dietary choices for critical high human health especially in the poor communities. Weinberger & Swai (2006) indicated that the variety in consumption of traditional vegetables was larger for poor households than for the wealthy households and they were utilized to fulfill their daily requirements of micronutrients.

In Thailand, there are numerous species of the indigenous vegetables which called varied name by areas. The value of them has become increasingly recognized over the past decade. The elders in the rural areas are often very indigenous knowledgeable about nutrient and therapy. However, in the present, the value perceptions of indigenous vegetables, especially the value of nutrition, medicinal properties, and folk wisdom, are threatened and despised by modern people who changed in their food habits and these bring about the declining importance in consumption (Weinberger & Swai, 2006). This situation becomes very important issue for many researchers to investigate the means of folk wisdom conservation and health promoting via indigenous vegetable value perception and consumption campaigns.

Because of the importance of indigenous vegetable value perceptions and consumption, the project of Indigenous Vegetables Learning Center establishment for health promoting and socioeconomic enhancement is set up by collaboration among the Faculty of Economics, Maejo University, the Thai Health Promotion Foundation, and the people in the community. The targets of this project are conserving indigenous vegetables, urging people to consume indigenous vegetables that are good for their health and pass on knowledge to the people in community. Sansai Luang sub-district, Sansai district, Chiang Mai province is selected to be the leading area to concretely promote this campaign and be the prototype for other areas.

To reach the targets of this project, the research on background data of the participants, especially value perceptions and factors that determine the indigenous vegetable consumption are very significant. Therefore, the purposes of this paper are focused on the evaluation of value perceptions of indigenous vegetables and the analysis of factors affecting indigenous vegetable consumption. In terms of value perception measurement, the composite index is employed for the key tool, whereas the analysis of factors affecting consumption uses the ordered probit model for estimating.

The contributions of this paper are beneficial knowledge for creating the campaign to enhance indigenous vegetables consumption bringing about healthy people in the selected area and helpful for expanding the similar promotion in other areas. The rests of this paper are structured as follows. Section 2 displays the literature review. Section 3 describes the data collection and methodology used to evaluate value perceptions and analyze factors affecting indigenous vegetable consumption. Section 4 represents the empirical results and their discussion, and section 5 summarizes the study's findings.

2. Research objective

The literature has been reviewed in two key areas such as value perception and determinants of consumption.

Value perception is the part of the consumer perception theory that attempts to understand how consumers' perceptions of product influence their behavior. Generally, consumer perception theory is used for designing product or brand in marketing (Ravald & Gronroos, 1996). However, many researchers and organizations concerning food issue have investigated consumer perceptions in order to understand consumers' behavior and promote the particular campaign for them. The value perception, thus, becomes an important approach and has been widely used in multidisciplinary.

The perceived value, e.g. quality, attributes, usability, benefits, etc., is evaluated based on the consumer utility of product concerned with the perception of what is received and what is given and it is also a ratio of total benefits to total costs or a trade-off between benefits and sacrifices (Zeithaml, 1988). There are multi-dimensional nature of perceived value such as functional value, social value, emotional value, epistemic value, and conditional value (Sheth et al., 1991). In the perceived value of food or vegetable perspective, various researches emphasize functional value involved in the utility derived from the perceptions of product quality and performance, namely, nutritional value perception (Frederick & Hawkins, 1992; Gibson et al., 1998), medicinal value perception (Etkin & Ross, 1982; Terry et al., 2001; Leonti et al., 2002; Pieroni, 2000; Pieroni et al., 2007; Krishna et al., 2009), and indigenous knowledge value perception (Aphane et al., 2003; Pieroni et al., 2007; Lwoga et al. 2010; Dweba & Mearns, 2011). Nutritional value perception is the awareness of value involving in vegetable nutrition such as fibre, minerals, vitamins, proteins, carbohydrates, etc., (Hoe & Siong, 1999; Wardle et al., 2000; Brandt & Mølgaard, 2001) whereas medicinal value perception refers to the perceived medicinal properties of vegetables that benefit for health and mind such as the body strengthening, disease prevention, cough and cold treatment, etc. (Pieroni et al., 2007). For Indigenous knowledge value, it deals with knowledge about indigenous vegetables passed on from generation to generation as part of the indigenous knowledge system of the community (Lwoga et al., 2010). It is valuable for conservation and inheritance.

