Complete household demand system of vegetables in Ogun State, Nigeria

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Abstract: Fruit and vegetable consumption has been shown to be an important part of any diet leading towards good health, but little is known about the vegetable demand behaviour at finer levels of disaggregation in Nigeria. Hence, this study estimated the price and income (expenditure) elasticities of demand for the commonly consumed vegetables among households in the Ogun State, Nigeria. Data were collected with the use of a well-structured questionnaire administered to one hundred and twenty (120) households that were randomly selected using a multi-stage sampling procedure. The data were analysed by simple descriptive statistics and estimation of a Nonlinear Quadratic Almost Ideal Demand System (NQAIDS) of vegetable demand behaviour of households sampled. The results show that income elasticity of demand for Bitter leave (–3.43) and the Eggplant (–3.67) are elastic, while income elasticity of demand for Tomato (0.27), to which about one-third of vegetables expenditure are devoted, is inelastic. The results further revealed that own-price elasticities of demand carry the expected negative signs for all the vegetables and are generally inelastic. Estimates of cross price elasticities show the dominance of substitutability among the vegetables with only few cases of complementarities.

Key words: Almost Ideal Demand System, complementarity, elasticity, substitutability, vegetable

Studies on vegetable production and marketing in Nigeria are many. Many of these studies concentrated on the efficiency of vegetable production and marketing; examples of such studies include Gockowski et al. (2003), Bamire and Oke (2004), Ibrahim and Omotesho (2009), Dipeolu et.al. (2009), Odiaka et al. (2008) and Oladele (2011). There have also been a number of previous studies that examined food demand in Nigeria. However, empirical work focusing particularly on the vegetable demand has been sparse. In addition, the majority of Nigeria food demand studies treated "vegetables" as a single aggregate item within a demand system that includes other aggregated food items, like "meat" and "fish" products (Aromolaran 2004; Olarinde and Kuponiyi 2005; Rahji and Adewumi 2008; Akinleye 2009; Obayelu et al. 2009; Tsegai and Kormawa 2009). Only similar studies, conducted outside Nigeria, by Belarmino (1983), Quisumbing (1985) and Mutuc et al. (2007) used a number of more disaggregate vegetable categories (e.g., green, leafy, and yellow) rather than using a single aggregate "vegetable" category to investigate the food demand behaviour.

Deaton and Muellbaucr (1980) are credited with the development of the Almost Ideal Demand System (AIDS) which has been the most commonly used demand system specification during the last 20 years. Wadud (2006) reported that during 1980–1991, as many as 89 empirical works used AIDS in the demand studies. In food consumption studies, AIDS has been widely used in several studies, such as: Tiffin and Tiffin (1999); Karagiannis et al. (2000); Wadud (2006); Sheng et al. (2008); Akinleye (2009); Obayelu et al. 2009; Janda et al. (2010).

However, there is no recent study that applies the AIDS model to Nigeria vegetable demand at finer levels of disaggregation. For example, the price and expenditure elasticities of the particular vegetables, like the tomato, cabbage, and eggplants, to mention few, have not been directly examined in Nigeria using a complete demand systems approach. Having precise demand elasticity estimates of vegetables at more disaggregate levels is essential if one is to have a more meaningful analysis of the consumption impacts of the domestic food policy interventions, like the price and income subsidies (Mutuc et al. 2007).

The objective of this study, therefore, is to examine the vegetable demand behaviour of households in Nigeria at a more disaggregated level. The study specifically aimed at determining the expenditure, own-price, and cross-price elasticities of demand of commonly consumed vegetables in the study area.

METHODOLOGY

The study was conducted in Egba Division of Ogun State, Nigeria, to investigate the demand pattern of vegetables in the study area. This division comprises of six Local Government Areas having its administrative headquarters in Abeokuta; the state capital. The Egba division was purposively selected because it has both the urban and rural characteristics. Data collected from the study area were generated through the administration of a set of structured questionnaire on 120 households selected randomly using the multistage random sampling technique. The questionnaire was designed to elicit information on household characteristics, such as age, educational level, marital status, income from all sources and household size of the farmers; the household expenditure on various vegetable commodities; the prices and quantities of the commonly consumed vegetable in the study area. The data were analysed with both descriptive and econometric tools with the demand pattern modelled within the framework of the Nonlinear Quadratic Almost Ideal Demand System.

