Journal of Research in Forestry, Wildlife & Environment Vol. 12(2) June, 2020
E-mail: jrfwe2019@gmail.com; jfewr@yahoo.com
http://www.ajol.info/index.php/jrfwe

ISBN: 2141 – 1778
Muhammad et al., 2020

ECONOMIC ANALYSIS OF NEEM (*Azadirachta indica)* PRODUCTION IN YOBE STATE, NIGERIA

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ABSTRACT

This work determined the economics of Azadirachta indica (neem) production in Yobe State, Nigeria. Specifically, it studied the socioeconomic characteristic of the farming respondents and the profitability of neem production in the State. Multistage sampling technique was used to select Afunori, Nangere and Damaturu plantation areas as well as the sampled neem farmers respectively. Yero Yemeni`s model was used in the determination of the number of neem farmers involved in the study. Data was collected using a structured questionnaire and the variables on which data was collected included neem production inputs and output, marketing costs and revenues. Data was also collected on socioeconomic variables. Both descriptive statistics and economic tools were used in analyzing the data including percentages, frequency distribution tables and Gross Margin (GM) analyses. Socioeconomic data revealed that aged, male gender, individuals with no formal education as well those with small land holding constituted 50%, 95.45%, 54.55% and 90.91% respectively. Financial results revealed respective GM and net profit values of ₦3, 831.82 and ₦ 3, 274.06 per hectare per year. Thus, it was concluded that neem production in the State was not economically viable and was attributed principally to ignorance of its economic potentials and lack of functional markets. Other production constraints uncovered included land tenure problem, poor extension services, lack of improved planting stocks and poor supportive services.

Key words: Economic analysis, *Azadirachta indica*, production

INTRODUCTION

Nigeria is potentially an agricultural country. Available statistics has shown that 75% of its total land area (923,769 square miles) can support agricultural activities (Leadership, 2008). In addition, the country has been endowed with favorable agro ecology for both arable crop and livestock production (YBSES, 2008; Polycarp, 2009) besides abundant water resources for irrigated agriculture (Bichi, 2009). Before 1950s, these potentials made the agricultural sector the main stay of the national economy from the standpoint of rural employment, provision of food and export earnings (Jama` are, 2000; CBN, 2006).With the discovery of oil in the early 1950s however, the agric sector has been deprioritized due to economic opportunities created by the huge oil reserves. Consequently, oil revenues accounted for more than 90% of the country`s foreign exchange earnings (CBN, 2006). In other words, Nigeria is over depending on oil as its major foreign exchange earner. This puts the country in a difficult and a dangerous situation in that the oil is not only a non-renewable resource, but is also increasingly becoming less attractive particularly with advent of biofuel technology (Yusuf, 1990). Furthermore, the oil market is highly unreliable due to unforeseen circumstances. For instance, poor oil revenues occasioned by the economic meltdown of 2009 have led to one third reduction in budgetary allocations to Local Governments and States as well as Federal Ministries. The same problem led to economic recession in 2015. In each case, there was a dramatic reduction in social and economic services to the nation hence the need to diversify the economy became apparent (Ogbebahu, 2009).

The Federal Government directed all States to look inwards with a view to finding alternative sources of capital for all forms of development in their respective domains. To achieve this, the National Raw material Research and Development Council (NRRDC) and the National Economic

Empowerment and Development Strategy (NEEDS) have been mandated to identify important renewable and non-renewal resources available in each state for subsequent investment into the sector (CBN, 2006). Accordingly, Yobe State endowed with favorable agro-ecology for neem (*Azadirachta indica*) resources is considering large-scale investment in afforestation and reforestation projects for two major reasons: first; desertification control and second revenue generation to fund socio-economic and physical services.

The use of neem to achieve both objectives is a right strategy. However, there is a need for critical analysis of economics of its production with respect to the attainment of the set objectives, severally reiterated in tree selection and usage criteria (Wilkinson and Elevitch, 2012). A prior research work is therefore necessary. The choice of this species from among tens of other species is based on the findings of the Yobe State Afforestation Project (YBSAP) and the Food and Agriculture Organization (2008) that neem thrives well in all parts of the State; it has multiple products of high market value can therefore serve as another source of revenue.

Azadirachta indica has considerable microclimatic potential. Studies (World Neem Foundation, 2012) have shown that it has the capacity to do the job of 10 air conditioners and can lower the temperature of its surroundings by 10^0C less than the outside ambient temperature. Socially, it performs a number functions including provision of shade for avenue functions, aesthetic and protective services around buildings and major roads, pasture tree to shade livestock besides serving as food and provision of fuel wood, poles and post (Abdullahi, 2004 and Orwa *et.al.*, 2009).

