Economic Evaluation of Wild Forest Spices in Ikot Ekpene, Nigeria

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Summary

This study investigated the rate of return on investment (ROI) and profit margin of wild forest spices in seven purposively selected communities of Ikot Ekpene Local Government Area. Total sum of 193 randomly selected respondents were interviewed comprising; 71 producers/collectors and 122 marketers. Data was analyzed using descriptive statistics, net income, profitability, ROI and multiple regressions. Sensitivity analysis was carried out on ROI to establish the point at which the viability of the enterprise was threatened for each of the spices in various communities. *Tetrapleura tetraptera* (Schum. & Thonn.) Taub. had ₦460.00k and ₦293.33k unit contribution/kg in Ikot Obong Edong and Amayam, respectively; *Zingiber officinale* Roscoe had ₦180.00k, ₦245.00k and ₦350.00k unit contribution /kg in Abiakpo Ikot Essien, Ikot Ediet and Ikot Ekpene, respectively; *Ocimum bassilicum* L. had ₦226.25k/kg unit contribution in Mbiaso while *Xylopia aethiopica* (Dunal) A.Rich. had ₦417.50k in Ikot Inyang. Multiple regression result showed that educational level of the marketers was significant (0.03, $p \leq 0.05$) on forest spices profit. Forest spices production/collection and trading has the capacity to alleviate poverty through additional household income, help food security and yield improved quality of life in Nigerian rural and peri – urban communities. Value addition through processing is suggested for improved profit and enhanced livelihood.

Key words

local forest spices, profit margin, ROI, improved livelihood, Nigeria

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Introduction

Forests globally are making significant contributions to the economies of nations through their products. Forest products are goods or resources obtained from the forest that satisfy human numerous needs (Tee, 2010). Forests remain very important yet undervalued and threatened resources on which millions of people in rural areas of the tropics depend for their livelihoods (Ogunbanjo and Aina, 2013). Non Timber Forest Products (NTFPs) are often gathered from nature, plantation forests or other managed ecosystems across the globe. NTFPs are goods of biological origin other than wood, derived from forest, other wooded lands and trees outside forest (FAO, 2001). Ruiz *et al*. (2004) noted that many NTFPs support subsistence and income generation to rural livelihoods. The contributions of NTFPs to the well-being of forest inhabitant have been reported by many researchers (Ibekwe, 2007; Nkwatoh *et al*., 2010; Onuche, 2011). However, deforestation induced by large scale illegal logging, annual bush burning, urbanization and agricultural expansion have greatly reduced the natural forest where important NTFPs are sourced (Babalola, 2009). Above 70% of population in developing tropical regions are subsistence farmers and live in remotely rural area. They mostly live below poverty line of $2 (U.S.) per day which invariably made them rely on NTFPs for livelihood sustenance during off season. It is reported that 1.4 billion people out of 6.2 billion world population live on $1.25 (U.S.) a day or less (IFAD, 2011). Nigeria has witnessed a monumental poverty level of 74.2% in the year 2000 (Okpe and Abu, 2009) while CIA (2016) reported that low per capital income of $3,203.3 (U.S.) and that 70% of Nigerian population live below poverty line of $2 (U.S.) per day as a year 2010. Poor populations rely on freely collected NTFPs for livelihood sustenance. Relevance of NTFPs in livelihood and diets of the people have made them important items of commerce and panacea for poverty among the people in the study area. NTFPs plays major role in poverty reduction by: improving livelihood, contributing to household food security, generation of additional employment and family income, offering opportunities for processing enterprise, and contributing to foreign exchange earnings (Chupezi, *et al*., 2009). Local vegetable spices are important NTFPs valued in the diet, culture and medicine of people locally in Nigeria. Despite the importance of many local spice species such as *Piper guineense* Schumach. & Thonn., *Aframomum melegueta* K.Schum., *Monodora* species and *X. aethiopica* in food security and nutrition, cultivation of these local vegetable spices is not a common practice; at most they are protected in farmlands when they grow naturally. Supply from wild sources is consequently declining due to loss of habitat, destructive and over harvesting methods, annual bush burning and lack of domestication.

Spices and condiments are defined as "vegetable products or mixtures, free from extraneous matter, used for flavouring, seasoning or imparting aroma in foods. They are available in fresh, dried whole and dried powder forms (Olife *et al*., 2013). Vegetable spices such as *X. aethiopica, P. guineense* and *A. melegueta* are marketed dried locally. Plants spices and condiments are usually aromatic and pungent in nature (Achinewu *et al*, 1995). Most chemicals responsible for distinctive taste and smell are essential oils or volatile oils compounds. Vegetable spices usually lose colour, taste and aroma over time in storage. Indigenous spices such as *P. guineense*, *X. aethiopica* and *T. tetraptera* are used generally to prepare local pepper soups, usually consumed hot before or after meals at homes or in commercial restaurants. Additionally, they are very important in the post parturition diet where it is believed to aid uterine contraction in women (Achenewu, 1996).

Marketing of forest spices involve the process of pricing, packaging, promoting and distribution to the consumer. Trade in forest spices in Nigeria is similar to other NTFPs trades that often involve rural dwellers and their households, NTFPs trade in Nigeria includes a number of agents such as farmers, minor collectors and middlemen. Also, the market is influenced by poor infrastructure, small market size, high cost of transportation, and seasonality of the product amongst many others. Oladele and Popoola (2014) reported that *P. guineense* marketing in south west Nigeria starts from the point of collection at the farm gate where seeds are sold fresh to minor or major collectors. The collectors provide immediate cash for the farmer, dry and store the produce thereby adding value to the product before transporting to major cities where exportation across national boundaries is initiated. Post-harvest handling, processing and storage conditions affect quality of local spices and invariably impact their prices.

