

## Economic analysis of *Thaumatococcus danielli* (Benn.) Benth. (miraculous berry) in Ekiti State, Nigeria

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### Abstract

*Thaumatococcus danielli* (Benn.) Benth. (miraculous berry) is a non-timber forest species that has been contributing to the rural economy for a long time but whose potentials have not been fully exploited for economic development. It is a multi purpose perennial herb that offers a wide assortment of uses with its leaves, fruits, stalks and roots. The economic analysis of *Thaumatococcus danielli* in Ekiti State, Nigeria, was carried out with a view to determine its potentials and impact on the income of the rural communities in Ekiti State. Information on its availability, uses, factors affecting its production and processing as well as its profitability and loss were examined. Twenty farmers, twenty leave sellers and fifteen mat weavers were randomly selected and interviewed. The data collected were analyzed using frequency counts and percentages, gross margin and production function analysis. The results shows profitability with average gross margin of ₦59,043.85, ₦69,267.51 and ₦74,699.70 per annum for farmers, leave sellers and mat weavers respectively. The variables regressed against income generated accounted for 71%, 62% and 65% of the variation in income for the farmers, leave sellers and mat weavers respectively. The most important variables determining income generated by farmers were farm size and variable and fixed costs. For leave sellers, variable cost and variation in prices of leaves were the most important factors determining income generation, while years of experience of processor and variable cost were the most important for mat weavers. The fruits of *Thaumatococcus danielli* did not generate any income despite their potentials as sweeteners. There is low level of cultivation as total area of cultivation by each farmer was below 0.2 hectares. It is recommended that awareness should be created for the use of the fruits as sweeteners, while establishment of plantation of *Thaumatococcus danielli* in large area should be encouraged to prevent scarcity and extinction.

**Key words:** NTFPs, rural community, miraculous berry, income.

### Introduction

Forest offers some valuable resources apart from timber for subsistence and rural economics. These valuable resources are referred to as non-timber forest products (NTFPs). They include diversity of fruits, nuts, seeds, latexes, gums, resins, spices, bamboos, barks and leaves of trees as well as wildlife products. Their contributions to the welfare of people all over the world are crucial. These products are heavily relied on by rural communities living in and around forest areas for food production, provision of employment, provision of rural infrastructure, provision of useful medicinal plants and provision of other useful materials like rope, meat, leaves and dyes<sup>6</sup>. FAO<sup>7</sup> reported that about 80% of the population of developing world depend on NTFPs for their primary health and nutritional needs.

Until recently, different definitions were given to NTFPs based on the perspective of authors, whereby some refer to them as minor forest products as they were considered less important than timber. Okafor<sup>9</sup> defined NTFPs as "all other biological products gathered from the forest and other natural vegetations for commercial or subsistence purposes". NTFPs have been defined as all resources/products (other than industrial round wood and derived sawn timber, wood chips, wood based panels and pulp) that may be extracted from forest ecosystem and are utilized within the household or are marketed or have social, cultural or religious significance<sup>15</sup>. A modified version of the definitions of NTFPs for international use was suggested at the

expert consultations on NTFPs for Latin America and the Caribbean held in Chile in 1994. It was defined as all goods of biological origin, as well as services, derived from forest or any land under similar use and exclude wood in all its forms<sup>3</sup>.

Lack of clear definitions and consistent classification from NTFPs have perpetuated the long standing institutional neglect of NTFPs<sup>7</sup>. In Nigeria, for example forestry practice has for a long time recognized timber only to the neglect of other products. This neglect is evident in the Central Bank of Nigeria (1995)'s situation report on Nigeria's food and industrial crops prospects up to 1990<sup>5</sup>. In that report, no indigenous fruit or food from trees were considered. The contribution of NTFPs to the rural economy in Nigeria is known to be substantial but there are paucity statistical data on which this could be quantified. Records, however, exist in Malaysia, Indonesia, Philippines and some other countries to show that NTFPs have contributed significantly to their national economy; particularly in foreign exchange earning. According to FAO<sup>6</sup>, Malaysia exported about \$100 million worth of rattan and bamboo in 1990 while Indonesia exported more than \$300 million worth of NTFPs which amounted to 10% of its total exports for that year. Similarly, Philippines exported about \$250 million worth of rattan and bamboo in the same year.