Theoretical issues and the empirical model

Food consumption is assumed to be weakly separable from the non-food consumption and the vegetable consumption is assumed to be weakly separable from other food consumption. This procedure assumed that the consumer's utility maximization decision can be decomposed into three separate stages. In the first stage, the total expenditures are allocated over the food and non-food items. In the second stage, food expenditures are then allocated over the vegetable and other food items. In the third stage, the vegetable expenditures are allocated over the following vegetable commodities: Bitter leaf, Cabbage, Carrot, Water spinach, Eggplant, *Corchorus sp.*, Okra, Tomato, *Celosia argentea, Amaranthus sp.*, Fluted pumpkin, Water leaf and Other vegetables. These vegetable commodities were chosen because they are the most commonly used vegetables among all households in the study area.

Given a situation of the multi-stage budgeting, let q denote the vector of goods demanded by the consumer and p be the corresponding vector of all prices. Further, let y be the total expenditure and V(p) represent the indirect utility function, which is continuous, non-decreasing and quasi-convex in p, homogenous of degree zero in *(p, y)*. In general, a household solves the following indirect utility function

$$MaxV\{V_1(p_1),V_2[V_{21}(p_{211}, p_{212},..., p_{21n}), V_{22}(p_{22})]\} \quad (1)$$

where V_1, $V_{2,}$ V_{21}, V_{22} each represents the indirect utility from consuming the non-food, food, vegetable food, and non-vegetable food, respectively. Thus, the indirect utility from consuming vegetable (V_{21}) is a function of the vector of prices for all vegetables items $[p_{211,} p_{212}, ..., p_{21n}]$, where $i = 1, ..., n$.

Following Moschini (2001), Mutuc et al. (2007) and Zentková and Hošková (2009), the Marshallian unconditional demand functions q_{21i} $(p_{211,} p_{212}, ..., p_{21n})$ can be expressed in the terms of the first-stage and the second-stage expenditure allocation function $((y_2(p), y_{21}(p))$ and the third-stage conditional demand function c_{21i} $(p_{211}, p_{212},..., p_{21i})$, where I represents the vegetable category in the utility function, and i represents the specific vegetable. In particular, the Marshallian unconditional demand function can be expressed as:

$$q_{21i(p)} = \frac{y_2(p)}{y} \times \frac{y_{21}(p)}{y_2(p)} \times c_{21i} \quad (p_{211}, p_{211}, ..., p_{21i})$$
$$= \frac{y_{21}(p)}{y_2(p)} \times c_{21i} \quad (p_{211}, p_{211}, ..., p_{21i}) \quad (2)$$

Equation 2 implies that the optimum within-group allocation is possible given only the price vector (p_{211}, p_{212},..., p_{21i}), the group expenditure allocation y_{21}, and the total expenditure y. At the same time, the price p_{21i}, is unobservable, given the expenditure y_{21i} and the observable physical quantities q_{21i}, which is calculated as:

$$UV_i = \frac{y_{21i}}{q_{21i}} \quad (3)$$

However, as shown in Dong et al. (1998), UV_i and y_{21i} are endogenously determined and can be expressed as:

$$y_{21i} = f(UV_i, y, W) \quad (4)$$

where $W = [w_1, ..., w_k]$ is a vector of the demographic and household characteristics. Therefore, the estimation of the quantity demanded system should be estimated simultaneously with the unit value system. Moreover, because the total vegetable expenditure is endogenous with the share of the vegetable expenditure, the total vegetable expenditure equation related to the total expenditure is estimated based on a double-log relationship. The model to be estimated is as follows:

$$\log(y_{21}) = a_0 + \sum_k a_k\ \omega_k + b\ \times \log(y) + \varepsilon \qquad (5)$$

where the w are the demographic and household characteristics, the a and b are the parameters to be estimated, and ε is the disturbance term.

To estimate the demand system (Equation 2) for the vegetables considered in this article, the Nonlinear Quadratic Almost Ideal Demand System (NQAIDS) developed by Banks et al. (1997) was adopted. The existing literature points to several advantages of the NQAIDS over other flexible demand systems: In particular, these include the flexibility to include nonlinearities and interactions with the household-specific characteristics in the utility function (which can be important for the household survey data) as well as a better forecasting performance (Blundell et al. 1993; Lyssiotou et al. 2002; Mutuc et al. 2007).

