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Demand for African Nutmeg and Scent Leaf Spice among Households in Imo State, Nigeria

Catherine A. Akinpelu[1*] Kabir K. Salman[2]
1. Spices Improvement Program, National Horticultural Research Institute, P.M.B 5432, Idi-Ishin, Ibadan, Nigeria
2. Department of Agricultural Economics, University of Ibadan, Oyo State, Nigeria
* E-mail of Corresponding author: adkate1@yahoo.com

Abstract
Spices are potential sources of some micronutrients of which Nigeria ranks low in consumption and this could be as a result of low demand. The objective of this study was therefore to analyze the demand for African Nutmeg (AN) and Scent Leaf (SL) in Imo State, Nigeria. A well-structured pretested questionnaire was used to gather information on household socio-economic characteristics (age, household size, income and educational level), household food expenditure, quantity of spice consumed and price per unit from a total sample size of 340 households. Data were analyzed using descriptive statistics and double hurdle model at $\alpha_{0.05}$. The study revealed that age, household size and monthly income were 50.5 ± 11.0 years, 6.5 ± 2.5 and ₦104, 699.0 ± ₦84,104.0 respectively. Households' health awareness on spices was relatively low (17.4%) for AN while it was high (65.6%) for SL. Scent leaf had a higher Expenditure Share on spices (ES) (27%) and Per Capita Expenditure (PCE) (₦56.40/month) than AN with an ES (24%) and PCE (₦40.32). Per capita expenditure, income class, location and prices of African nutmeg and scent leaf respectively influence household's decision to consume and subsequently demand AN and SL in Imo state. Rural-urban differences exist in the demand for both spices by households in Imo state. The study however recommends an increased awareness on the nutritional and medicinal properties of the selected spices which invariably would lead to an increase in its demand.
Keywords: Household demand, Double hurdle, Micro-nutrients and Imo state

1. Introduction

A spice is a vegetable substance of indigenous or exotic origin and being aromatic is used to enhance the flavour of food (Ekeanyanwu and Etienajirhevwe, 2012). They may be in the form of dried seeds, fruits, roots, barks, leafs or vegetative used nutritionally in significant quantities as a food additive for the purpose of flavor, color or as a preservative that kills harmful bacteria or prevents their growth and can contribute significant portions of micronutrients (Vitamin A, iron, magnesium, calcium, etc) to the diet (Tsai *et al*., 2007; Gurib-Fakim, 2006; Krishna *et al*., 2009). Spices are generally found in four agro ecological zones of the country namely: Forest (including mangrove and rainforest), Dried Savanna, Guinea Savanna and Sudan Savanna (Adelaja, 2005).

In Nigeria and other African countries, the kernel obtained from the seeds of African nutmeg (*Monodora myristica*) is a popular spicing agent as well as an aromatic stimulating addition to medicine and snuff (Ekeanyanwu et al., 2010). Scent leaf possesses diaphoretic properties, with the juice of the leaves acting as a stimulant and carminative (Nwinyi et al, 2009). Spices are mostly of vegetable origin. Thus, an inadequate intake of vegetables is increasingly recognized as one of the key risk factors for cardiovascular diseases and some forms of cancers, the two leading causes of death in the world today (Ruel *et al*., 2005). Due to vitamin A deficiency alone, 25 percent of our children grow up with lowered immunity, which leads to frequent illness and poor health (Maziya-Dixon *et al*, 2004). Lack of micronutrients in the diet impairs cognitive and physical development, leading to a less productive and upward moving economy. Studies have shown that poverty in developing countries, like Nigeria, takes various forms such as low nutritional status, low level of education, decline in the spending on social services, high percentage of household income spent on food, low level of savings, low level of investments and low level of productivity (Tangka *et al*, 2002; Njimanted, 2006; Umeh and Asogwa, 2012). Thus, this study intends to investigate the level of health awareness on the selected spices, the expenditure profile viz-a-viz the factors affecting their demand in the study area.

2. Problems of Zero Expenditure

Econometric modeling of household demand has a major problem associated with zero expenditure during household survey. Tafere e*t al* (2010) identified three main sources of zero-expenditure in household survey which includes permanent zero consumption (or non-consumers), zero consumption during the survey period, and optimal zero consumption (or potential consumers). Permanent zero consumption may arise due to non-economic reasons that include religious beliefs, health considerations and perhaps non-smokers in the case of tobacco.