In terms of vegetable consumption, many researchers have been separated the determinants of it in various categories such as demographic, lifestyle characteristics and socioeconomic and factors, e.g. age, gender, income, family sizes, food habits, monetary cost of food, etc. (Brug et al. 1995; Cade et al. 1999; Pollard et al. 2001); product safety, specifically with respect to microbiological and chemical hazards (Brug, et al., 1995; Rimal et al., 2001; Danelon & Salay, 2012); price (Brug et al., 1995; Cox et al., 1998); product value, e.g. nutrient content, medicinal properties, etc. (Ling & Horwath, 2001); and psychosocial factors, e.g. attitude, concern, belief, taste and preference, etc. (Brug et al., 1995; Ling & Horwath, 2001; Pollard et al., 2002). Because of the nonmonetary cost, readily availability in local areas and involvement with the people in communities, the factors affecting indigenous vegetables consumption used in this paper consist of lifestyle characteristics and socioeconomic and factors, product safety, product value, and psychosocial factors.

3. Methodology

Sample selected in this research are the 300 participants in the project of Indigenous Vegetables Learning Center establishment for health promoting and socioeconomic enhancement in Sansai Luang sub-district, Sansai district, Chiang Mai province via purposive sampling approach. The data are received by face-to-face interviews.

In this paper, we employ two methodologies to acquire value perceptions and indigenous vegetable consumption consists of composite index and ordered probit model with maximum likelihood estimation, respectively.

Composite index

Composite index is a mathematical aggregation of individual indicator set that measure multi-dimensional concepts (Nardo et al., 2005). It is mainly transform quantitative data into the indices that benefits for comparability, especially the different measurement units (Booysen, 2002). For value perceptions of food, there are various aspects and differences in the measurement units. Thus, composite index method is valuable for integrating multi-dimensions into one value. The composite index used in this paper is applied from Human Development Index (HDI) of UNDP. The procedures to construct the index are as follow:

Step 1: Selection of variables

The variables dealing with index evaluation consist of nutritional value perception, medicinal value perception, indigenous knowledge value perception, and total value perception, shown in Table 1.

TABLE 1. Variables and definitions for each index

Variables	Definitions
NVPI	Nutritional value perception index
MVPI	Medicinal value perception index
IVPI	Indigenous knowledge value perception index
TVPI	Total value perception index

Step 2: Normalization

When the variables in a data set have different measurement units and different ranges, normalization is required prior to data aggregation via putting all variables on a common basis before aggregating (Nardo et al., 2005). Several techniques can be used to normalize variables such as ranking, z-scores, re-scaling, categorical scales, etc. In this paper, re-scaling method is used for calculating. The formula is as follow:

$$I_{iv} = \frac{S_{iv} - S_v^{\min}}{S_v^{\max} - S_v^{\min}} \tag{1}$$

where I_{iv} is the vth index the ith respondent, S_{iv} is the vth score of the ith respondent, and $S_v^{\min}$, $S_v^{\max}$ are the minimum and maximum of the vth scores, respectively.

Step 3: Aggregation of individual index into the composite index

Because the principle and database of each index are different causing the variance in the data, the sum and average methods could not be applicable to the total index calculation. Hence, we apply Human Poverty Index (HPI) evaluation of UNDP that utilize the cubic equation for reducing data variation in the following way:

$$C = \left[\frac{\sum_{v=1}^{V} I_v^3}{V}\right]^{\frac{1}{3}} \tag{2}$$

where C is the composite index of total value perception, and I_v is the vth index.

Step 4: Determination of the criterions of value perception levels

The criterions of value perception levels can be expressed in Table 2.

TABLE 2. Criterions of value perception levels

Index scores	Levels of value perception
$\bar{x} - S.D.$ > Index scores	Low
$\bar{x} - S.D.$ < Index scores < $\bar{x} + S.D.$	Moderate
Index scores > $\bar{x} + S.D.$	High

Note: $\bar{x}$ is average score and $S.D.$ represents standard deviation.