*Thaumatococcus danielli* (Benn.) Benth., otherwise known as miraculous berry, is a NTFP that belongs to the family of Marantaceaea, a tropical rhizomatous, perennial herb<sup>2</sup>. It is a

multipurpose perennial herb that offers a wide assortment of uses. Industrially, the fruit berry contains a mealy pulp (thaumatin) in the mesocarp which has high pharmaceutical potential in drugs, confectioneries and mineral drinks manufacturing as sweetener<sup>10</sup>. They indicated it to be 100,000 sweeter than sugar, hence it is used as a sweetener and flavor. The protein thaumatin and monelin which are constituents of the fruit belong to the most potent sweeteners known on molar basis<sup>11</sup>. Traditionally, the leaves are used for wrapping various types of foods such as bean cake, yam flour, rice and pounded yam for both domestic use and commercial enterprise. They are also used for preserving kolanuts and as food supplement to some ruminants including goat. The fibrous nature of the leaves enhance its use in combination with some other materials as roof thatching in hamlet and as resorts. The stalk is used for weaving mat, fish traps, ornamental bag and it is also used as sponge and for pulping roll; while the root features in traditional medicine<sup>13</sup>.

This study therefore deals with the economic analysis of *Thaumatococcus danielli* with a view to identifying its uses in the area of study while examining its impact on the income of the rural communities. The profitability was determined while factors affecting the production of *Thaumatococcus danielli* were identified.

### Methodology

The study was carried out in Ogotun Ekiti of Ekiti South-West Local Government and Ipoti Ekiti of Ijero Local Government in Ekiti State, Nigeria. The state is located between longitudes 4°5' and 5°45' East of the Greenwich meridian and latitudes 7°15' and 8°5' North of the Equator. It lies South of Kwara and Kogi State, East of Osun State and bounded by Ondo State in the East and in the South. Two geographical seasons are noted in the state. These seasons are the raining season which runs from March to October and dry season which starts in November to February. The mean annual temperature varies between 21 and 28°C with high humidity. The south-westerly winds and the North East Trade winds blow in the raining and dry (Harmattan) seasons respectively. Tropical forest exists in the South, while Guinea savanna predominates in the northern peripheries. The State has 16 Local Government Areas with the capital located at Ado-Ekiti. The estimated population of the State at its creation from the old Ondo State in October 1<sup>st</sup> 1996 was 1,750,000. Ogotun Ekiti which is one of the three major towns of Ekiti South-West Local Government Area of the State, has a population of 21,954 people and a total land area of 27.5 km<sup>2</sup>. Ipoti Ekiti is one of the 14 towns that make up Ijero Local Government Area of the State. The town has a land area of 42 km<sup>2</sup> and a population of 26,428 people<sup>8</sup>. Ogotun and Ipoti Ekiti are the major producers of *Thaumatococcus danielli* in Ekiti State. The towns are blessed with *Thaumatococcus danielli*, as the plant grows naturally and is found commonly under forest floor and cocoa plantation. Commercial plantation of the plant is practiced by some farmers purposely for mat weaving and for the sales of the leaves to neighboring towns. The predominant occupation of men in the area is farming while their women engage in mat weaving.

Twenty farmers of *Thaumatococcus danielli*, twenty sellers of leaves and fifteen mat weavers were randomly selected based on the number of *Thaumatococcus danielli* producers in the study areas. Thus a total of 55 respondents were interviewed through a

structured questionnaire designed for the objectives of the study. Twenty two questionnaires were administered to *Thaumatococcus danielli* producers in Ogotun Ekiti, while thirty three were administered in Ipoti Ekiti. The questionnaires were administered through oral interpretation of the questions to some of the respondents and self administration by the literate respondents. Data were collected on the socio-economic characteristics of the respondents and on the level of cultivation, availability, processing, prices, sales and uses of the plant.