The zero consumption during the survey could be linked to frequency with which households consume spices such that the survey period is not long enough to capture it. And, optimal zero consumption may arise due

to economic reasons perhaps the households are unable to consume the commodity at current price and income level. The latter is what Heckman (1979) referred to as sample selection problem/bias. With regard to the present study, we envisaged the presence of zero expenditure will create censoring in the survey data. To this end, the study made use of Double Hurdle model to estimate the demand characteristics of spices in the study area.

2.1 Theory of Consumer Behavior

The theory of household consumer behavior is based on the concept of consumer preference and the assumed existence of consumer utility function. The theoretical assumption poses that when a consumer is faced with alternative bundles or "baskets" of commodities each of which has some utility content, he/she will prefer a bundle with higher utility content to one with lower utility content. There are however two key assumptions to this theory which are; (i) there is perfect competition in the market and (ii) every consumer is a utility maximizer.

Utility or satisfaction is a function of a good/commodity or a bundle of goods being consumed. This means that the quantity of commodity is an input in the consumption activity of a household and the utility derived from its consumption is the output. It is noteworthy that quite a number of assumptions and abstractions are involved in this kind of formulation of the consumption process. Factors usually taken into consideration about the standard consumer include his income, price and household demographic variables e.t.c. (see Lipsey, 1975; Burk, 1978; Koutsoyianis, 1985; Houston *et al*, 1998; Murty, 2000; Ndife, 2002; Ishida, *et al*, 2003).

The basic objective of the theory of consumer behavior is to explain how a rational consumer makes decision on - what to consume, when confronted with various prices within a limited budget. At this level of generality, the usefulness of this theory for empirical purposes is that it establishes a set of constraints that the demand parameters must satisfy, thus limiting the number of independent parameters to be estimated and ensuring consistency in the results obtained.

3. Methodology

Study Area

The study was carried out in Imo state, Nigeria. The state was chosen because of an array of indigenous and exotic spices abounding in this zone (Adebayo et al, 2010). The study area lies within latitudes 4°45'N and 7°15'N, and longitude 6°50'E and 7°25'E. It covers an area of 532,000 ha, with an arable area of approximately 300,000 ha. The Imo people are predominantly subsistence farmers with Igbo being their major language. The Igbo's number about 23 million thereby having one of the highest population densities in West Africa, ranging from 300 to over 1000 persons per kilometer. (ISG, 2000).

Source and types of data:

Primary data obtained through the use of pretested questionnaire and Focus Group Discussions was used for the study. Information elicited include; socio-economic and demographic characteristics of the respondents such as age, gender, household size, level of education, employment status, household income level, marital status and also, household spices expenditure details using a 30 days household expenditure data, market price/desired price of the selected spices.

Sampling procedure and Sampling size:

The study employed multistage sampling technique. The first stage was the random selection of six (6) local government areas (LGAs) within the three (3) agricultural zones using sampling proportionate to size. In the second stage, two villages were randomly selected from each of the LGA's while in the third stage, was the random selection of three hundred and sixty (360) households from the sampling frame of all the houses within the selected villages. A total sample size of 340 households was found useful for the analysis due to inconsistency in the information provided by the household heads.

Analytical Procedure:

Data collected were analyzed using simple descriptive statistics such as frequency, percentage and tables. To achieve the main objective of this study, a typical linear demand function is specified:

$$C_{ij} = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 ..... + \alpha_k X_k + \nu_{ij} \quad \text{---------- 1}$$

C_{ij} is a vector of household expenditure assumed to represent household demand for the following *j-th* identified spices in the study area viz. **African nutmeg and scent leaf**. The explanatory variables X_1 to X_{13} hypothesized to explain household demand for above the aforementioned spices include:

X_1 = Age of respondent (years)
X_2 = Gender of household head (1 = male, 0 = female)
X_3 = Marital status (1= married, 0 otherwise)
X_4 = Household Size
X_5 = Years of schooling (Years)
X_6 = Location (1= Rural, 0= Urban)

X_7 = Per Capita Expenditure on Spices (PCE) (₦)
X_8 = Price of African nutmeg (₦/kg)
X_9 = Price of Scent leaf (₦/kg)
X_{10} = Occupation of household head (1= farming, 0 otherwise)
X_{11} = Q_25 (Dummy variable representing HHs within 25% below income distribution)
X_{12} = Q_50 (Dummy variable representing HHs within 50% below income distribution)
X_{13} = Q_75 (Dummy variable representing HHs within 75% of income distribution)[1]