Forest spices have contributed significantly to food security in the rural and urban centres globally, however; report on their individual economics in different agro ecological region in Nigeria is generally scanty or lacking in some areas. A detailed study of its economics will be a means to further understand forest spices contribution to rural households sustenance and poverty alleviation among the rural population in the Niger Delta Region of Nigeria and especially in Ikot Ekpene Local Government Area of Akwa Ibom state.

Methodology

Study Area: The study was carried out in seven communities within Ikot Ekpene Local Government Area (LGA), Akwa Ibom State, Nigeria. Ikot Ekpene people speak Annang ethnic language. The area is located within the Cross River Basin, between latitude 4^0 25' and 7^0 North and 7^0 15' and 9^0 30' East (Fig.1). It shares boundary in the north and west with Abia State, in the east by Ikono LGA and south by Essien Udim LGA. Ikot Ekpene until its break up was comprised of five clans: Obot Akara, Nto Edino, Ikot Abia, Amayam and Ikot Ekpene urban. Presently it has been reconstituted into two: Nto Edino, Ikot Abia and Obot Akara forming the new Obot Akara LGA. In this work the delineated area of study encompassed the new Ikot Ekpene. Ikot Ekpene is the political and cultural capital of Annang ethnic group. It is also dubbed the "Raffia City" because of the large presence of raffia based industries in the area. Land area covered is about 125 km^2 and with population of 225,000 (NPC, 2006). The people are predominantly peasants and subsistence farmers producing arable crops such as cassava, maize and vegetables. Oil palm and *Raphia* are popular tree crops amongst others in the area. Many species of local spices are obtainable in the natural forests of the area.

Figure 1. Map of Ikot Ekpene LGA showing the study locations

Sampling techniques and data collection

Seven communities with organised local markets were purposively selected in a Multistage sampling procedure in the study area (Ikot Obong Edong, Ikot Ekpene, Abiaokpo Ikot Essien, Ikot Inyang, Amayam, Mbiaso and Ikot Ediet). Four daily and three weekly markets (Urau Mbakara, Anwai Udo Akai, Urau Otor, Urau Ikot Iyang, Urau Amayam, Urau Mbiaso and Urau Ikot Ediet) were further selected for questionnaire administration within the selected communities. Pre-tested and well-structured questionnaires were randomly administered among producers and marketers of forest spices in the form of oral interview in the selected communities. Questions were interpreted in their local language (Annang) and responses carefully recorded. A total of 193 respondents were available for interview consisting 71 producers and 122 marketers. Data on forest spice uses, seasonality, cost and sales were obtained from the respondents and processed accordingly.

Data analysis

Net revenue was used to evaluate the profitability of production/collection and trade of local forest spices. Multiple Regression analysis was used to assess impact of demographic characters on production/collection and trade profitability of forest spices. Returns on investment (ROI) on forest spices were calculated to determine the rate at which the money invested could be realized. Sensitivity analysis was carried out on ROI to establish the point at which viability and profitability are stable or threatened.

Multiple linear regression models: This model was used in explaining the relationship between profits and demographic factors of respondents.

$$Y = a + b_1 X_1 + b_2 X_2 + \ldots + b_n X_n + e$$

where: Y = dependent variable (profit margin), $X_1 - X_n$ = independent variable (age, educational level, gender, household size, primary occupation, experience, marital status, source of capital for investment, uses), a = intercept, $b_i \ldots b_n$ = regression coefficient and e_i = error

Rate of return on investment (ROI): ROI depicts the level of profitability of an investment and it's an important criterion in determining the choice of investment (Arene *et al.*, 1987).

$$ROI = \frac{TR - TC}{TC} \cdot 100\%$$

where: TR = total revenue, TC = total cost.

Results and discussion

Respondents distribution among forest spice producers and marketers in Ikot Ekpene LGA

Questionnaire administration among producer and marketer of forest spices in the study area is shown in Fig 2. The highest population of spice producers was recorded in Ikot Iyang community (16) and the least in Ikot Ekpene (7). However, Abiaokpo Ikot Essien possessed the highest number of forest spice marketers (33) while Mbiaso had the least (10).

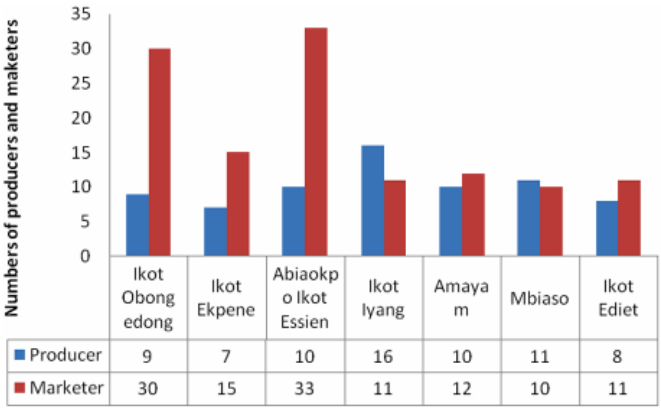

Figure 2. Number of interviewed forest spices producers and marketers in Ikot Ekpene LGA. Source: field survey 2015

Ikot Iyang has the highest number of producers and it is the least urbanized among the selected communities. Residents have access to farmland and are close to forest areas. Larger population of marketers is in peri-urban communities such as Ikot Obong Edong (30) and Abiaokpo Ikot Essien (33) where populations are larger with restricted access to farmlands. On the other hand, Ikot Ekpene is an urban centre and had average number of local forest spices marketers (15) due to availability of processed and exotic alternative spices. Consumers in urban centres have opportunity to choose from various spice options in groceries and sales outlets compared to residents of remotely rural areas who depend solely on wild spices for non-availability of processed alternative spices.