The analytical tools used in this study were descriptive statistics (tables, frequency count and percentages) and simple statistics regression. Production function analysis was used to determine the effects of input used (the independent variables) on the level of income (dependent variable) generated by the farmers, mat weavers and sellers of the leaves of *Thaumatococcus danielli*. The general forms of the equation for the farmers, mat weavers and sellers are given as follows:

For farmers:  $Y = f(X_1, X_2, X_3, X_4, X_5, E)$ , where Y = income generated by farmers in naira,  $X_1$  = experience of farmers in years,  $X_2$  = farm size in hectares,  $X_3$  = household size,  $X_4$  = variable cost,  $X_5$  = fixed cost, E = error term

For mat weaver:  $Y = f(X_1, X_2, X_3, X_4, E)$  where Y = income generated by mat weaver in naira,  $X_1$  = experience of mat weaver,  $X_2$  = household size,  $X_3$  = variable cost,  $X_4$  = fixed cost, E = error term

For sellers of leaves:  $Y = f(X_1, X_2, X_3, X_4, E)$  where Y = income generated by seller,  $X_1$  = experience of sellers in years,  $X_2$  = household size,  $X_3$  = variation in price,  $X_4$  = variable cost, E = error term.

The variables were regressed using the following functional forms:

- (1) Linear function  $Y = a_0 + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + e_i$
- (2) Semi-Logarithm function  $\ln Y = a_0 + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + e_i$
- (3) Double-Logarithm function  $\ln Y = \ln a_0 + a_1 \ln x_1 + a_2 \ln x_2 + a_3 \ln x_3 + a_4 \ln x_4 + a_5 \ln x_5 + e_i$

Where  $a_0$  is the intercept,  $a_1, a_2, \dots, a_5$  are the regression coefficients,  $e_i$  is the error term.

The cost and return analysis was also carried out through the estimation of gross margin and net profit. The gross margin and the net profit analyses were used to estimate costs and returns for individual respondent in order to determine the profitability of the business. The costs considered are those of labour, transportation, rent, dye and tools such as knife and cutlass. Average gross margin per farmer, mat weaver and leave seller were estimated.

Average gross margin = Average gross returns – Average variable costs of production

### Results and Discussion

**Age distribution:** The age distribution of respondents on *Thaumatococcus danielli* is presented in Table 1. The farmers and mat weavers have the highest percentage of their ages between 41-50 years. This could be due to rural-urban drift of youths and school leavers in search of better job opportunity. The use of local technology and the long time involved in mat making may also make the processing unattractive to the youth. Majority (70%) of the leave sellers was of younger ages (below 40 years). They were intermediaries who buy the leaves from the farmers in the

farm and sell to market women in neighboring towns. They play vital role in providing outlets for sales.

**Educational status:** The results of the educational status in Table 2 show that the highest percentage of farmers, leave sellers and mat weavers had primary school education with 70, 65 and 73 percent respectively. Only the leaves' sellers (30%) had secondary school education. This may be due to the fact that most of the leave sellers are of younger age. Farmers had the highest percentage (30%) of no formal education, followed by mat weavers with 27%. This high level of illiteracy may be responsible for non-records keeping of their business transactions as majority of the respondent could not easily provide information on their past transactions. Education will induce economic motivation, widen farmers' social and economic horizon and predispose them to greater receptivity of new ideas<sup>14</sup>.

**Gender classification:** The results obtained in this study as presented in Table 3 show that men (80%) are only involved in the propagation of the plant while, about 20 % of the women also propagate the plant. The processing and marketing of the produce are the responsibilities of the women (100%). These findings agree with the observation of Okafor *et al.*<sup>12</sup>, that about 94 percent of the people that are engaged in the distribution of NTFPs are mainly women.

**Local uses:** The data on the uses of *Thaumatococcus danielli* as presented in Table 4 show that 95% of the respondents claimed that the leaves are mainly used for wrapping various types of food like rice, yam flour, bean cake, pap, pounded yam and for preserving kolanuts. 69% of the respondents claimed that the outer bark of the stalks is used mainly for weaving mat while the mat also serves as raw material for the manufacturing of ornamental bags. Other uses include the inner bark as sponge and pulp, while the stalk is also used to wave fish trap. All the respondents claimed that the fruits are used locally as food sweeteners. For the root, 11% of the respondents affirmed that it is used for medical purposes to cure ailments such as asthma, stomach ache and typhoid fever (Plates 1-7).

**Propagation:** Table 5 shows that 65% of the farmers claimed that they cultivated the plant alone in their plantation of less than 0.2 hectares. 20% preferred to have it scattered in cocoa plantations, while 10% had their plant scattered in forest plantations. Only 5% obtained this product from the wild. The high level of farmers' cultivation in pure stand may be due to the economic benefits derived by the farmers which made it possible for them to provide labor. On the other hand intercropping the plant with agricultural tree crops ensures maximum multiple land use while reducing the cost of labor.