The explanatory variables were selected based on previous studies such as Ruel *et al* (2005), Shinoj and Mathur (2006), Akinleye (2007), Obayelu *et al*. (2009) and Ogundari and Arifalo (2013). The determinants of spices demand was analyzed using the double hurdle model. The underlying data generating process (DGP) for DH model for the demand for spices can be described using the following two equations:

$$d_i^* = m_k'\delta + \zeta_i \qquad d_i = \begin{cases} 1 & if \quad d_i^* > 0 \\ 0 & if \quad otherwise \end{cases} \quad \text{Participatory equation 1}$$

$$e_i^* = x_j'\beta + \tau_i \qquad e_i = \begin{cases} e_i^* & if \quad d_i^* > 0 \text{ and } e_i^* > 0 \\ 0 & if \quad otherwise \end{cases} \quad \text{Consumption equation 2}$$

Where, equation 1 represents what Cragg (1971) refers to as first hurdle model. It relates the individual decision to consume spices denoted by a dummy variable (d) to a vector of exogenous variable m_k'. The d_i^* is the unobserved latent variable which describes whether household consumes spices or not while d_i is the correspondent observed variable. ζ_i is the error term for equation 1. Equation 2 is the Cragg's second hurdle, where e_i^* is the unobserved latent variable describing expenditure on spices while e_i is the corresponding observed expenditure on spices by the households. The x_j' is a vector of determinants of household expending on spices and τ_i is the error terms for equation 2.

4. Results and Discussion

Socioeconomic characteristics of household heads

As shown in Table 1, 62.05% of the household heads were within the age group 41-60 years, with mean age of 50 years. This result indicates that African nutmeg and scent leaf are spices utilized and appreciated more by the elderly than with the younger generation. More than half 50.88% of households in Imo state were headed by females with only 49.12% headed by males. The mean annual income for a household in the study area is N93, 655.91 while the mean household size is 6 with more than half (60.00%) of the households in the study area having between 4-7 household members. Most of the household heads (52.65%) had tertiary level of education depicting clearly that the high level of literacy can positively enhance their demand for spices in the study area.

Households' awareness on health benefits of spices

Awareness on health benefits of the selected spices using Likert scale rating ("very poor" = 1, "poor" = 2 "fair" = 3, "good" = 4, and "very good" = 5) are shown in Fig 1. The results revealed that African nutmeg had a higher rating (8.82% and 15.59%) for "poor" and "fair" perspective respectively compared to scent leaf (1.47% and 3.82%) while, scent leaf has the highest rating (65.59%) for the "very good" perspective compared to African nutmeg (30.88%). Invariably, health awareness of spices was relatively lower for African nutmeg than it was for scent leaf. This could be attributed to the fact that most households in Imo state utilize scent leaf for various purposes most especially in the preparation of soups.

Household Expenditure Pattern on Spices

Scent leaf as shown in Fig 2&3. has a higher expenditure share (27.00%) and mean per capita expenditure (₦56.40%) while African nutmeg has a lower expenditure share (24.00%) and mean per capita expenditure of (₦40.32) depicting that an average household in the study area spent more on the purchase of scent leaf than it did on African nutmeg and other selected spices.

Determinants of Household Demand for African nutmeg

The participation stage of the explanatory variables as revealed in Table 4 show that; prices of African nutmeg and scent respectively exert positive influence on households' decision to consume African nutmeg while education and middle income status negatively influences the households' decision to consume African nutmeg.

The second hurdle of the model examined the actual demand for African nutmeg per kilogram as the dependent

[1] Q0.25 represents the poorest HHs, Q0.5 represents HHs in the middle income and Q0.75 represents richest HHs

variable. The result shows that location, occupation, price of African nutmeg and high income status are positive significant determinant factors that influences the demand for African nutmeg. The location of the household is positive and significant ($p \leq 0.10$) implying that more rural household heads demanded African nutmeg than their urban counterparts. This is in consonance with the study by Obayelu *et al* (2009), that household's decision to participate in fruits and vegetable food group was based on their income and location. Occupation and high income status of the household were also positive and significant at ($p \leq 0.001$).