Its industrial applications in medical, agrochemical, cosmetics, soap, pharmaceutical and wood industries generate considerable revenues to all participants in the value chain (Muhammad, 2016). Generally, an *Azadirachta indica* tree can provide estimated economic and ecological services worth US$24,000 in its 250 years life span (Saxena, 2012). Experts described it as a tree with solution to all global problems whereas the United Nations general assembly declares it as the tree of the 21st century (World Neem Conference, 2012).

Generally, this work assessed the economics of neem production in Yobe state, Nigeria. Specifically, it studied the socioeconomic characteristics of neem seed marketers and the profitability of neem production in the State.

Neem (*Azadirachta indica)* belongs to Meliaceae the mahogany family. It is a versatile multipurpose tree widely used in the resolution of physical, social and economic problems (Muhammad, 2016). It's widespread involvement in environmental management programs such as afforestation and reforestation projects, sand dune fixation and stabilization programs, re-greening urban and rural settlements, draught, desertification, flood and erosion control as well as in wide range of agroforestry projects attest to its high physical potentials (Stoney, 2005). This is supported by its high adaptation to a broad range of ecological conditions that may not favor most xyrophytic species in the same family (NAS, 2010).

MATERIALS AND METHODS

Study Area

Yobe State is located between latitudes 10^o 27' and 13^o 23' North and longitudes 9^o 40' and 12^o 30' East of the Green Which Meridian (Figure 1). It occupies the North Eastern part of the country and is bounded on the north by the Niger republic, on the east by Borno State, Bauchi on the southwest and Jigawa State on the Northwest (Encyclopedia Britannica, 2006). It covers a total land area of 45,502 square kilometers. Available data indicates considerable variations in the amount of rainfall and length of the rainy season between the northern and southern parts of the State. In the north, annual rainfall ranges from 300 mm to 500 mm and the rainy season lasts for about 90 days. In the southern part, the range per annum falls between 500 mm and 1000 mm within a maximum of 140 days (YBSG, 2004). Besides the shortage of the growing season, the pattern of the fall is very unpredictable leading to drought. Temperature is particularly very high throughout the year ranging from 39 ^{o}C to 42 ^{o}C (YBSG, 2004). The temperature and rainfall data gives a vivid picture of the type and distribution of vegetation in the state: Sahel in the north and Sudan Savannah in the south. Both vegetation types are under severe continuous threats of desert

encroachment (Iloeje, 1992). The dominant ethnic groups are Manga, Fulani, Ngzim, Bade, Bolewa, Karei-Karei. Their major occupations are farming and marketing. Among the popular cash crops grown in the State are gum Arabic, groundnut, onion, cotton, and tomatoes. Other crops commonly grown in the State include millet, guinea corn, maize, rice, beans and sesame.

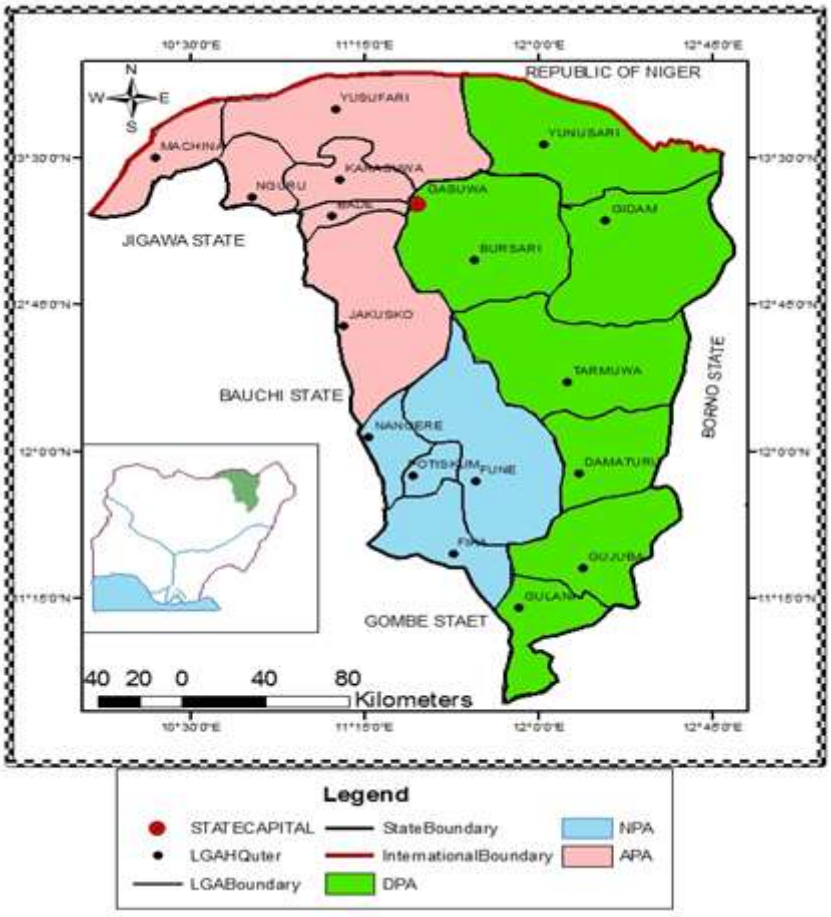

Figure 1: Map of Yobe State showing the three plantation areas of APA, NPA and DPA