From Table 6, availability of land places a limit on farmers' interest for increasing their farm size. 60% of the farmers will increase their farmlands if land is made available, while 20% will increase their farmland if labour is available. 10% and 5% of the farmers will increase farmland based on availability of rhizomes cuttings for vegetative propagation and availability of potential buyers respectively. The high percentage of land scarcity may be due to land owners preference for other arable crops which are harvested within one growing season as compared to *Thaumatococcus danielli* plantation which requires permanent farmland.

**Table 1.** Distribution of respondents by ages (Field survey, 2004).

Age (Years)	Farmers		Leave sellers		Mat weavers	
	Freq	%	Freq	%	Freq	%
Below 30	0	0	4	20	1	7
31- 40	4	20	10	50	2	13
41-50	12	60	4	20	9	60
51-60	4	20	1	5	3	20
Above 60	0	0	1	5	0	0
Total	20	100	20	100	15	100

**Table 2.** Distribution of respondents by educational status (Field survey, 2004).

Educational status	Farmers		Leaves sellers		Mat weavers	
	Freq	%	Freq	%	Freq	%
No formal education	6	30	1	5	4	27
Primary school	14	70	13	65	11	73
Secondary school	0	0	6	30	0	0
Total	20	100	20	100	15	100

**Table 3.** Classification of respondents' gender (Field survey, 2004).

Gender	Farmers		Leave sellers		Mat weavers	
	Freq	%	Freq	%	Freq	%
Men	16	80	0	0	0	0
Women	4	20	20	100	20	100
Total	20	100	20	100	20	100

**Table 4.** Classification of local uses of *Thaumatococcus danielli* (Field survey, 2004).

Item	Use	Frequency	%
Leaf	Food wrapping and		
	Kolanut preservation	52	95
	Animal feed	3	5
	Roofing	0	0
	Total	55	100
Stalk	Weaving mat	38	69
	Fish trap	2	4
	Sponge	11	20
	Pulp (tissue)	4	7
	Total	55	100
Fruit	Food sweetener	55	100
	Total	55	100
Root	Medical purposes	6	11
	None	49	89
	Total	55	100

**Availability:** According to 70% of the leave sellers and 47% of the mat weavers, the plants are rarely available. This could be the consequence of not planting in large area, as the area cultivated by each farmer is usually less than 0.2 hectares.

**Items of commerce:** As shown in Table 8, 65% of the respondents revealed that the leaves are the major item of commerce in the

**Table 5.** Classification of farmers by propagation methods (Field survey 2004).

Method	Freq	%
Pure Plantation	13	65
Scattered in:(i) Forest plantation	2	10
(ii) Cocoa plantation	4	20
Left in the wild (natural forest)	1	5
Total	20	100

**Table 6.** Determinants of farmers' interest in increasing farmland size (Field survey, 2004).

Determinant	Freq	%
Availability of potentials buyers	1	5
Land availability	12	60
Labor availability	5	25
Rhizomes cuttings availability	2	10
Total	20	100



**Plate 1:** One of the authors interviewing a farmer in a 3 year *Thaumatooccus danielli* plantation.



**Plate 2:** Bundles of *Thaumatooccus danielli* leaves for sale in the market.



**Plate 3:** Cooked pap (wrapped with leaves of *Thaumatooccus danielli*) for sale.



**Plate 4:** A mat weaver carrying a bundle of the stalk of *Thaumatooccus danielli*.



**Plate 5:** Processed stalk, bundle of unprocessed stalk and a woven mat.



**Plate 6:** A mat weaver at work using dyed processed stalk.



**Plate 7:** Fruits of *Thaumatooccus danielli* with the sweetened mesocarp of one of the fruits opened.

study area. This is followed by stalk with 35%. The fruits and roots attract no cost as they are not economic items. However, studies have shown the potentials of the fruit and the root. The fruit is a sweetener which can be used as sugar substitute in food and pharmaceutical industries<sup>4</sup>, while the root is used for curing ailment such as stomach ache, cough and fever<sup>11</sup>.