Hence, an increase in farming household heads and an increase in income will increase the demand for African nutmeg. This is in agreement with the study by Ogundari and Arifalo, 2013 on the demand for fruits and vegetables in Nigeria where farming household heads were found to demand more of vegetables than non-farming heads of households.

Determinants of Household Demand for scent leaf

The 1st hurdle (as shown in Table 2) which is also known as the participation stage, reveals that occupation of the household head and prices of African nutmeg and scent leaf respectively exert positive influence on households' decision to consume scent leaf while the location of household and, marital status negatively influences the households' decision to consume scent leaf. The influence of price of spices is in consonance with the study on frozen foods by Zerrin *et al*, 2011, who postulated that an increase in prices of the frozen food items would result in proportionally less decrease in their demand while the marital status influence on household spices consumption is in agreement with the study by Obayelu *et al*, 2009 wherein marital status influenced expenditure share of fruits and vegetables in North-Central Nigeria.

The second hurdle of the model examined the actual demand for scent leaf per kilogram as the dependent variable. The results show that location, per capita expenditure, low income status, middle income status and high income status of the households are the significant determinant factors that influence the demand for scent leaf. The location of the household is positive and significant ($p \leq 0.05$) implying that more rural household heads demanded scent leaf than their urban counterparts. This is in accordance with the study by Obayelu *et al*, 2009 and Ogundari and Arifalo, 2013.

The per capita expenditure was negative and significant ($p \leq 0.001$) which implies that the demand for scent leaf increases with a decrease in per capita expenditure of household. Low income ($p \leq 0.001$) and middle income status ($p \leq 0.001$) of the households positively influence the demand for scent leaf while the high income status of household negatively influences the actual demand for scent leaf. Hence, the demand for scent leaf is higher among the low and middle income class. This is in accordance with the study by Shinoj and Mathur, 2006 who opined that a positive income change would motivate consumers in the low income class to spend more on spices in comparison to their higher income counterparts.

5. Conclusion

The study highlighted the expenditure pattern and factors influencing the participation and consumption of African nutmeg and scent leaf in Imo state. Results indicated that the level of health awareness on scent leaf was higher than that on African nutmeg. This invariably has led to an increase in the household expenditure share of scent leaf when compared with African nutmeg. Rural-urban differences exist in the demand for spices in Imo state as households in the rural areas have a higher likelihood of participation and consumption of the selected spices either as a result of the availability of these spices on their farmlands and home gardens or their knowledge on the medicinal and nutritional properties of the spices.

5.1 Recommendations

Based on the result of the study, the following are recommended:

• Awareness on the health and nutritional properties of these spices should be intensified in the state to increase demand.

• Due to the rural-urban differences in spices consumption, it is pertinent to encourage advocacy in the urban areas of the state so as to boost demand for the spices.

• The demand for spices in Imo state was most prominent amongst the low income groups, therefore government through agricultural organisations sensitize the sectors (rural and urban) comprising of the rich and the poor on the benefits and potentials inherent in the demand for spices in the State.

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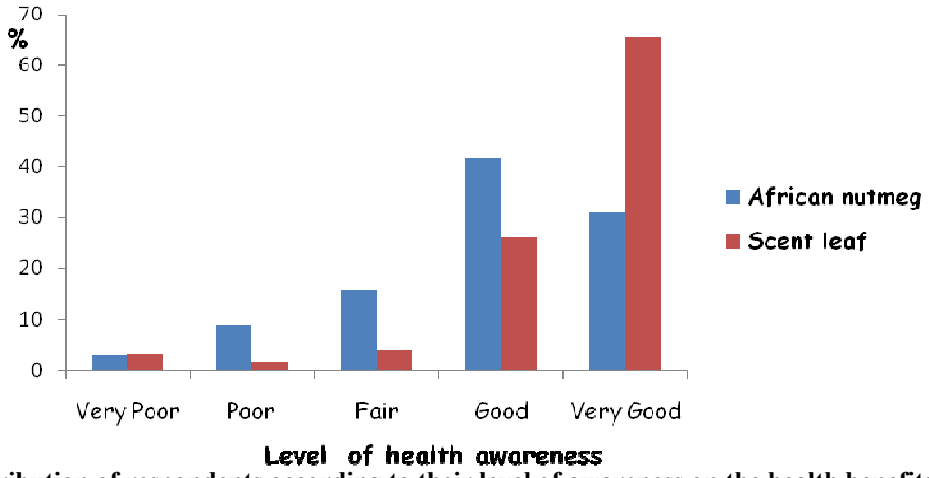

