Socio-economic determinants of *Corchorus olitorius* and *Telfairia occidentalis* demand in Osun State, Nigeria: Implications for local value chain upgrading

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Background

- *Corchorus olitorius* (jute mallow, '*ewedu*' in Yoruba, '*ayoyo*' in Hausa) and *Telfairia occidentalis* (fluted pumpkin, '*ugu*' in Igbo) are popular green leafy vegetables in sub-Saharan Africa (Schippers, 2000) that constitute a culturally significant component of the indigenous cuisine in southwestern Nigeria.
- *C. olitorius* leaves are a rich source of iron, protein, calcium, thiamin, riboflavin, niacin, folate and dietary fiber. Both the leaves and seeds of *T. occidentalis* are of high nutritional, medicinal and industrial values, being variously rich in protein, fat and vitamins (Badifu *et al.*, 1991; Aletor *et al.*, 2002).
- Both vegetables have low-input cultivation needs within traditional farming systems and provide appreciable cash income to small farm families in resource-poor rural and peri-urban communities in developing countries.
- Consumption of vegetable greens in human diets falls short of the World Health Organization's (WHO) minimum recommendation of 400g per capita per day – a cause of micronutrient deficiencies in developing countries. Low vegetable intake was ranked sixth main factor for mortality in the world (approximately 2.7 million deaths a year) (WHO, 2002).
- Value chain upgrading strategies for neglected and underutilized species (NUS) are dependent on the availability of empirical information on their utilization, socio-economic characteristics of users and the demand dynamics.

Objectives

- To determine the socioeconomic characteristics of household heads and examine the factors influencing household demand for *C. olitorius and T. occidentalis* in rural and urban Osun State, Nigeria.
- To provide information that will enhance the development and implementation of value chain upgrading strategies for both NUS.

Methodology

Study area
Osun is a land-locked state in South-West Nigeria covering approximately 8,602 km^2. It runs a predominantly agrarian economy that is dependent on two distinct seasons – the Rainy (late March until October) and Dry (November to early March) seasons. Temperatures range between 21.1ºC and 31.1ºC, while mean annual rainfall ranges between 800mm in the derived savanna agroecological zone to the north and 1500mm in the rain forest zone to the south.
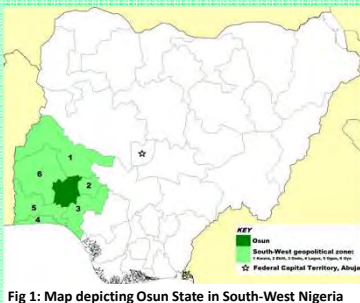

Fig 1: Map depicting Osun State in South-West Nigeria

Sampling
A three-stage sampling procedure was used for the study. The 1st stage was a random selection of *four out of the 30 Local Government Areas (LGAs)* in Osun State. At the 2nd stage, a random selection of *one town (urban settlement)* and *one village (rural settlement)* from each of the four selected LGAs was carried out. The 3rd stage was a random selection of *100 households* from each selected settlement.

Data collection and analyses
- Well-structured questionnaires were pretested and used to obtain primary data on socio-economic and demographic characteristics of household heads. We also observed household expenditure (quantity and price) on *Corchorus olitorius and Telfairia occidentalis* using the respondents' seven days memory recall.
- We used descriptive statistics to describe respondents' socioeconomic and demographic characteristics.
- The *Tobit Model* of regression analysis (Tobin, 1958) was employed in determining the socioeconomic factors influencing demand for both vegetables.