**Pricing:** The leaves and stalks of *Thaumatooccus danielli* are sold in bundles with prices varying with season. Price data obtained range between ₦30-₦45 per kg for leaves. The bundles of stalk vary in sizes and their weights range between 20-30 kg with the price varying from ₦790.00- ₦980.00. Average price per kg is ₦ 35.00 for the stalk. Depending on size and colour the prices for non-coloured mat vary between ₦400.00- ₦600.00 while coloured mat prices vary between ₦700.00- ₦1,000

**Levels of income generated:** The income generated as shown in Table 9 reveals that majority of the mat weavers (53%) and leave

sellers (40%) earn between ₦80,000-₦100,000 per annum, while most of the farmers (75%) earn between ₦60,000-80,000 per annum. This shows that majority of the people involved in *Thaumatococcus danielli* business are low income earners with farmers having the lowest income. This may be responsible for the respondents engagement in other agricultural practices and businesses as claimed by them.

**Table 7.** Classification of the availability of *Thaumatococcus danielli* produce (Field survey, 2004).

Availability	Leave sellers		Mat weavers	
	Freq	%	Freq	%
Readily	4	20	6	40
Rarely	14	70	7	47
Not Available	2	10	2	13
Total	20	100	15	100

**Table 8.** Classification of commercial components of *Thaumatococcus danielli* (Field survey, 2004).

Item	Freq	%
Leaf	36	65
Stalk	19	35
Fruit	0	0
Root	0	0
Total	55	100

**Estimated costs and returns:** Cost incurred was estimated by adding the fixed cost on cutlass and knife and variable cost on rent, labour, transportation, dye, stalks and leaves of *Thaumatococcus danielli* as applicable to farmers, leave sellers and mat weavers. The returns (revenues) were calculated using the selling price and the quantity sold. The average returns, the average costs and the average gross margin per respondent are presented in Table 10. The mat weavers had the highest average gross margin of ₦74,699.70 followed by the leaves sellers with ₦69,267.51 while the farmers had the lowest average gross margin of ₦59,043.85.

**Estimated production functions:** The functional form which best explains the effect of independent variables ( $X_1-X_5$ ) on the dependent variable Y was chosen based on the following criteria: a) the goodness of fit, using the magnitude of the coefficient of multiple determination ( $R^2$ ); b) the significance of regression (F-ratio), which measures the joint effect of all the  $X_1-X_5$  on Y; c) the significance of the t-value of the regression coefficient. The estimated production function obtained to be the best fit for farmers, mat weavers and sellers are represented as follows.

**Relationship between income and factors affecting income generated by farmers:**

$$Y = 304313.7 + 80148X_1 + 113405X_2 - 98297X_3 + 102907X_4 + 134330X_5 \dots \text{linear.}$$

$$(2.17) \quad (3.54)*** \quad (2.89)** \quad (3.09)** \quad (4.21)***$$

The values in parenthesis are t-values \*\* significant at 5% \*\*\* significant at 1%

$R^2 = 0.71$ ;  $F = 46.02$  (significant at 1%).

The significance of F-test shows a joint effect of the variables on the level of income generated. The value of the coefficient of multiple determination ( $R^2$ ) of the result implies that 71% of the income generated by farmers was explained by the explanatory variables. This coefficient of  $X_1$  (years of experience) had no significant relationship with income generated. This indicates that farmers with or without years of experience can generate the same level of income. The coefficients of  $X_2$  (farm size),  $X_4$  (variable cost) and  $X_5$  (fixed cost) were significant. However, that of  $X_3$  (household size) was also significant but with negative sign. This implies that increasing household size should not be a priority to increasing level of income generated, but rather increasing the number of hired labour. This may be due to the fact that most members of the farmers' household are students, while the single girls at home are involved only in mat weaving or sales of leaves and mat.

**Relationship between income and factors affecting the income generated by mat weavers:**

$$\ln Y = 205674 + 164009X_1 + 142910X_2 + 15070X_3 + 124291X_4 \dots \text{Semi-log}$$

$$(4.52)** \quad (3.24) \quad (4.03)** \quad (3.12)$$

$R^2 = 0.65$ ;  $F = 51.75$  (significant at 5%)

The value of the coefficient of multiple determination ( $R^2$ ) is 0.65 which means that income level of mat weavers was explained up to the tune of 65% by the variable included while the significance of F-test shows a joint effect of the variables on the level of income generated. The coefficient of  $X_1$  (years of experience of processor) and  $X_3$  (variable cost) were significant. This implies that the level of income generated by the mat weaver will increase with years of experience and with increase in variable cost. The years of experience needed to increase income may be as a result of technique and skill required in weaving mat and this can only be acquired through years of experience. Increase in variable cost that also led to increase in income generated could be due to increase in labour cost since mat weaving takes time as it is done manually.