Fig 1: Distribution of respondents according to their level of awareness on the health benefits of spices

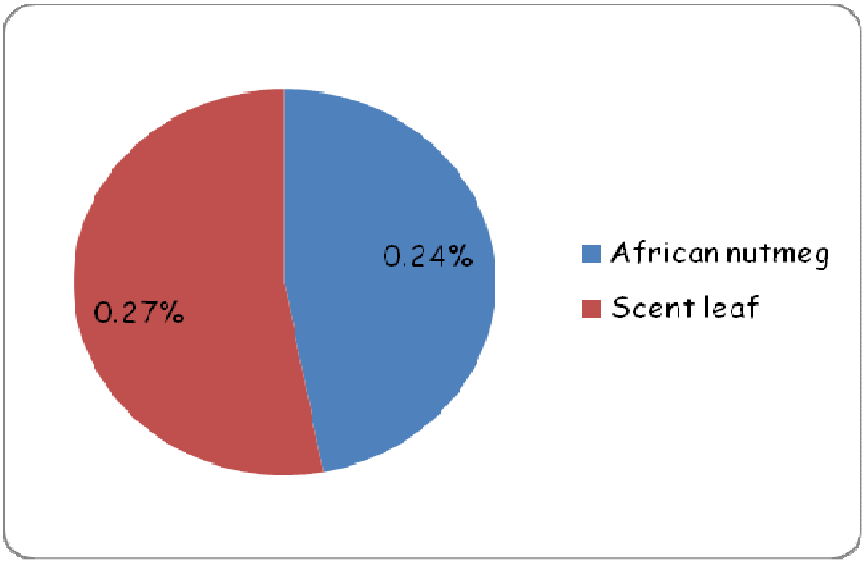

Fig 2: Expenditure share (%) for AN and SL

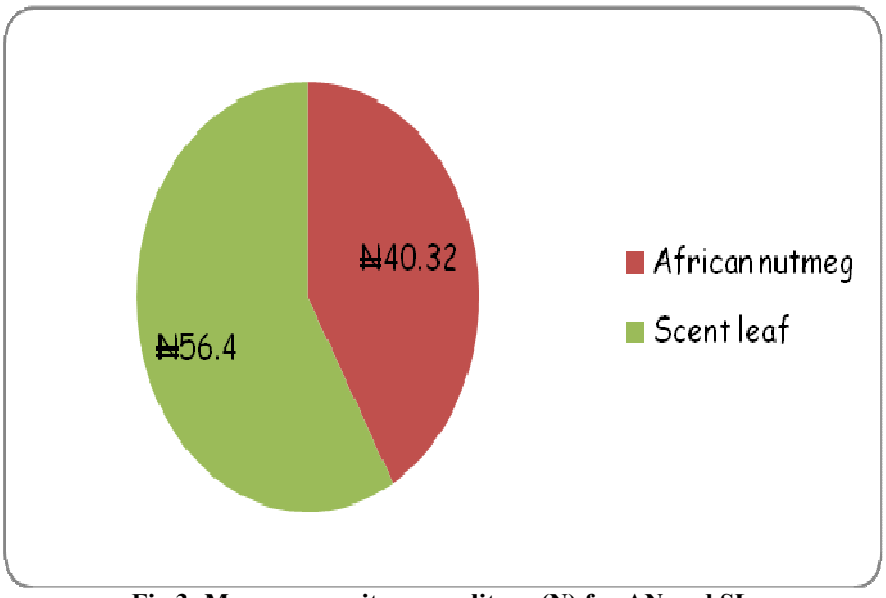

Fig 3: Mean per capita expenditure (₦) for AN and SL

Table 1. Demographic and Socio-economic characteristics of household heads

Variables	Frequency (N)	Percentage (%)
Age group		
22 – 40 Years	75	22.04
41 – 60 Years	211	62.05
61 – 85 Years	54	15.85
Mean	**50.49**	
Gender		
Male = 1	167	49.12
Female = 0	173	50.88
Household Income		
≤ ₦30,000	56	16.47
₦31,000 – ₦70,000	104	30.59
₦71,000 – ₦110,000	87	25.59
₦111,000 – ₦150,000	43	12.65
≥151,000	50	14.71
Mean	**₦93,655.91**	
Household size		
1-3 members	31	9.12
4-7 members	204	60.00
8-11 members	94	27.65
≥12	11	3.23
Mean		**6.47**
t-value	**0.8551 (2.5164)**	
Education		
Primary	34	10.00
Secondary	104	30.59
Tertiary	179	52.65
Adult education	12	3.53
Non-formal education	11	3.24