Demographic characteristics of forest spices producers/collectors and marketers in Ikot Ekpene LGA

Demographic characteristics of the producers/collectors are presented in Table 1. Males constitute 31.0%, while females constitute 69.0%. The study shows that males and females are

involved in the collection/cultivation of forest spices in all the communities but the percentage of female collectors/producers is higher than male collector/producers. However, higher percentage of females (85.2%) is involved in forest spices marketing. Results in this study are in consonance with the findings of Oladele and Popoola, (2014) who noted that marketing of forest spices is normally regarded as female business in southern Nigeria while men are concerned with the production and harvesting from difficult terrains in the forests. Young adults (from 21 years) and elderly persons above 50 years were all involved in forest spices production/collection. Collection of forest spices provide employment and promote income generation by engaging many young adults. Many of the forest spice species are obtained from long distances and difficult terrains requiring physical strength of agile and skilled individuals. Similar scenario was observed in India (Tejaswi, 2008). Elderly individuals engage in collection of less strenuous species such as picking fruits of *T. tetraptera* from the forest floor. Spice marketers age ranged between 31-40 years (18.9%), 41-50 years (32.8%) and above 50 years (34.4%). A good number of the producers/collectors are married (66.2%), only 12.7% were unmarried. About 74.6% of the marketers are married. Educational background of forest spice producers/collectors ranged from primary to tertiary education. Academic qualification is not major criteria for production and marketing of forest spices as 26.8% of producers/collectors and 43.4% of marketers do not have any formal education but are still successful in the business. It means that local forest spices merchants do not require formal education but acquire training through apprenticeship or from relatives in most cases. Findings in this study corroborates with Ogbonna and Ogbonna (2010) who observed that spices marketers in Anambra state of Nigeria had at least primary education before acquiring marketing skills.

Forest spices collectors/producers' also engage in other occupations such as civil service (12.7%), trading (66.2%) and artisans (18.3%). Forest spice production/collection is considered a secondary means of livelihood to supplement family income especially during the off seasons which is characterised by declined activities on the farm. Similar situation was reported in Eastern Cape Province, South Africa (Roland and Oyelana, 2014). Jonah *et al.,* (2013) noted that NTFPs collection activities are at peak in Oyo state of Nigeria when farm works are light and scanty. Forest spices such as *P. guineense* and *A. melegueta* produce fruits in the dry season when difficult terrain can be accessed easily and collectors can travel long distances in the forest. However, spices marketers are engaged all year round to market dried stored produce at higher price. Marketers usually buy the forest spices during the glut (dry season), process by drying and store until rainy/off season for improved profit.

Some forest spice producers/collectors maintain large family sizes of 6-10 persons (54.9%) and sometimes above 10 persons in a nuclear family (7.0%). Marketers family sizes were 6-10 persons (44.3%), 1-5 persons (37.7%) and above 10 persons (18.0%). This trend is typical of family size in sub-sahara West Africa where households are usually large due to their belief in having many children that will assist in farm work (Babatunde, 2008; Adepoju and Obayelu, 2013). It is worth to emphasize that the trend is changing nowadays to small household size in urban centres where utilities and cost of living are relatively high (NBS, 2012).

Table 1. Demographic characters of forest spice producers/ collectors and marketers in Ikot Ekpene LGA

Demographic characters		Producers/ Collectors		Marketers	
		Frequency	%	Frequency	%
Sex	Male	22	31.0	18	14.8
	Female	49	69.0	104	85.2
	Total	71	100.0	122	100.0
Age	10-20	–	–	4	3.3
	21-30	2	2.8	13	10.7
	31-40	15	21.1	23	18.9
	41-50	39	54.9	40	32.8
	Above 50	15	21.1	42	34.4
	Total	71	100.0	122	100.0
Marital status	Married	47	66.2	91	74.6
	Single	9	12.7	12	9.8
	Separated	5	7.0	3	2.5
	Widow/(er)	10	14.1	16	13.1
	Total	71	100.0	122	100.0
Education	No formal education	19	26.8	53	43.4
	Primary	17	23.9	41	33.6
	Secondary	27	38.0	23	18.9
	Tertiary	8	11.3	5	4.1
	Total	71	100.0	122	100.0
Primary occupation	Civil servant	9	12.7	11	9.0
	Trading	47	66.2	-	-
	Farming	-	-	57	46.7
	Artisan	13	18.3	51	41.8
	Retire civil servant	2	2.8	3	2.5
	Total	71	100.0	122	100.0
Family size	1-5	27	38.0	46	37.7
	6-10	39	54.9	54	44.3
	Above 10	5	7.0	22	18.0
	Total	71	100.0	122	100.0

Source: Field survey 2015

Types and utilisation pattern of local forest spices produced/collected and marketed in Ikot Ekpene LGA

Table 2 showes ten (10) common forest spices found in the various communities of the LGA. They are utilised mainly as food and medicine. Local forest spices species are consumed as medicine to improve taste and preservation of herbal preparations. Forest spices are used for treatment of several illnesses by rural dwellers without easy accessibility to modern health care facility. Some flavouring elements in forest spices also improve palatability of foods with bland tastes. Species such as *Gongronema latifolium* Benth., *Monodora myristica* (Gaertn.) Dunal and *P. guineense* have been documented in Abia and Enugu states to support use of these spices as medicine for common ailments (Aiyeloja and Bello, 2006; Okwu, 2007; Omosun *et al*., 2013). This is in agreement with Tainter (2001) who reported that forest spices are collected or cultivated and consumed for food, medicinal purpose and preservation. This study indicates that residents of the study area value forest spices for two major reasons, food and medicinal purposes. Local uses of spices were classified by producers/collectors 45.1% as Food and 54.9% as Medicine, while marketers classified local spices 40.2% as Food and 59.8%