Sample and Sampling Procedure

The State was divided into three plantation areas: comprising Afunori Plantation Area (APA), Nangere Plantation Area (NPA) and Damaturu Plantation Area (DPA) with each covering 6, 4 and 7 Local Government Areas respectively (Figure1). This was based on the existing zoning arrangement of the State Afforestation Project (SAP). APA covered a total land area of 16,059.52 Square kilometers, whereas NPA and DPA had 10,706.35 and 18, 736.12 square kilometers respectively (YBSES, 2008). Multi stage sampling technique was used. The first stage was a purposive sampling of neem plantations in each of the plantation areas of APA, NPA and DPA. The second stage relates to the sampling of neem farming respondents. Out of the 489 total number of neem farmers (YBSES, 2008), a sample of 220 was drawn based on Yero Yemeni's model (1967) of sample size determination (equation III) in the order of 78, 52 and 90 gum Arabic farmers in APA, NPA and DPA respectively.

METHOD OF DATA COLLECTION

Data was collected using structured questionnaires. A total of 250 questionnaires were produced for data collection out of which 220 copies were correctly filled, returned and used in data analysis.

Determination of Economic Variables

Gross margin and profitability analyses constituted the main economic tools used in assessing the profitability of neem production in the state.

(i) Determination of Gross Margin

Gross Margin was determined with the formula below:

GM = TR – TVC……. [i]

Where:

GM = gross margin of neem production (₦)

TR = Total Revenue generated from neem production (₦)

TVC = total variable cost incurred in neem production (₦)

(ii) **Net profit was determined** as:

NP = TR – TC…… [ii]

Where:

NP = net profit realized from neem seed marketing (₦)

TR = total revenue realized from neem seed marketing (₦)

TC = total cost incurred from neem seed marketing (₦)

Sample size determination

Yero Yemenis model was used to determine sample size as:

$$n = \frac{N}{(1+Ne^2)} \ldots\ldots\ldots [iii]$$

Where;

n = Sample size

N = Population size

e = Sampling error (0.05)

RESULTS

Socioeconomic Characteristics of the Respondents

The modal age class of the sampled neem farmers was 47 – 57 years (50%), followed by the oldest age class (58 years and above) which constituted 22.73% of the respondents. The remaining age classes of 25 – 35 years and 36 – 46 years collectively formed the balance of 27.27% (Table 1) and represented youth participation in Neem production in the State. The male gender dominated the neem production scenarios in all the three plantation areas. It constituted 95.45% against 4.55% participation of the female gender (Table 1). The educational qualification of the respondents was indisputably, one of the most important social variables considered. The need to undertake such analysis was informed by the direct relationship between output and literacy level of farmers (World Bank, 2005). However, farmers with No Formal Education (NFE) were the dominant group (54.55%) compared to the individual scores of other group with varying levels of education (Table 1). Collectively, the educated group formed 45.45% which was comparatively lower than the percentage of individuals with NFE.

Table 1 summarizes the occupational distribution of the respondents. Results have shown that farming was the dominant occupation (65.55%) among the sampled neem farmers followed by farming and trading (15.91%), other occupation (hunting and fishing) (11.36%), trading (4.55%) and public service (2.27%). The majority (90.91%) of the neem farming respondents had 1 - 3.99 ha of land (Table 1). Only 2.27% of the respondents owned between 7 and 9.99 ha. The balance (6.82%) controlled neem farms ranging from 4 to 6.99 ha. Respondents identified six (6) constraints to commercial production of neem in the state. Four of them were ranked high, namely poor market (36.36%), poor extension services (27.27%), land tenure problem (13.64%) and lack of improved planting stocks (13.64%) (Table1).

Profitability Analysis

Gross margin (GM) and profitability analysis models were used to determine the relative economic worthiness of neem production in the study area. Results reveal GM value of ₦19, 120, 775.96. This generates GM of only ₦3, 831.82/ha/year. The total net profit (NP) realized was ₦16, 337, 551.69. On the average, each respondent earned ₦110.32/tone of neem seed produced and marketed (Table 2).