Ordered probit model

Because the dependent variable, indigenous vegetable consumption, is ordinal ranking, the ordered probit model is appropriate to determine the factors influenced on it. The theoretical framework of this method is based on standard normal random utility maximization (McFadden, 1973). In this study indigenous vegetable consumption is postulated in terms of consumption proportional rankings and it is hypothesized that these are determined by a vector of respondents' socioeconomic factors, health care concern, value perceptions, attitude, and taste preference of indigenous vegetables which shown in Table 3.

TABLE 3. Variables and definitions for ordered probit model

Variables	Definitions
Dependent variable:	
VCON	Share of indigenous vegetables in total vegetable consumption (0=extremely low [less than 21%], 1=low [21-40%], 2=moderate [41-60%], 3=high [61-80%], 4=extremely high [more than 80%])
Independent variables:	
GEN	Gender (1=female, 0=male)
AGE	Age (years)
STA	Status (1=single, 0=other)
CHI	Amount of children (persons)
EDU	Educational levels (1=lower than the primary school level, 2=the primary school level, 3=the secondary school level, 4=the bachelor degree, 5=higher than the bachelor degree)
INC	Average household income per month (baht)
EXP	Food expenses per day of household (baht)
NOHP	Number of persons in household having health problems (persons)
HCL	Health care levels (1=low, 2=moderate, 3=high)
CONC	Concern of contaminants in vegetables (1=concern, 0=other)
NUV	Nutritional value perception score (scores)
MEV	Medicinal value perception score (scores)
INV	Indigenous knowledge value perception score (scores)
ATT	Attitude of indigenous vegetable score (scores)
TASTE	Taste preference of indigenous vegetable (1=low, 2=moderate, 3=high)

For the i^th observations ($i = 1, 2, ..., 300$), the ordered probit technique is specified around a latent variable whose level is influenced by explanatory variables such that:

$$y^* \;=\; \beta' X + e \tag{3}$$

where y_i^* is unobserved indigenous vegetable consumption variable held by individual dependent variable, X is a vector of independent variables, β is a vector of parameters, and e is a vector of stochastic error term, $e \sim iid\ N(0,1)$. Suppose that y is observed indigenous vegetable consumption variable in ordinal value, y = 0, 1, 2, 3, 4. The relationship between y and y_i^* is assumed to be a function of cut-off points (μ_j) which are estimated along with the regression coefficients and vary with individuals and can be expressed as (Greene, 1993, 1998; Myrland et al., 2000; Akbay et al., 2007):

$$\begin{aligned} y &= 0 \;\; if \;\; y^* \le 0 \\ y &= 1 \;\; if \;\; 0 < y^* \le \mu_1 \\ y &= 2 \;\; if \;\; \mu_1 < y^* \le \mu_2 \\ y &= 3 \;\; if \;\; \mu_2 < y^* \le \mu_3 \\ y &= 4 \;\; if \;\; \mu_3 < y^* \end{aligned} \tag{4}$$

where μ_1, μ_2 and μ_3 ($0 < \mu_1 < \mu_2 < \mu_3$) are unknown threshold parameters of y_i^*. It is now possible to estimate both β and μ parameters. Since the distribution of stochastic error term, e, is assumed to be standard normal, the probabilities entering the log-likelihood function can be shown as (Greene, 1998):

$$\begin{aligned} P(y=0) &= \Phi(-\beta' X) \\ P(y=1) &= \Phi(\mu_1 - \beta' X) - \Phi(-\beta' X) \\ P(y=2) &= \Phi(\mu_2 - \beta' X) - \Phi(\mu_1 - \beta' X) \\ P(y=3) &= \Phi(\mu_3 - \beta' X) - \Phi(\mu_2 - \beta' X) \\ P(y=4) &= 1 - \Phi(\mu_3 - \beta' X) \end{aligned} \tag{5}$$

where $\Phi(\cdot)$ is the cumulative probability function.