Source: Estimates from field survey, 2013

Table 2: Maximum Likelihood Estimation of Double Hurdle Model for African nutmeg

	Double Hurdle Estimations	
Dependent Variable:	**1st Hurdle (Tier 1)**	**2nd Hurdle (Tier 2)**
Age of respondent (years)	0.0083 (0.0128)	0.0027 (0.0039)
Marital status (1/0)	0.1543 (0.2904)	0.0864 (0.0735)
Sex	-0.6830 (0.3107)**	-0.0529 (0.0838)
Household size	0.1790 (0.3368)	-0.1358 (0.0891)
Years of education	-0.8491 (0.3404)**	-0.0772 (0.0772)
Location(1/0)	-5.7032 (162.3309)	0.2683 (0.1545)*
Per capita expenditure	0.3991 (0.2487)	0.0153 (0.0607)
Occupation of household head	-0.0687 (0.1819)	0.1796 (0.0553)***
Price of African nutmeg ₦/kg	0.1791 (0.0605)***	0.1796 (0.0553)**
Price of scent leaf ₦/kg	0.1109 (0.0611)*	0.0149 (0.0208)
Q_25	-5.4141 (162.3316)	0.0669 (0.1656)
Q_50	-1.3359 (0,6152)**	0.0923 (0.1685)
Q_75	-0.6016 (0.4078)	0.6231 (0.1502)***
Intercept	4.0583 (162.3539)	4.9408 (0.7837)
Sigma	-	0.6269 (0.0251)
Log likelihood		-356.8089
Number of observations		340
Wald Chi^2 (12)		36.64
Prob> Chi^2		0.0014

Source: Generated by Author with data from field survey (2013) using Stata.
*Note: *, **, and *** indicate p-values significant at 10%, 5%, and 1%, respectively. Standard errors are in parentheses. 1/0 refers to dummy variables with 1 for affirmative responses and 0 otherwise.*

Table 3: Maximum Likelihood Estimation of Double Hurdle Model for scent leaf

	Double Hurdle Estimations	
Dependent Variable:	**1st Hurdle (Tier 1)**	**2nd Hurdle (Tier 2)**
Age of respondent (years)	0.0056 (0.0109)	-0.0038 (0.0044)
Marital status (1/0)	-0.5313 (0.2129)**	-0.0529 (0.0831)
Sex	0.1896 (0.2407)	0.1362 (0.0903)
Household size	0.1153 (0.23560)	0.0472 (0.1024)
Years of education	0.0161 (0.1984)	-0.1011 (0.0855)
Location (1/0)	-1.2173 (0.5981)**	0.3689 (0.1637)**
Per capita expenditure	0.1980 (0.1602)	-0.2462 (0.0688)***
Occupation of household head	0.3211 (0.1685)*	0.0394 (0.0594)
Price of African nutmeg ₦/kg	0.1159 (0.0551)**	0.0435 (0.0286)
Price of scent leaf ₦/kg	0.1179 (0.0429)**	-0.0109 (0.0266)
Q_25	-6.0316 (160.1113)	0.9369 (0.1777)***
Q_50	-4.9973 (160.1110)	0.6691 (0.1785)***
Q_75	-5.6630 (160.1106)	-0.4831 (0.1556)***
Intercept	3.8172 (160.1271)	7.2540 (0.8752)
Sigma	-	0.6655 (0.0276)
Log likelihood		-394.67291
Number of observations		340
Wald Chi^2 (12)		37.78
Prob> Chi^2		0.0010

Source: Generated by Author with data from field survey (2013) using Stata.
*Note: *, **, and *** indicate p-values significant at 10%, 5%, and 1%, respectively. Standard errors are in parentheses. 1/0 refers to dummy variables with 1 for affirmative responses and 0 otherwise.*

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