Table 2. Forest spices produced/collected and sold in Ikot Ekpene LGA

Spice name	Local name	Plant parts and mode of use
Gongronema latifolium Benth (Asclepiadaceae)	Utazi	Leaves as vegetable spice/medicine
Xylopia aethiopica (Dunal) A.Rich (Annonaceae)	Attar	Fruits as medicine
Piper guineense Schumach. & Thonn. (Piperaceae)	Nkwa adusa	Leaves as vegetable and fruits as spice in food. Taste improvement and preservation of herbal medicines
Monodora myristica (Gaertn.) Dunal (Annonaceae)	Iwon	Fruits as spices in food
Aframomum melegueta K.Schum. (Zingiberaceae)	Ntuen ibok	Seeds as medicine
Zingiber officinale Roscoe (Zingiberaceae)	Ntuen ibok isong	Rhizome as food/medicine
Tetrapleura tetraptera (Schum. & Thonn.) Thaum (Mimosaceae)	Uyayak	Fruits as food/medicine
Ocimum basillicum L. (Lamiaceae)	Nton oku	Leaves as spice in food
Monodora tenuifolia Benth (Annonaceae)	Ayim efik	Fruits as spice in food
Dennettia tripetala Baker f. (Annonaceae)	Nkarika	Fruits as spice in food

Source: Field survey 2015

as Medicine. Four (4) of the ten species serve dual purpose: as food and medicine, while another four (4) serve as food alone. Only two (2) species are used as medicine solely (Table 2).

Production and preservation of forest spices in the study area

Forest spices cultivation in Ikot Ekpene showed that *O. basillicum* (51 producers) was the most cultivated while *Monodora species* (16 producers) was the least cultivated (Fig. 3). The highest number of cultivator grow the species that are usually herbs/climbers/rhizomes that can be easily propagated in home gardens (Fig. 3) and on arable farmlands close to residential areas and that are commonly domestically utilized species such as *G. latifolium* (47), *O. basillicum* (51), *P. guineense* (44), *A. melegueta* (37) and *Z. officinales* (32). Forest spices obtained from trees are usually collected from wild and home gardens (Okwu, 2007; Dike, 2010). However, they are protected and nurtured in farmlands if found growing naturally. In periods of surplus production fruits are marketed to supplement family income (Roland and Oyelana, 2014).

Most species of the forest spices (64.8%) are grown in home gardens (Fig. 4), this further lends credence to the fact that the spices are produced as secondary activity to enhance family income. Immediate family members are directly involved in the production process such as cultural tending operations in the garden at no extra cost (Oladele, 2014). Non-payment of rent on land for many species facilitates lower production cost and increased profit margin for spice producers. Upon collection/harvesting, fruit spices are usually sun/air dried and stored for months or sometimes years depending on the species (Fig 5). Fruit spices such as *A. melegueta*, *P. guineense*, *M. myristica*, *T. tetraptera* can be stored for about a year or two while the easily perishable leaf spices such as *G. latifolium* and *O. basilicum* have storage challenges and therefore cannot be stored for long periods. Drying process reduces moisture content of the forest spices and consequently prevents deterioration when not for immediate consumption. Rural inhabitants suffer for lack or poor electricity supply. Preservation extends the life span of the forest spices and pave way for it's availability during the off season.

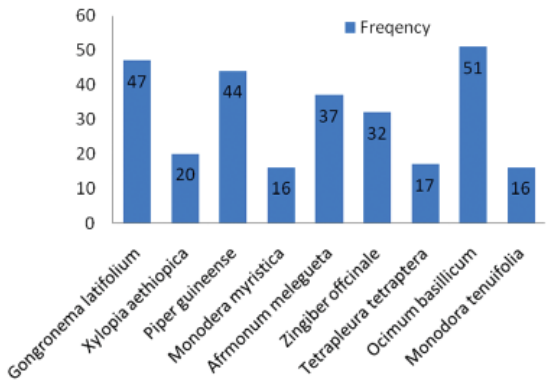

Figure 3. Cultivation of forest spices in Ikot Ekpene LGA. *Source: field survey 2015*

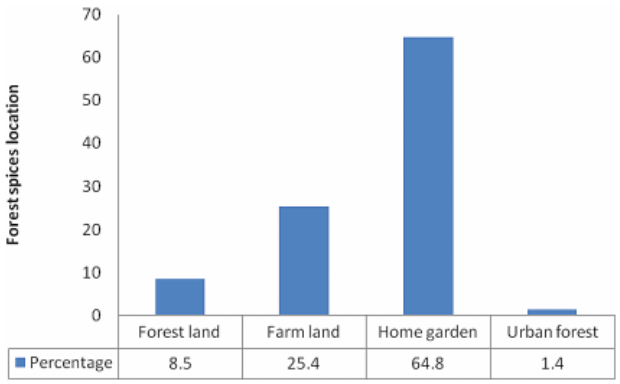

Figure 4. Production sites of forest spices in Ikot Ekpene LGA. Source: field survey 2015

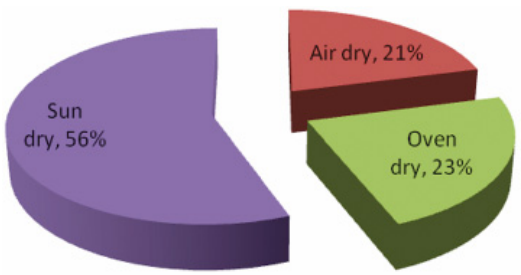

Figure 5. Preservation of forest spices in Ikot Ekpene LGA. Source: field survey 2015