The likelihood function for the model is:

$$L \;=\; \prod_i \prod_j \left[\Phi(\mu_j - \beta' X_i) - \Phi(\mu_{j-1} - \beta' X_i) \right]^{I(y_i = j)} \tag{6}$$

where $I(y_i = j)$ is the indicator function that equal one if $y_i = j$, and zero otherwise.

The log-likelihood function is expressed as:

$$\log L = \sum_i \sum_j I(y_i = j) \log\left[\Phi(\mu_j - \beta' X_i) - \Phi(\mu_{j-1} - \beta' X_i)\right] \quad (7)$$

For interpreting the estimation, the signs and their statistical significance of the ordered probit coefficients estimated by maximum likelihood estimation (MLE) represent the direction of response dealing with the level of particular variable, while the changes in the probabilities can be explained by marginal effects. The marginal effects of the explanatory variable on the individual probability of indigenous vegetable consumption can be computed as:

$$\frac{\partial P(y=j)}{\partial x_m} = \left\{\Phi\left(\mu_{j-1} - \sum_m \beta_m x_m\right) - \Phi\left(\mu_j - \sum_m \beta_m x_m\right)\right\}\beta_m \quad (8)$$

where $\frac{\partial P(\cdot)}{\partial x_m}$ is the derivative of probability with respect to x_m, and β is the ordered probit MLE of x_m's parameters. The positive marginal effects of x_m indicate that the increasing in x_m escalates the probability of choosing their consumption ranking of the respondents, while the negative marginal effects represent the opposite meaning (Akbay et al., 2007). LIMDEP 9.0 is used to estimate the ordered probit model (Greene, 1998).

4. Results and discussion

Value perceptions of indigenous vegetables

The descriptive statistics of value perception indices and the score meanings are shown in Table 4. The medicinal value perception index (MVPI) has the highest average score, and followed by nutritional value perception index (NVPI) and indigenous knowledge value perception index (IVPI), respectively. The score meanings are represented in the last column. Radar graph is used for comparing among value perception indices, which can be expressed in Figure 1. In terms of the total value perception index (TVPI), we use the composite index technique as a tool to evaluate overall value perception of indigenous vegetables. The average score of TVPI equals to 0.54. That means the respondents' total value perceptions consisting of nutritional value, medicinal value, and indigenous knowledge value perceptions are in the moderate level.

TABLE 4. Descriptive statistics of value perception indices and the score meanings

Indices	Min	Max	$\overline{x}$	S.D.	Score meanings
NVPI	0.00	1.00	0.48	0.28	Less than 0.20 = Low level 0.20 – 0.77 = Moderate level More than 0.77 = High level
MVPI	0.00	1.00	0.51	0.24	Less than 0.28 = Low level 0.28 – 0.75 = Moderate level More than 0.75 = High level
IVPI	0.00	0.75	0.38	0.22	Less than 0.16 = Low level 0.16 – 0.59 = Moderate level More than 0.59 = High level
TVPI	0.09	0.86	0.54	0.14	Less than 0.39 = Low level 0.39 – 0.68 = Moderate level More than 0.68 = High level

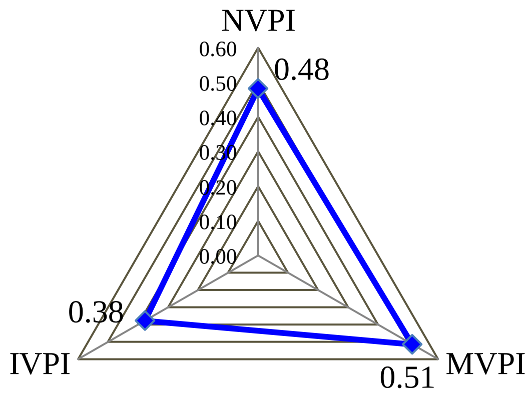

Figure 1. Average scores of value perception indices

Considering amount of respondents in each level of value perception indices expressed in Table 5, the result reveals that over than 50% of the respondents have recognized the value of indigenous vegetables in the moderate level. This finding is useful to support the campaign planning of the project of Indigenous Vegetables Learning Center establishment for health promoting and socioeconomic enhancement in Sansai Luang sub-district, Sansai district, Chiang Mai province.