The NQAIDS specification used in this study can be represented as:

$$\omega_{21i} = \alpha_i + \sum_j \gamma_{ij} lnp_{21j} + \beta_j (lny_{21} - lnP) + \\ + \frac{\lambda}{\prod_j p_{21j}^{\beta j}} (\ln y_{21} - \ln P)^2 + \varepsilon \qquad (6)$$

where P is the corresponding price index, is the budget share of the i^{th} vegetable, ε_i is the error term, and the a's, β's and λ's are the parameters to be estimated. Note that the traditional symmetry, homogeneity, and adding-up constraints are imposed in Equation 6. Furthermore, the price index P in Equation (6) is defined as:

$$\ln P = \alpha_0 + \sum_j \alpha_j \ln p_{21j} + \frac{1}{2}\sum_j \sum_i \gamma_{ij} \ln p_{21i} \ln p_{21j} \qquad (7)$$

The use of Equation 7 in estimating the budget share equation (Equation 6) implies that the model is truly nonlinear.

Elasticity estimates

The AIDS has been found very suitable for the study of food demand of different types. The estimated coefficients can be converted to generate estimates of elasticities, which can throw light on the price and expenditure responses of the consumers. The own-price and cross-price elasticities associated with the NQAIDS model in Equation 7 were calculated using the Marshallian and Hicksian elasticities. Following Wadud (2006), the Marshallian price and expenditure elasticities are given by:

$$\varepsilon_{ij}^{m} = -\delta + \left(\frac{\gamma_{ij}}{S_i}\right) - \left(\frac{\beta_i}{S_i}\right) S_j \qquad (8)$$

$$\boldsymbol{\eta}_i = 1 + \left(\frac{\beta_i}{S_i}\right) \qquad (9)$$

where δ is the Kronecker delta.

The Hicksian elasticities can be obtained through the Slutsky equation in elasticity for, namely, as:

$$\varepsilon_{ij}^{H} = -\delta + \left(\frac{\gamma_{ij}}{S_i}\right) - S_j \qquad (10)$$

RESULTS AND DISCUSSION

Socio-economic characteristics

The analysis of socio-economic characteristics of household vegetable demand across urban and rural areas of the Egba Division of Ogun State is presented in Table 1.

Age is a very important socio-economic factor in the consumption study. About 33% of the respondents are below 30 years of age and they are mostly living in the rural areas. Aged, who are above 60 years old, are few (5.9%) and they lived in rural areas. The majority (63.8%) of the respondents are females living in urban areas.

The quantity of vegetables consumed by a household will greatly be influenced by the number of people living in the household. The household size distribution of the respondents revealed that about 43.3% of the household sampled have between 5–6 members. Larger households with members more than 8 are mostly found in the rural areas. The results in Table 1 also show that 83.3% of the household heads sampled are married and 39.2% are self-employed. Also, about 71.7% of the sample consume animal protein in addition to vegetables.

Share of vegetable expenditures

The share of vegetables in total household food expenditure and the budgetary shares of various items in the average weekly vegetable expenditure are shown in Table 2.

As shown in Table 2, about 8.5% of the households average weekly food expenditure ₦ 5124.68 (equivalent to US$ 32.03) per week were devoted to the purchase of various types of vegetables. Tomato has the highest share (33%) of the household expenditures on vegetables. This implies that about one third of the household expenditures on vegetables go for Tomatoes. This result is in agreement with the a-priori expectation; Tomatoes are in high demand because of their multiple uses. Next to the share of Tomatoes are the shares of Carrot (9.7%), Eggplant (8.9%), Fluted Pumpkin (8.5%) and *Corchorus sp.* (8.1%). Water leaf and Water spinach have the lowest share of 4.6% and 0.6%, respectively. This result may probably be due to the belief that the very low class income groups of the society consume especially Water leaf.