Plate 1. Local spices market, Ikot Ekpene, Nigeria

Trading of local forest spices in Ikot Ekpene LGA

Substantial number of forest spices traders (56.6%) has been in the enterprise for more than 10 years while 43.4% have between 1-10 years trading experience in spice trading activities. High profit margins obtained from trading activities motivate those involved to remain in the business for many years. They also engage in sale of other farm or forest products such as palm oil, forest fruits and vegetables in different seasons (Plate 1). Availability of other NTFPs in different seasons keeps the traders in business round the year. Sourcing forest spices from scattered farm gates in remote villages are mostly done by young and energetic individuals (minor collectors) who in turn sell to major buyers in local markets. Major buyers usually process (drying) for storage purposes before shipment to city markets where exporters, retailers and consumers are located (Aiyeloja and Ajewole, 2006). Initial capital outlay to invest in local forest spice trade by minor and major collectors is not huge, hence many individuals are involved. No trade restriction was observed from any union. There is free entry and exit as it occurs in perfect market situation. In the real sense, most minor collectors are producers themselves or spouse of producers who operate at the rural markets. Start-up capitals are obtained from personal savings and soft loans or donations in form of assistance from relatives (Fig. 6). This trend was also observed in Anambra state (Aiyeloja *et al*., 2012). Although, several agribusiness loans are available in specialised agricultural and commercial banks in Nigeria, forest spices producers/collectors and traders lack good information on such facilities due to their high illiteracy level and in most cases are unable to meet the strict requirements of collateral if they are unable to payback as scheduled (Raufu *et al*., 2012; Yusuf *et al*., 2014). The major problem encountered by forest spices traders in Ikot Ekpene LGA is inadequate capital (54.1%) for expansion (Fig. 7) while bad roads, poor storage facilities, poor marketing, health and shelf life of spices were also identified as bane to forest spice trade. Scanty loan facilities administered by specialised agricultural banks are grossly inaccessible by the traders in remote rural areas in Nigeria. Lack or inadequate power supply limits the use of dryers in remote areas, hence greater percentage of farmers' harvest are lost to deterioration and subsequently record low returns on investment.

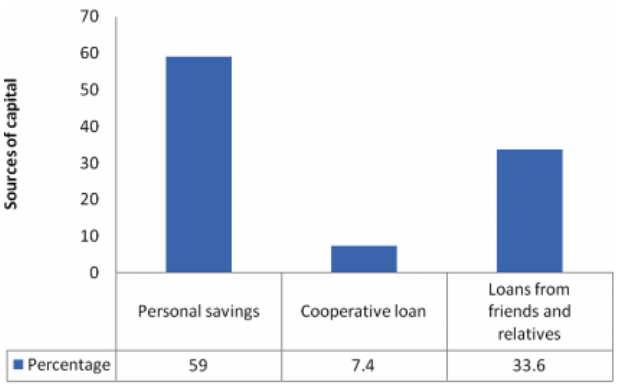

Figure 6. Sources of capital for forest spices traders in Ikot Ekpene LGA

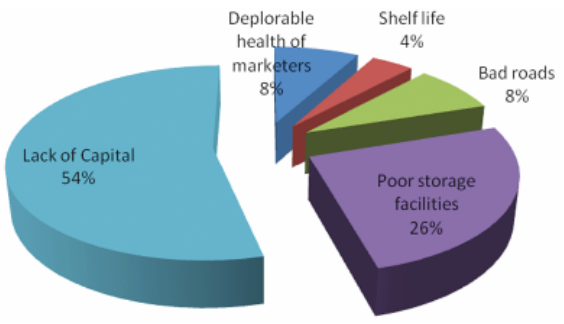

Figure 7. Problems of spice trade in Ikot Ekpene LGA. *Source: field survey 2015*

Consumers' preference factors for forest spices in Ikot Ekpene LGA

Taste (53.3%) is the major factor of preference in the consumption of forest spice followed closely by species that have medicinal uses (35.2%). Storage potentials for the product after harvesting (6.6%) and price (4.1%) also influence consumer's decision to purchase (Fig. 8). Spices possess certain chemical constituents such as essential volatile oils that produce astringent taste in foods. Most spices produce aromatics compounds that give excellent flavour in our foods (Alonge and Ituen, 2010; Green *et al.*, 2012). Oleoresin and piperine are present in *Z. officinales* and *P.guineense,* respectively. They are responsible for the astringent taste that improves foods with bland taste. For decades *Z.officinale* has been used to treat inflammation, pain-mediated diseases and diarrhea in Malaysia, gastrointestinal issues in India and Nigeria, while *P. guineense* seed is known for its activities as stomachic and carminative. The leaves are also used for female infertility while the fruits are used as an aphrodisiac in in West Africa (Malhotra and Singh, 2003; Yob *et al.*, 2011; Echo *et al.*, 2012). *A. meleguata* produces satisfying aroma in foods in addition to its medicinal values in the prevention of post-partum contraction. Influence of taste and medicinal properties of forest spices is vital for consumers' preference. Species preference of forest spices showed that *A. melegueta* (54%) was the most preferred while *M. tenuifolia* Benth (15%) was least preferred (Fig.9).