The Tobit Model:

$$y_i^* = x_i\beta + e_i$$
$$y_i = x_i\beta \text{ if } y_i > 0$$
$$= 0 \text{ otherwise}$$

Where,
- y_i = observed quantity demanded (purchased) of *C. olitorius* (y_1) or *T. occidentalis* (y_2) in kilograms,
- y_i^* = desired or optimal demand level for the respective vegetable,
- x_i = vector of socioeconomic and demographic variables that characterize the household's preferences and/or influences household's purchasing behavior [age of household head in years (x_1); sex of household head (x_2, 1 = male, 0 = female); marital status of household head (x_3); household size (x_4); level of education (years of schooling, x_5); income of household head in naira (x_6); employment status of household head (1 = employed, 0 = unemployed, x_7); possession of home garden (x_8, 1 = yes, 0 = No); access to credit facilities (x_9); expenditure on food in Nigerian Naira, N (x_{10}); price of *C. olitorius* in N (x_{11}); price of *T. occidentalis* in N (x_{12}); price of okra (substitute for *C. olitorius*) in N (x_{13}); price of amaranth (substitute for *T. occidentalis*) in N (x_{14}); and combined price of *C. olitorius* and *T. occidentalis* in N (x_{15}).
- e_i = the error term, assumed to be independently normally distributed with zero mean and constant variance, σ^2.

Results

Socioeconomic characteristics of household heads (Figure 2)
- 98% of household heads were employed, but only 28% percent were engaged in agriculture.
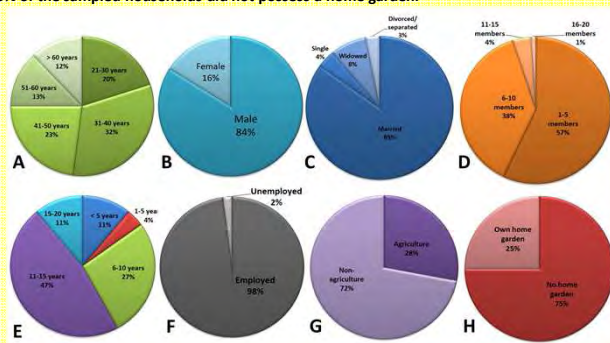- 75% of the sampled households did not possess a home garden.

Fig 2: Socioeconomic characteristics of households in Osun State, Nigeria [A=x_1, B=x_2, C=x_3, D=x_4, E=x_5, F=x_7, G=employment sector, H=x_8] *See definition of the Tobit Model in Methodology.

Determinants of household demand for *C. olitorius and T. occidentalis*
- Tobit analysis with pooled data (Table 1) revealed that household size, expenditure on food, and the combined price of *C. olitorius* and *T. occidentalis* had positive and significant effects on household demand for both vegetables.
- The marginal effect observed from pooled data (dy/dx) revealed that a unit rise in households' possession of home gardens would lead to 0.61 unit rise in the demand for both vegetables.
- Household size, expenditure on food, as well as its own price, positively and significantly influenced the demand for *C. olitorius* among households in the study area (Table 2).
- Level of education and employment status had an inverse relationship with *C. olitorius* demand, indicating that as household heads become more educated and empowered economically, their demand for *C. olitorius* tends to reduce.
- The marginal effect observed from the model for *C. olitorius* showed that a unit increase in household size would result in 0.07 unit increase in household demand for *C. olitorius*.
- In the case of *T. occidentalis* (Table 3) marital status and level of education had an inverse relationship with its demand implying that as household heads get married and become more educated, their demand for *T. occidentalis* decreases thereby associating the consumption of *T. occidentalis* with singleness and illiteracy.
- The price of *T. occidentalis* was positively and significantly related to its demand.
- Marginal effect for *T. occidentalis* revealed that a unit increase in education would lead to 0.08 reduction in the demand for *T. occidentalis*, while a unit rise in possession of home garden would result in 0.8 unit increase in the demand for *T. occidentalis* in the households.

Table 1: Estimated Tobit model for *C. olitorius* and *T. occidentalis*.