Table 1. Socio-economic characteristics of the sampled households

	Urban	Rural	Total
Age			
< 30	14 (26.6)	26 (44.8)	40 (33.3)
30–39	19 (30.6)	8 (13.8)	27 (22.5)
40–49	22 (35.5)	9 (15.5)	31 (25.8)
50–59	7 (11.3)	8 (13.8)	15 (12.5)
60–69	–	5 (8.6)	5 (4.2)
> 70	–	2 (3.4)	2 (1.7)
Sex			
Male	22 (33.5)	16 (27.6)	38 (31.7)
Female	40 (64.5)	41 (72.4)	82 (63.8)
Household size			
< 2	5 (8.1)	10 (17.2)	15 (12.5)
2 4	23 (37.1)	23 (39.7)	46 (38.3)
5–6	32 (51.6)	20 (34.5)	52 (43.3)
> 8	2 (3.2)	5 (8.6)	7 (5.8)
Marital Status			
Single	7 (11.3)	9 (15.5)	16 (13.3)
Married	53 (85.5)	47 (81)	100 (83.3)
Divorced	1 (1.6)	–	1
Other	1 (1.6)	2 (3.4)	3 (2.5)
Occupation			
Salary Earner	27 (43.5)	12 (20.7)	39 (32.5)
Self Employed	28 (45.2)	19 (32.8)	47 (39.2)
Retired Persons	1 (1.6)	1 (1.7)	2 (1.7)
Unemployed	–	1 (1.7)	1 (0.8)
Others	6 (9.7)	25 (43.1)	31 (25.8)
Vegetarian			
Yes	18 (29.0)	16 (27.6)	34 (28.3)
No	44 (71.0)	42 (72.4)	86 (71.7)
Total	62 (100)	58 (100)	120 (100)

The figures in parenthesis are percentages (%)

Expenditure elasticity

Expenditure elasticity simply refers to the degree of responsiveness of expenditure to change in income. The expenditure elasticities for each of the vegetable commodities considered are presented in Table 3.

Results in Table 3 reveal that five expenditure elasticities are statistically significant. The expenditure elasticities are significant for Bitter leaf at 1%, Water spinach at 10%, Eggplant at 1%, Tomato at 1%, and *Amaranthus sp.* at 5% level. In general, the estimated expenditure elasticities for the different vegetable commodities are close to unity, which is consistent

Table 2. Household food expenditures and vegetables budget shares

Description	Mean	Standard deviation
Total food expenditure (N/week)	5 124.68	4 156.12
Expenditures on vegetables (N/week)	436.43	433.95
Vegetable share in food expenditures	0.085	0.078
Commodity share in the vegetable budget		
bitter leaf	0.050	0.072
cabbage	0.054	0.104
carrot	0.097	0.135
water spinach	0.006	0.028
egg plant	0.089	0.134
corchorus sp.	0.081	0.089
okra	0.052	0.059
tomato	0.335	0.235
celosia argentea	0.048	0.064
amaranthus sp.	0.064	0.055
fluted pumpkin	0.085	0.078
water leaf	0.046	0.054
other vegetables	0.020	0.061

and within the range of the previous studies (Llanto 1998; Mutuc et al. 2007).

The Bitter leaf and Eggplant have high but negative expenditure elasticities, which indicates that an increasing income would induce a low consumption of these commodities relative to the other vegetables. This situation is especially true because Bitter leave and Eggplant are typically viewed as an inferior commodity in the study area since these vegetables crop are rarely cultivated in the commercial quantity.

At the other end of the spectrum, Tomato is another commodity of interest because it tends to have a lower expenditure elasticity relative to other vegetables. This result implies that vegetable is viewed more as a necessity. Tomato as a necessity is not surprising as it is used as an ingredient to sauté fish, meat and other vegetable forms. It also forms the main component of soup and most simple diets in Nigeria.

In Table 4, the estimates of the own-price and cross-price elasticities of the household demand for various vegetable commodities are shown. The own-price elasticities are the emboldened values along the principal diagonal of the Table. The other off diagonal values are estimates of the cross price elasticities. The own-price elasticity coefficients are statistically significant for Bitter leaf (–0.47), Water spinach (–0.36),Tomato (–0.13), C*elosia argenta* (–0.49), and other vegetables (–1.5). The coefficients for the own-price elasticities carry the expected negative signs for all vegetables; implying that a decrease in prices of the vegetables will bring about an increase in the quantity of the product demanded. The result also shows that only the own-price elasticity of demand for other vegetables is above unity, the demand for Bitter leaf, Water spinach, Tomato, and *Celosia argenta* are slightly less elastic.