Average contribution margin of forest spices vary with species and communities (Table 3). *Z. officinale* had the highest contribution margin in four of the seven communities, viz: Ikot Ekpene (₦350:00), Amayam (₦298:00), Ikot Ediet (₦245:00) and Abiakpo Ikot Essien (₦180:00). Contribution margin was the highest for *T. tetraptera* in Ikot Obong Edong (N460:00), *O. basilicum* (N226:25) in Mbiaso and *X. aethiopica* (N417:50) in Ikot Inyang. *Z. officinale* is an exotic species that adapted perfectly in sub-sahara West Africa climates ranging from the swamp rain forest to the northern guinea savannah ecosystems (Ayodele and Sambo, 2014). *Z. officinale* is traded at the international market with China, Jamaica, Nigeria and India as major exporters to Europe and North America (Nmadu and Marcus, 2013; Oladele, 2014). *Z. officinale* is widely consumed and well accepted by all classes of the population for its dual function as spice and medicine. Contribution margins were high for *Z. officinale* in the most of the communities probably due to high demand and low cost. Various contribution margins in different communities may be attributed to use values, which vary with changes in local communities. Plants are used for different purposes in different cultures; moreover, certain species serve more than one purposes in different ethnic locations. A good example is *M. tenuifolia* that had the lowest contribution margin (₦120.00/Kg) in Amayam and second highest in Ikot Ekpene (₦285:00/Kg) communities as illustrated in Table 3. Hence, contribution margins of same species of local spice do not follow same trend in all the selected communities. Multiple regression result ($p \leq 0.05$) showed that educational level of the traders had significant effect (0.03) on forest spice profits. Traders/collectors with higher educational qualifications had higher profits than the less privileged in educational status because they tend to be more organised, keep records, add value through processing before sales and are aware

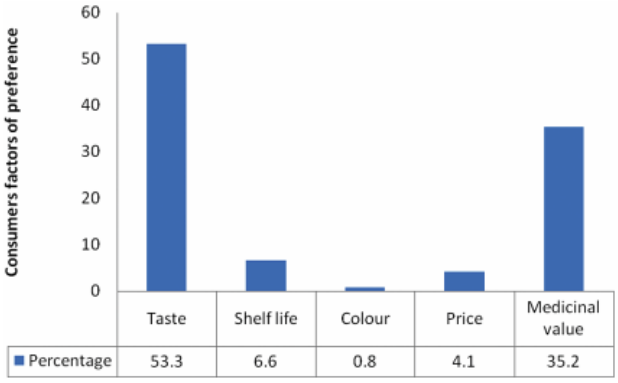

Figure 8. Factors of consumers' preference for forest spices in Ikot Ekpene LGA

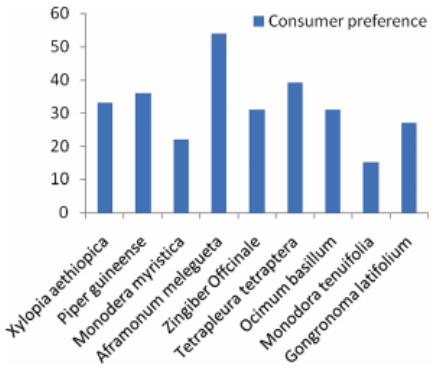

Figure 9. Consumer's preference of forest spices in Ikot Ekpene LGA. Source:field survey 2015

of developments in spice marketing opportunities. All the local forest spices showed high profit margins in all the communities surveyed; many families are involved in the trading activities.

Sensitivity analysis on return of investment (ROI) of forest spices in Ikot Ekpene LGA showed that continous increase in cost of production/collection, processing and marketing beyond certain degrees will threaten the viability and profitability of investment in local forest spices. Spices with highest ROI are the most resilient and vice-versa for species with low ROI (Table 4). Similar report of high ROI for NTFPs was documented in south western Nigeria (Pandit, 2008; Akanni, 2013). Little or no cost in production was adduced for the excessive high profits. Non inclusion of production/collection cost in the financial analysis did not capture the actual economic value and profits on these forest products. In Amayam, *M. myristica* was threatened between 50 - 100% increase in cost while *A. melegueta* was threatened above 250% cost increase, simply for non-inclusion of cultivation cost such as land rent, capital and labour costs. In rural areas in Nigeria, NTFPs are usually collected from community forest freely, hence, excessive profits are associated with