TABLE 5. Amount of respondents in each level of value perception indices

Indices	Levels of value perceptions		
	High	Moderate	Low
NVPI	44 (14.67)	203 (67.67)	53 (17.67)
MVPI	68 (22.67)	165 (55.00)	67 (22.33)
IVPI	76 (25.33)	168 (56.00)	56 (18.67)
TVPI	47 (15.67)	195 (65.00)	58 (19.33)

Note: Value in ( ) represents percentage.

Factors affecting indigenous vegetable consumption

Ordered probit model is estimated under MLE. Estimated coefficients and marginal effects are presented in Table 6. The estimated coefficients in the second column are tested by using standard errors and p-values. Moreover, Table 6 also presents the estimates of the threshold variables, μ. According to Maddala (1983) the threshold coefficients should be positive and display the relationship as $\mu_1 < \mu_2 < \mu_3$. The result of threshold parameter estimation reveals that all of them are positive and statistically significant at the 0.01 level that means the response categories are indeed ordered properly. Hence, the independent variables in the ordered probit model are relevant in explaining indigenous vegetable consumption behaviors.

Based on the statistically significant coefficients (Table 6), the gender of respondents (GEN) is a crucial determinant causing the positive effect on indigenous vegetable consumption behaviors. This finding shows that females influence on indigenous vegetable consumption increase. This result really exists because women in Thailand, especially in rural areas, are more frequently purchase food and cook for households than men.

For other significant parameters considering, the ages of respondents (AGE), educational levels (EDU), household's food expenses per day (EXP), health care levels (HCL), and medicinal value perception (MEV) have the positive signs indicating the increasing affinity to consume indigenous vegetables as theses increase, while taste preference of indigenous vegetable (TASTE) has the opposite effect.

However, the parameter estimates of ordered probit model cannot generally be used to interpret the results. Consequently, the marginal effects are employed for interpreting. Table 6 also displays the marginal effects of variables. The marginal effects of increasing the ages of respondents (AGE) indicate the decrease in the likelihood of "extremely low", "low" and "moderate" indigenous vegetable consumption to other vegetable consumption and the increase in "high" and "extremely high" indigenous vegetable consumption.

The educational level (EDU) has a statistically significant positive effect on indigenous vegetable consumption. As the educational level increases, the probability of consuming indigenous vegetables is also increasing. The marginal effects for EDU reveal that if the respondent is in the higher level of education, there are the increases of 2.81% in the probability of choosing "extremely high" proportion and 2.15% in the probability of choosing "high" proportion, and the decreases of 3.62% in the probability of choosing "moderate" proportion, 1.00% in the probability of choosing "low" proportion, and 0.33% in the probability of choosing "extremely low" proportion.

Household's food expenses per day (EXP) also significantly affect indigenous vegetable consumption. The augmentation of household's food expenses per day lead to the increase in indigenous vegetable consumption. The cause of this result is the cheapness or no price of indigenous vegetables. These vegetables are widely available in the local areas, especially in the kitchen gardens. Accordingly, the consuming of indigenous vegetables is the alternative to reduce household's food expenditures. For marginal effects estimation, the increase in EXP brings about the decreases of 1.95% in the probability of choosing "extremely low" proportion, 5.87% in the probability of choosing "low" proportion and 21.17% in the probability of choosing "moderate" proportion of indigenous vegetable consumption, whereas 16.42% in the probability of choosing "extremely high" proportion and 12.57% in the probability of choosing "high" proportion of consuming indigenous vegetables are increasing.

In addition to socioeconomic determinants, the level of health care (HCL) and medicinal value perception (MEV) have also influencing on indigenous vegetable consumption. The findings represent that the higher in health care level and medicinal value perception increase the probability of choosing "high" and "extremely high" proportions of consuming indigenous vegetables, but decrease the probability of choosing "moderate", "low" and "extremely low" proportions of consumption. These effects indicate that indigenous vegetable consumption is the choice of health care and treatment.