Table 4 also shows that there are a number of statistically significant cross-price elasticities for the vegetables considered in the study. Positive cross-price elasticities indicate substitutability implying that an increase in the price of vegetable commodity *i* causes an increase in the quantity of vegetable *j* demanded; while negative cross-price elasticities indicate the complementarity implying that an increase in the price of vegetable *i* decreases the quantity of vegetable *j* demanded. As shown in Table 4, the possibilities for the vegetable commodity substitution with price increases exist for most pairs of the vegetable commodities, except Okra and Cabbage, *Amaranthus sp.* and Bitter leaf, as well as Fluted pumpkin and Water leaf, among few others, which were revealed as complements, given that they share negative cross-price elasticities.

Table 3. Expenditure elasticity

S/No	Vegetable type	Elasticity at means	*t*-values
1	Bitter leaf	–3.43***	–2.83
2	Cabbage	–0.65	–0.48
3	Carrot	–0.10	–0.13
4	Water spinach	1.02*	–1.73
5	Eggplant	–3.67***	3.47
6	*Corchorus sp.*	0.75	0.83
7	Okra	1.25	0.68
8	Tomato	0.27*	1.68
9	*Celosia argentea*	–0.78	–0.98
10	*Amaranthus sp.*	1.75**	2.24
11	Fluted pumpkin	–0.21	–0.23
12	Water leaf	0.83	1.34
13	Other vegetables	–0.66	–0.75

Note: *t*-values are those of related income coefficients (β_j) in the estimated NQAIDS model

*, **, ***, denote 10%, 5%, and 1% level of significance

CONCLUSION AND RECOMMENDATION

The estimate of this paper adds to the growing literature on vegetable demand using the Almost Ideal Demand System (AIDS) framework. Since there are few works on the developing economies, this study may be of interest to researchers working in this area. The estimates from this study show that all twelve vegetable commodities considered in the study – Bitter leaf, Cabbage, Carrot, Water spinach, Eggplant, *Corchorus sp.*, Okra, Tomato, *Celosia argentea, Amaranthus sp.*, Fluted Pumpkin and Water leaf – have an inelastic and negative own price elasticity of demand, implying they are generally accepted as necessities. Most of the vegetable commodities were treated as substitutes by the households, given that they share the positive cross-price elasticities of demand, except for a few that were found to be complements. Hence, the study concluded that while the demands for vegetables are generally price inelastic in the study area, households tend to substitute some relatively cheaper vegetables for those that become more expensive. However, only the demand for Water spinach, Tomato, and *Amaranthus sp.* were found to increase significantly with increase in income; while the demand for Bitter leaf and Carrot decline significantly with the increase