Spices	Average cost price/kg (₦)	Average sale price/kg (₦)	Average contribution and profit margin/kg (%)	ROI (%)
		Amayam		
X. aethiopica	160	425	265 (62.35)	165.63
P. guineense	96	270	194 (71.85)	181.23
A. melegueta	87.78	388.89	250 (64.29)	343.03
Z. officinale	132	430	298 (69.30)	225.65
T. tetraptera	206.67	500	293.33 (58.66)	141.92
M. myristica	175	300	125 (41.67)	71.43
G. latifolium	68.33	200	131.67 (65.84)	192.69
O. basillicum	77.13	207.15	134.29 (64.83)	168.53
M. tenuifolia	115	225	120 (53.33)	95.65
		Abiakpo Ikot Essien		
X. aethiopica	117.5	260	142.5 (54.62)	121.3
P. guineense	51.43	202.85	151.43 (74.65)	294.44
A. melegueta	64	236	172 (72.88)	257.15
Z. officinale	70	250	180 (72.00)	257.15
T. tetraptera	100	266.67	166.67 (62.5)	166.67
M. myristica	93.33	210	116.67 (55.56)	125.01
G. latifolium	42.86	168.57	125.72 (74.58)	293.34
O. basillicum	31.67	138.33	115 (83.13)	336.78
M. tenuifolia	85	240	155 (64.58)	182.36
		Ikot Ekpene		
X. aethiopica	215	315	100 (31.75)	46.52
P. guineense	98	222	124 (55.86)	126.54
A. melegueta	80	192.5	112.5 (58.44)	140.63
Z. officinale	125	475	350 (73.68)	280
T. tetraptera	240	425	185 (43.53)	77.08
M. myristica	190	350	155 (44.29)	84.21
G. latifolium	50	213.33	163.33 (76.56)	326.66
O. basillicum	63.33	213.33	150 (70.31)	236.85
M. tenuifolia	140	425	285 (67.06)	203.57
		Ikot Ediet		
X. aethiopica	210	363.33	153.33 (42.20)	73.01
P. guineense	88	286	178 (62.24)	225
A. melegueta	150	359	125 (34.82)	133.33
Z. officinale	205	450	245 (54.44)	119.52
T. tetraptera	195	450	225 (50.00)	130.77
M. myristica	265	450	185 (41.11)	67.82
G. latifolium	124.29	261.43	137.15 (52.46)	110.33
O. basillicum	124.44	246.67	133.33 (54.05)	98.24
M. tenuifolia	270	476.67	206.67 (43.36)	76.54
		IKot Obong Edong		
X. aethiopica	165	350	185 (52.86)	112.12
P. guineense	118.57	450	331.42 (73.65)	279.53
A. melegueta	106.67	383.33	123.33 (32.17)	259.37
Z. officinale	130	583.33	453.33 (77.71)	348.71
T. tetraptera	215	675	460 (68.15)	213.95
M. myristica	135	450	315 (70.00)	233.33
G. latifolium	92	320	228 (71.25)	247.83
O. basillicum	80.83	355	274.17 (77.23)	339.79
M. tenuifolia	160	390	230 (58.97)	143.75
		Mbiaso		
X. aethiopica	173.33	383.33	210 (54.78)	121.10
P. guineense	172	310	164 (52.90)	83.72
A. melegueta	128.33	283.33	123.33 (43.53)	120.78
Z. officinale	186.67	334.44	224.44 (67.10)	79.17
T. tetraptera	185	350	215 (61.43)	89.19
M. myristica	160	300	140 (46.67)	875
G. latifolium	121.11	333.33	212.22 (63.67)	175.23
O. basillicum	142.5	368.75	226.25 (61.36)	158.78
M. tenuifolia	155	280	195 (69.64)	80.65
		Ikot Inyang		
X. aethiopica	282.5	450	417.5 (92.78)	59.29
P. guineense	250	468	242 (51.71)	872
A. melegueta	181	485	324 (66.80)	167.96
Z. officinale	160	406.25	246.25 (60.62)	153.90
T. tetraptera	333.33	600	266.67 (44.45)	80.50
M. myristica	146.66	383.33	236.67 (61.74)	161.37
G. latifolium	100	297	197 (66.33)	197
O. basillicum	99.17	279.17	180 (64.48)	181.50
M. tenuifolia	140	400	260 (65.00)	185.72

Source: Field survey 2015

Table 3. Average contribution /profit margin/kg and ROI of forest spices in Ikot Ekpene LGA

such forest products. ROI of *A. melegueta* was high partly due to storage benefit over long period of about five years that enhance price stability and it's multiple use in food as local preservatives and local herbal medicine. However, *M. myristica* deteriorates easily in storage and mostly used as condiments in local pepper soup occassionaly, hence, it's ROI is lowest. In Ikot Ekpene community, population is high and elite in nature due to availability of socio infrastructures provided by crude oil based industries and government departments. Several restaurants and educated individuals use *Z. officinale* and *O. basillicum* in commercial and private cooking. This will possibly increase demand and ROI of these two species, hence, the resilience of their profit margins to increase in costs of above 250%. Responses to changes in production and marketing costs of local spice species showed similar trend in seven communities studied.

Conclusions

Forest spices have capacity to reduce poverty and sustain livelihood especially among the rural population in sub-sahara West Africa. Collections and sales of forest spices in its season are profitable at subsistence level from the findings. This generate additional family income that is used to cater for pressing needs domestically. This is achieved through job creation for rural dwellers in terms of local spice collection, processing and marketing, which could also reduce youth involvement in security insurgence in the coastal regions of Nigeria where insecurity is a social menace. Forest spices contribute to primary health care delivery among rural population through ethnomedicines. Forest spices also play important role in food security among the poor population especially in the study area. The study demonstrated that production and marketing of forest spices contributes to livelihood improvement in Ikot Ekpene LGA in Akwa Ibom state of Nigeria. However, the sustenance of the role of forest spices among poor population is hinged on better storage facilities, value addition, improved marketing efficiency, access to credit facilities by rural farmers and marketers, enhanced commercial cultivation of local spices and conservation of existing resource through sustainable harvesting and utilization.

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Table 4. Sensitivity analysis (ROI) of forest spices in Ikot Ekpene LGA (Incresing cost)