**Table 9.** Average annual income generated by respondents (Field survey, 2004).

Income ₦	Farmers		Leaves sellers		Mat weavers	
	Freq	%	Freq	%	Freq	%
Below 20,000	0	0	1	5	0	0
20,000-40,000	2	10	3	15	1	7
40,000-60,000	3	15	2	10	3	20
60,000-80,000	15	75	5	25	2	13
80,000-100,000	0	0	8	40	8	53
Above-100,000	0	0	1	5	1	7
Total	20	100	20	100	15	100

**Table 10.** Estimated costs and returns of *Thaumatococcus danielli* for year 2000-2004 in Ogotun and Ipoti Ekiti (Field survey, 2004).

Costs/ Returns (₦)	Farmers	Leave sellers	Mat weavers
Average gross returns	69,120.14	91,540.00	96,621.12
Average fixed cost	2,485.78	-	1,021.11
Average variable cost	10,076.29	22,272.49	21,921.42
Average gross margin	59,043.85	69,267.51	74,699.70

*Relationship between income and factors affecting income generated by leave sellers:*

$$\ln Y = 220140 + 185721X_1 + 157295X_2 + 169231X_3 + 102921X_4 \dots \dots \text{Semi-log}$$

(4.92)      (3.39)      (4.67)\*\*      (4.10)\*\*

$R^2 = 0.62$ ,  $F = 52.03$  (significant at 1%)

F-test was significant at 1% and this shows that all the variables included had effect on the income generated by the sellers. The value (0.62) of the coefficient of multiple determination ( $R^2$ ) shows that 62% of the income of sellers was accounted for by the independent variables included. However, only the coefficients of  $X_3$  (variation in prices) and  $X_4$  (variable cost) were significant. Thus the higher the variable cost, the higher the level of income generated. The significance in the variation of prices leaves may be due to season. During rainy season leaves are in abundance there by making prices to fall, while during dry season they are scarce, thus an increase in price.

### Conclusions and Recommendations

The study has shown that *Thaumatococcus danielli* is a good source of income generation for households in the rural communities of Ekiti State. There are many uses to which the plant has been put, ranging from food wrapping, kola nut preservation, livestock feed, mat weaving, pulping, sweetening to the curative use for varieties of ailment. These uses do increase the income of many people, thus improving their standard of living. Although the gross margin for the farmers, leave sellers and mat weavers shows that the enterprise is profitable but it has not attained a reasonable profitability level; while its contribution to the national economy is insignificant.

The limitation in contributing significantly to economic development is due to its neglect as the plant is cultivated in small areas with the largest plantation covering less than 0.2 hectares; thus the plant is rarely available as claimed by majority of the respondents. Furthermore, its divergent uses have not been properly harnessed. As at present, the fruits do not generate any income despite all the studies that have been carried out on the use of the fruits as sweeteners in food and pharmaceutical industries while people's awareness of the medicinal uses of the plant's root has not been realized. Extraction of sugar from the fruits will in no doubt improve the industrial economy of the country while providing employment for young school leavers.

Based on the findings of this study, the following are recommended to improve the potentials of *Thaumatococcus danielli* in contributing significantly to economic development.

1. *Establishment of plantations of Thaumatococcus danielli in large areas.* Steps should be taken by the government to ensure that land is made available to the reach of willing farmers. This could be achieved by creating awareness on the financial benefits of the miraculous berry through the extension agents to land owners who prefer the use of their land for arable crops which are harvested within one growing season. Establishment of plantations in large areas will prevent scarcity and extinction of the plant.

2. *Production of sweeteners from the fruits.* Government policy should be geared towards the production of sweeteners from the fruits for pharmaceutical, confectioneries and other allied industries. Research facilities and the necessary technology should be made available for the extraction of sugar and some drugs ingredients from the plant while creating awareness for the

use of the fruits as sweeteners. This will give value to the fruits while increasing farmers' income through the sales of the fruits.

3. *Provision of capital.* The federal, state and local government should encourage small scale industries and individuals that are making use of the woven mat into ornamental bags in form of loans. This will no doubt reduce the high scourge of unemployment in the country. Further efforts could also lead to exportation of both the raw materials and finished products to neighbouring countries to earn the much required foreign exchange.

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