Table 4. Own- and cross- price elasticities of commonly consumed vegetables

Variables	Bitter leaf	Cabbage	Carrot	Water spinach	Egg plant	*Corchorus sp*	Okra	Tomato	*Celosia argentea*	*Amaranthus sp.*	Fluted pumpkin	Water leaf	Other vegetables
Price of Bitter leaf	**−0.47***** **(−2.82)**	−0.67 (−0.48)	−0.15 (0.13)	0.12 (1.43)	0.59*** (3.5)	0.12 (0.83)	0.21* (1.68)	−0.37 (−0.31)	−0.13 (−0.98)	−0.26** (−2.24)	−0.27 (−0.23)	0.15 (1.34)	−0.99 (−0.75)
Price of Cabbage	−0.67 (−0.51)	**−0.72** **(−0.29)**	−0.11 (−0.7)	−0.38 (−0.44)	−0.2 (−0.97)	0.14 (0.80)	−0.26* (−1.92)	−0.98 (−0.54)	0.19 (1.36)	0.13 (0.94)	0.11 (0.77)	0.78 (0.64)	0.19 (1.33)
Price of Carrot	−0.15 (−0.1)	−0.11 (−0.7)	**−0.32** **(−1.32)**	0.12* (1.79)	0.49 (0.24)	0.10 (0.71)	−0.63 (−0.59)	−0.48 (−0.22)	0.18* (1.68)	0.23** (2.33)	−0.13 (−0.98)	0.27 (0.28)	−0.35 (−0.29)
Price of Water Spinach	0.12* (1.64)	−0.38 (−0.44)	0.12** (1.97)	**−0.36***** **(−2.62)**	−0.17 (−1.82)	−0.26 (−0.27)	−0.43 (−0.45)	−0.46 (−0.75)	−0.70 (−0.66)	−0.10 (−0.92)	0.81* (1.71)	0.46 (0.59)	0.17 (1.45)
Price of Egg plant	0.59 (3.55)	−0.20 (−0.97)	0.49 (0.24)	−0.17 (−1.82)	**−0.87** **(−0.24)**	−0.17 (−0.84)	−0.43 (0.27)	−0.41* (−1.81)	−0.97 (−0.62)	0.44 (0.29)	0.30* (1.66)	−0.64 (−0.44)	0.16 (0.97)
Price of *Corchorus*	0.12 (0.80)	0.14 (0.80)	0.10 (0.71)	−0.26 (−0.26)	−0.2 (−0.87)	**0.32** **(1.34)**	−0.13 (−0.86)	−0.14 (−0.87)	−0.31 (−0.21)	−0.20 (−1.14)	0.21 (1.44)	0.53 (0.41)	−0.25* (−1.65)
Price of Okra	0.21* (1.72)	−0.26* (−1.92)	−0.63 (−0.59)	−0.43 (−0.45)	0.43 (0.27)	0.13* (−1.86)	**−0.26** **(−1.45)**	−0.12 (−1.13)	0.22* (1.73)	0.32** (2.44)	−0.97 (0.79)	−0.59 (−0.53)	0.54 (0.37)
Price of Tomato	−0.37 (−0.31)	−0.98 (−0.54)	−0.48 (−0.22)	−0.46 (−0.75)	−0.41* (−1.82)	−0.14 (−0.87)	−0.12 (−1.12)	**−0.13***** **(3.15)**	−0.18 (−1.54)	−0.14 (−1.35)	−0.82 (−0.57)	0.10 (0.98)	0.38 (0.33)
Price of *Celosia argentea*	−0.12 (−0.91)	0.18* (1.65)	0.17* (1.68)	−0.7 (−0.65)	−0.79 (−0.62)	−0.31 (−0.21)	0.22* (1.73)	−0.18 (−1.54)	**−0.49***** **(−2.65)**	0.35** (2.42)	0.80 (0.69)	−0.64 (−0.58)	−0.16* (−1.71)
Price of *Amaranthus*	−0.26 (−2.23)	0.13 (0.94)	0.23** (2.33)	−0.1 (−0.92)	0.44 (0.29)	−0.16 (−1.14)	0.32** (2.44)	−0.14 (−1.35)	0.35** (2.42)	**−0.19** **(−1.04)**	−0.32 (−0.27)	−0.30 (−0.27)	0.77 (0.51)
Price of Fluted Pumpkin	−0.27 (−0.26)	0.11 (0.76)	−0.13 (−0.98)	0.81 (1.71)	0.30* (1.66)	0.21 (1.44)	−0.97 (−0.79)	−0.82 (−0.57)	0.80 (0.69)	−0.32 (−0.3)	**−0.20** **(−1.10)**	−0.19* (−1.79)	−0.69 (−0.55)
Price of Water Leaf	0.15* (1.73)	0.78 (0.64)	0.27 (0.28)	0.46 (0.59)	−0.64 (−0.44)	0.53 (0.41)	−0.59 (−0.53)	0.10 (0.98)	−0.64 (−0.57)	−0.30 (−0.27)	−0.19* (−1.79)	**0.27** **(0.18)**	0.62 (0.51)
Price of others	−0.99 (−0.78)	0.19 (1.32)	−0.33 (−0.29)	0.17 (1.44)	0.16 (0.97)	−0.25 (−1.62)	0.54 (0.37)	0.38 (0.33)	−0.16 (−1.13)	0.77 (0.51)	−0.69 (−0.54)	0.62 (0.51)	**−0.35*** **(−1.65)**

Figure in parentheses are t-values are those of related price coefficients () in the estimated QAIDS model

*, **, ***, denote 1%, 5%, and 10% level of significance

in income. The demand for other types of vegetables did not respond significantly to the income changes. These results point on several policy implications. Firstly, the enhancement of healthy nutritional habits through the educational programmes to enlighten various households in the study area on the consumption of vegetables appears inevitable, given the tendency to treat some of the vegetables (e.g. Carrot is very rich in carotene), as inferior commodities. This suggests a poor appreciation of the nutritive value of some vegetables. Secondly, since the demand for the vegetable commodities is generally prince inelastic, but more responsive to income changes, some focus on the poverty alleviation and the enhanced income, which are crucial in stimulating an increased vegetable consumption to enhance nutrition. Measures to encourage the increased vegetable production to enhance income would also be helpful. These may include the subsidized provision of improved seeds, irrigation facilities and fertilizer by the agro-services.

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