Variable	Coefficient	Standard error	P>|t|	dy/dx
x_1	0.0092	0.0106	0.388	0.0213
x_2	-0.0976	0.4766	0.838	0.3059
x_3	-0.2383	0.2151	0.272	0.1179
x_4	0.0849***	0.0488	0.086	0.0588
x_5	-0.0216	0.0277	0.438	0.0200
x_6	-0.0000	0.0000	0.580	-0.0000
x_7	-1.2602***	0.6593	0.060	0.8049
x_8	0.4716	0.3091	0.132	0.6141
x_9	0.0198	0.2725	0.942	0.0789
x_{10}	0.0000***	0.0000	0.099	0.0000
x_{14}	-0.0071***	0.0041	0.087	-0.0060
x_{15}	0.0105*	0.0015	0.000	0.0110

LR chi² (13) = 80.47   Prob > chi² = 0.0000
Log likelihood = -67.9551   Pseudo R² = 0.3719
*, **, ***, significant at 1%, 5% and 10% respectively

Table 2: Estimated Tobit model for *C. olitorius*.

Variables	Coefficient	Standard error	P>|t|	dy/dx
x_1	-0.0029	0.0050	0.561	0.0029
x_2	0.1695	0.2554	0.509	0.4602
x_3	-0.0371	0.1011	0.715	0.1206
x_4	0.0830*	0.0248	0.001	0.0662
x_5	-0.0319**	0.0139	0.025	-0.0201
x_6	-0.0000	0.0000	0.223	-0.0000
x_7	-0.7194**	0.3162	0.026	-0.2576
x_8	-0.0420	0.1522	0.784	-0.0369
x_9	-0.0459	0.1252	0.715	-0.0402
x_{10}	0.0000***	0.0000	0.096	0.0000
x_{11}	0.0117*	0.0018	0.000	0.0120
x_{13}	0.0008	0.0010	0.398	0.0009

LR chi²(13) = 105.16   Prob > chi² = 0.0000
Log likelihood = -23.120006   Pseudo R² = 0.6946
*, **, ***, significant at 1%, 5% and 10% respectively

Table 3: Estimated Tobit model for *T. occidentalis*.

Variables	Coefficient	Standard error	P>|t|	dy/dx
x_1	0.0241	0.0155	0.125	0.0241
x_2	-0.9382	0.7461	0.213	-0.9382
x_3	-0.7004**	0.3432	0.045	-0.7004
x_4	-0.0068	0.0627	0.914	-0.0068
x_5	-0.0764***	0.0447	0.092	-0.0764
x_6	-0.0000	0.0000	0.133	-0.0000
x_7	-0.6665	0.8773	0.450	-0.6665
x_8	0.7862	0.4751	0.103	0.7862
x_9	0.3030	0.4601	0.512	0.3030
x_{10}	-0.0000	0.0000	0.711	-0.0000
x_{12}	0.0196*	0.0039	0.000	0.0196
x_{14}	-0.0049	0.0064	0.446	-0.0049

LR chi²(13) = 68.97   Prob > chi² = 0.0000
Log likelihood = -37.972943   Pseudo R² = 0.4759
*, **, ***, significant at 1%, 5% and 10% respectively

Conclusions

- Possession of home gardens would enhance consumption of both NUS vegetables thereby checking incidence of malnutrition in the study area. There is an urgent need for public awareness on the importance of home gardens planted with these and other NUS in the nutritional well-being of both rural and urban households.
- Demand for the vegetables fell with rising levels of education and income. There's a strategic need for nutrition awareness. Intense public enlightenment regardless of literacy level on the role of NUS vegetables in enhancing human diets is recommended.
- The study provides relevant background information needed to develop a value chain upgrading strategy for both NUS vegetables.

References: Aletor, O., Oshodi, A.A. and Ipinmoroti, K. 2002. Chemical composition of common leafy vegetables and functional properties of their leaf protein concentrate. *Food Chemistry* 78: 63-68; Badifu, G.I.O. and Ogunsua, A.O. 1991. Chemical composition of kernels from some species of Cucurbitaceae grown in Nigeria. *Plant Food Human Nutrition* 41: 35-44; Schippers, R. R. 2000. African indigenous vegetables - an overview of the cultivated species. Revised version on CD-ROM. Natural Resources International Limited, Aylesford, UK; WHO. 2002. The World Health Report 2002. World Health Organization, Geneva.