Table 1: Socioeconomic characteristic of Neem farming respondents

Age class	Frequency	Percentage (%)
25 – 35	35	15.91
36 – 46	25	11.36
47 – 57	110	50
58 and above	50	22.73
Total	220	100
Gender		
Male	210	95.45
Female	10	4.55.
Total	220	100
Educational Qualification		
No Formal Education	120	54.55
Primary	45	20.45
Secondary	35	15.91
Tertiary	20	9.09
Total	220	100
Occupation		
Public servant	5	2.27
Farming	145	65.91
Trading	10	4.55
Farming & trading	35	15.91
Others	25	11.36
Total	220	100
Farm size (ha)		
1 – 3.99	200	90.91
4 – 6.99	15	6.82
7 – 9.99	5	2.27
Total	220	100
Production constraints		
Land tenure problems	30	13.64
Poor extension services	60	27.27
Lack of improved seedlings	30	13.64
Poor market	80	36.36
Poor yield	5	2.27
Lack of government support	15	6.82
Total	220	100

Table 2: Gross Margin and Profitability Analyses of Neem production in Yobe state 2009 - 2013

Variable	Value (₦)
Total hectares	998 ha
Quantity of neem seed produced and sold	673.13 tones
Fixed cost	2, 783, 224.27
Total variable cost	35, 676, 919.89
Total cost	38, 460, 144.16
Total revenue	54, 797, 695.85
Gross margin	19, 120, 775.96
Gross margin/ha/year	3, 831.82
Net profit	16, 337, 551.69
Net profit/ha/year	3, 274.06

DISCUSSION

The neem production scenario was dominated by aged individuals against the stipulations of the Millennium Development Goals (MDGs) of high youth involvement in socioeconomic activities (UNDP, 2008). Despite the prevailing favorable neem agro-ecology, productivity was insignificant due to inadequate active labor that could have been harnessed to accomplish hectic farm operations, and the low risk taking tendencies among aged individuals as reported in the early works of Aturamu and Daramola (2005) as well as Adegeye and Dittoh (2005). It further confirms the rural urban drift phenomenon that significantly reduced labor size available for neem production (Ruma, 2008). The low demand for neem products might have discouraged high youth participation in neem production business (Hill and Ray, 1987). There is therefore an ardent need for awareness creation about economic potentialities of neem among policy makers and other citizens.

There was gross under involvement of women in neem production in Yobe State and this contravenes the principle of gender equality enunciated in the Millennium Development Goals (UNDP, 2008). The gender disparity observed can be overcome by incorporating neem production packages into the various women empowerment programs of the state. Results indicated active participation of both individuals with formal and non formal education in the production business of neem in the study area. This is explained by the need for livelihoods improvement. The extent was greater among individuals with NFE due mainly to the higher rate of unemployment among them (World Bank, 2005). Neem production in the state was mostly accomplished by farmers due to their limited sources of income compared to other occupational groups. Lack of awareness about its economic potentials was one of the major hurdles to its commercial production. This further agrees with Aturamu and Daramola (2005) who established that perception of a specific production package significantly influences its adoption.

Production of neem is accomplished predominantly by smallholders. This can be attributed to a number of factors including the prevailing hereditary land tenure system, domination of neem production business by uneducated farming clients and the general peasantry nature of most farming communities. These conditions are unfavorable for economic production (World Bank, 2005). There is therefore, the need for review of the existing land use act and development of high level empowerment program that can address challenges from both technical and material perspectives. The neem farming respondents identified six (6) production constraints but four (4) of them including lack of functional markets, poor extension services, land tenure problems and lack of improved planting stocks were ranked higher. These constraints significantly hindered higher productivity.

Economically, neem production in the State was not profitable. Yet it is the tree of the 21st century and is believed to have solutions to all global problems. The question posed by this work is this: "why was its production not profitable in the state?" A number of reasons could be advanced to answer the above question. One; according to an anonymous writer, resources are not until they become. This is true of neem in Nigeria where its economic potentials are not yet understood let alone exploited. Its utilization in the country and other countries in sub-Sahara Africa is restricted to physical functions only. On the contrary, it is the most widely used species in India for both economic and ecological functions. Two; it has no established market for its multiple products and this negatively undermines its production and marketing. Three; it has no association promoting any of its activity in the value chain. Based on these shortcomings, this work therefore recommends the need for awareness creation about its economic potentials severally reiterated in this work. This should be extended to both policymakers and other citizens in rural and urban areas. A functional market for neem products should be created to stimulate high level operations in production and marketing. This may require establishment of neem processing industry. Formation of neem product associations would provide supportive, promotional and motivational services to producers, processors and exporters of neem and neem based products in the state. If economic diversification programs target 25% agricultural growth by 2025 (YBSES, 2008), then the creation of favorable production and marketing policies are inevitable**.**

CONCLUSION

Results from this study have shown that neem production in Yobe State was not profitable. Socioeconomically, the production scenario was severely marred by gender disparity, lack of functional markets and improved planting stocks as well as poor extension services and land tenure problems. The situation was further worsened by ignorance of its economic potentials. Therefore, neem production can only be part of the economic diversification program of the state with the creation of favorable production and marketing policies.

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