Interestingly, the taste preference of indigenous vegetables (TASTE) has significantly negative sign that means the increase in taste preference level of indigenous vegetables causes the decrease in the indigenous vegetable consumption, as shown in Table 6. This empirical result points that the belief of people about medicinal taste. Most of Thai people belief that indigenous vegetables are valuable in medicinal properties, so the flavor of these should be bitter.

TABLE 6. Estimated coefficients and marginal effects for ordered probit model of indigenous vegetable consumption by using MLE

Variables	Coefficient	S.E.	Marginal effects				
			$P(y=0)$	$P(y=1)$	$P(y=2)$	$P(y=3)$	$P(y=4)$
Constant	-3.9462*	0.7561					
GEN	0.4580*	0.1637	-0.0123	-0.0340	-0.1101	0.0767	0.0797
AGE	0.0383*	0.0090	-0.0009	-0.0026	-0.0093	0.0055	0.0072
STA	0.1388	0.2919	-0.0027	-0.0086	-0.0331	0.0167	0.0278
CHI	0.0914	0.1109	-0.0020	-0.0061	-0.0221	0.0131	0.0172
EDU	0.1497*	0.0571	-0.0033	-0.0100	-0.0362	0.0215	0.0281
INC	0.0231	0.0703	-0.0005	-0.0016	-0.0056	0.0033	0.0043

Variables	Coefficient	S.E.	Marginal effects				
			$P(y=0)$	$P(y=1)$	$P(y=2)$	$P(y=3)$	$P(y=4)$
EXP	0.8754*	0.1038	-0.0195	-0.0587	-0.2117	0.1257	0.1642
NOHP	0.0146	0.0668	-0.0003	-0.0010	-0.0035	0.0021	0.0027
HCL	0.6860*	0.1296	-0.0153	-0.0460	-0.1659	0.0985	0.1286
CONC	0.2058	0.1495	-0.0047	-0.0140	-0.0497	0.0302	0.0382
NUV	0.0016	0.0310	0.0000	-0.0001	-0.0004	0.0002	0.0003
MEV	0.1403 *	0.0477	-0.0031	-0.0094	-0.0339	0.0201	0.0263
INV	-0.0036	0.0416	0.0001	0.0002	0.0009	-0.0005	-0.0007
ATT	0.0049	0.0155	-0.0001	-0.0003	-0.0012	0.0007	0.0009
TASTE	-0.6952 *	0.1137	0.0155	0.0466	0.1681	-0.0998	-0.1304
μ_1	0.6721*	0.1181					
μ_2	1.7918 *	0.1280					
μ_3	3.6313 *	0.1715					
Log-likelihood function				-251.1423			
Chi-square statistics				368.6221 *			
McFadden Pseudo R – squared				0.4232			

Note: * Statistically significant at the 0.01 level.

5. Conclusions

The awareness of safety and healthy food is continuously increasing. Thus, the issues of safety food consumption choices are popular. Indigenous vegetables are the one of various alternatives influencing on consumption decision making of local people. The purposes of this paper are to evaluate value perceptions of indigenous vegetables and to analyze factors affecting indigenous vegetable consumption. Samples selected in this paper are 300 people which join in the project of Indigenous Vegetables Learning Center establishment for health promoting and socioeconomic enhancement in Sansai Luang sub-district, Sansai district, Chiang Mai province and the tools used for estimating are composite index technique and ordered probit model.

The results indicate that the respondents have recognized the value of indigenous vegetables, nutritional value, medicinal value, indigenous knowledge value, and total value, in the moderate level. For analyzing the factors affecting of indigenous vegetable consumption, the determinants dealing with socioeconomic determinants consist of gender, age, educational level and household’s food expenses per day have significantly positive effect on consumption. Moreover, health care level and medicinal value perception of indigenous vegetable also affect the consuming. On the other hand, taste preference of indigenous vegetable has significantly negative effect on it.

The findings of this paper are useful for creating the campaign to enhance indigenous vegetables consumption bringing about healthy people in the selected area and helpful for expanding the similar promotion in other areas.

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