Forest spices	Average cost/kg	Average sales price/kg	Average profit margin/kg	Sensitivity analysis of cost increase									
				ROI/kg	20%	50%	100%	120%	150%	180%	200%	220%	250%
						Amayam							
X. aethiopica	160	425	265	165.63	121.3	77.08	32.82	20.74	6.25	-5			
P. guineense	96	270	194	181.23	134.38	87.5	40.63	27,85	12,5	4.47	-6,25		
A. melegueta	87.78	388.89	250	343.03	269.18	195.36	121.51	101.38	77.22	58.27	47.67	38.45	26.58
Z. officinale	132	430	298	225.65	171.46	117.18	62.88	48.08	30.30	16.35	8.59	1.8	-6.93
T. tetraptera	206.67	500	293.33	141.92	101.62	61.29	20.97	9.99	-3.23				
M. myristica	175	300	125	71.43	42.86	14.29	-14.29						
G. latifolium	68.33	200	131.67	192.69	143.93	95.15	46.35	33.05	17.09	4.54	-2.45		
O. basillum	77.13	207.15	134.29	168.53	123.64	79.01	34.29	22.01	7.43	-4.09			
M. tenuifolia	115	225	120	95.65	63.05	42.83	-2.18						
						Abiakpo Ikot Essien							
X. aethiopica	117.5	260	142.5	121.3	84.39	48.09	10.64	5.80	-11.49				
P. guineense	51.43	202.85	151.43	294.44	228.67	162.92	97.21	79.28	57.76	40.87	31.89	23.26	12.69
A. melegueta	64	236	172	257.15	207.29	145.83	107.82	67.62	47.5	31.69	22.95	15.23	5.36
Z. officinale	70	250	180	257.15	197.62	138.09	78.57	62.33	42.86	27.55	19.05	11.61	2.05
T. tetraptera	100	266.67	166.67	166.67	122.23	77.78	66.67	21.22	6.67	--4.77			
M. myristica	93.33	210	116.67	125.01	87.52	50.02	12.51	2.28	-9.99				
G. latifolium	42.86	168.57	125.72	293.34	227.77	162.21	96.66	78.78	57.33	40.47	31.11	22.90	18.56
O. basillum	31.67	138.33	115	336.78	264.03	191.16	118.39	98.55	74.71	55.98	45.59	36.51	24.79
M. tenuifolia	85	240	155	182.36	135.29	88.24	41.18	28.35	12.95	8.41	-5.89		
						Ikot Ekpene							
X. aethiopica	215	315	100	46.52	22.09	-2.33							
P. guineense	98	222	124	126.54	88.78	56.34	13.27	2.97	-9.39				
A. melegueta	80	192.5	112.5	140.63	103.33	60.17	20.32	9.38	-3.75				
Z. officinale	125	475	350	280	216.67	153.33	90	72.73	52	35.72	26.67	18.75	8.52
T. tetraptera	240	425	185	77.08	47.57	18.06	-11.46						
M. myristica	190	350	155	84.21	53.51	22.80	-7.89						
G. latifolium	50	213.33	163.33	326.66	255.55	184.44	113.33	93.94	70.66	52.38	42.22	33.34	21.91
O. basillum	63.33	213.33	150	236.85	180.74	123.53	68.43	53.12	34.74	20.30	12.29	5.27	-3.76
M. tenuifolia	140	425	285	203.57	155.76	102.38	51.79	37.98	21.43	8.42	1.19	-5.14	
						Ikot Ediet							
X. aethiopica	210	363.33	153.33	73.01	44.18	15.35	-13.49						
P. guineense	88	286	178	225	170.83	116.6	62.5	47.73	30	16.08	8.33	1.57	-7.15
A. melegueta	150	359	125	133.33	99.4	59.56	19.67	8.79	-4.27				
Z. officinale	205	450	245	119.52	82.93	46.44	10.29	-0.23					
T. tetraptera	195	450	225	130.77	92.31	53.85	15.39	4.89	-7.69				
M. myristica	265	450	185	67.82	41.51	13.21	-15.09						
G. latifolium	124.29	261.43	137.15	110.33	75.28	40.23	5.17	-4.45					
O. basillum	124.44	246.67	133.33	98.24	65.19	32.15	-8.88						
M. tenuifolia	270	476.67	206.67	76.54	47.13	17.69	-11.72						
						IKot Obong Edong							
X. aethiopica	165	350	185	112.12	76.77	41.41	6.07	-4.11					
P. guineense	118.57	450	331.42	279.53	216.28	153,01	89.77	72.53	51.81	35.55	26.51	18.61	8.44
A. melegueta	106.67	383.33	123.33	259.37	199.48	139.57	79.69	63.35	43.75	28.35	19.79	12.31	2.68
Z. officinale	130	583.33	453.33	348.71	273.93	199.15	124.36	103.97	79.49	60.26	49.58	40.23	28.21
T. tetraptera	215	675	460	213.95	161.63	80.88	56.98	42.71	25.59	12.13	4.66	-1.93	
M. myristica	135	450	315	233.33	177.78	122.22	66.67	51.52	33.33	19.05	11.11	4.17	-4.77
G. latifolium	92	320	228	247.83	189.86	131.89	73.92	58.11	39.14	24.23	15.95	8.69	-6.22
O. basillum	80.83	355	274.17	339.79	266.02	192.79	119.59	99.63	75.68	56.87	46.39	37.25	25.49
M. tenuifolia	160	390	230	143.75	103.13	62.5	21.88	10.79	-25				
						Mbiaso							
X. aethiopica	173.33	383.33	210	121.10	84.31	47.45	10.56	5.25	-11.54				
P. guineense	172	310	164	83.72	50.19	20.16	-9.89						
A. melegueta	128.33	283.33	123.33	120.78	83.99	47.19	10.39	3.55	-11.68				
Z. officinale	186.67	334.44	224.44	79.17	49.31	23.02	-10.4						
T. tetraptera	185	350	215	89.19	57.66	26.13	-5.41						
M. myristica	160	300	140	875	56.25	25	-625						
G. latifolium	121.11	333.33	212.22	175.23	129.37	85.49	37.62	25.11	10.09	-1.71			
O. basillum	142.5	368.75	226.25	158.78	115.65	72.52	29.39	17.63	3.51	-7.59			
M. tenuifolia	155	280	195	80.65	50.54	20.44	-9.68						
						*I*kot Inyang							
X. aethiopica	282.5	450	417.5	59.29	32.75	6.19	-20.36						
P. guineense	250	468	242	872	56	24.8	-6.4						
A. melegueta	181	485	324	167.96	123.29	77.54	33.98	21.79	7.18	-4.31			
Z. officinale	160	406.25	246.25	153.90	111.59	69.28	26.96	15.42	1.57	-9.32			
T. tetraptera	333.33	600	266.67	80.50	50.01	20.01	-9.99						
M. myristica	146.66	383.33	236.67	161.37	117.82	74.25	30.69	10.81	4.55	-6.66			
G. latifolium	100	297	197	197	147.5	98	48.5	35	18.8	6.08	-1		
O. basillum	99.17	279.17	180	181.50	134.59	87.68	40.76	27.96	12.61	5.37	-6.17		
M. tenuifolia	140	400	260	185.72	138.09	90.48	42.86	29.88	14.29	2.01	-4.76		

Source: Field survey 2015

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