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
jfewr ©2020 - jfewr Publications
ISBN: 2141 – 1778
Muhammad et al., 2020

ECONOMIC ANALYSIS OF *Senegalia senegal* (GUM ARABIC) PRODUCTION IN YOBE STATE, NIGERIA

Muhammad, Y. K., Ilu, K. J., Jibo, A. U. and Salami, K.D.
Department of Forestry and Wildlife Management, Federal University Dutse, Jigawa State, Nigeria.
***Corresponding Author:** *myayokarage30@gmail.com; sulbijkarage20@gmail.com;*
+234 803 926 5558; +234 708 392 4599

ABSTRACT

This work analyzed the economics of Senegalia senegal (gum Arabic) production in Yobe state, Nigeria. Specifically, it studied the socioeconomic characteristic of the farming respondents and the profitability of gum Arabic production in the state. Purposive and random sampling techniques were used to select Afunori, Nangere and Damaturu plantation areas as well as the sampled gum Arabic farmers respectively. Yero Yemeni`s model was used in the determination of the number of gum Arabic farmers involved in the study. Data was collected using a structured questionnaire and the variables on which data was collected included gum Arabic production inputs and output, marketing costs and revenues. Data was also collected on socioeconomic variables. Both financial and statistical tools were used in analyzing the data including Gross Margin (GM) and Profitability analyses. Socioeconomic data revealed that the gum Arabic production scenario was dominated by youth, the male gender, educated elites and public servants with small land holding. Financial results on the contrary, revealed US$ 805.86 (₦241, 758.00) GM values per hectare per year, whereas US$ 345, 948.88 (N103, 784, 664.00) was the total net profit realized. On the average each respondent earned US$1, 572.49 (₦ 471, 747.00). Thus, it was concluded that gum Arabic production in the state was economically profitable. However, its resources were grossly under exploited. Other production constraints uncovered included land tenure problem, poor extension services, lack of improved planting stocks and poor support on the part of government. Creation of enabling environment for improved production and marketing as well as adequate stakeholder involvement were some of the major policy recommendations made.

Keywords: Economic analysis, *Senegalia senegal*, production, Yobe State

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 favourable agro ecology for both arable and livestock production (YBSES, 2008 and 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 and 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 gum Arabic resources is considering large-scale investment in afforestation and reforestation projects for two major reasons: (i) desertification control and (ii) revenue generation to fund socio-economic and physical services. The use of gum Arabic to achieve both objectives could be 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 gum Arabic thrives well in all parts of the state and has multiple highly valued products with high revenue generation potentials.

If the production of any agricultural product is highly influenced by its demand (Umar et. al., 2011), then it can be asserted that gum Arabic has a global market demand guaranteed by its high quality binding and storage properties (Abdul, 2002). This is explained by its large scale utilization in many manufacturing industries including food, medical, pharmaceutical, cosmetic, lithographic, textile and ceramic industries. Massive engagement of the citizenry in the program will depend on favorable production and marketing policies.

Objectives

Generally, this work analyzed the economics of gum Arabic production in Yobe state, Nigeria. Specifically, it studied the socioeconomic characteristics and assessed profitability of gum Arabic production in the state.

Gum Arabic (*Acacia senegal*) is a desert thriving plant with over 1100 species flourishing in the wild predominantly in sub – Saharan Africa and the Sahel where the agro ecology is most favorable for the species (Umar et. al., 2011). However, only three of these species are known to be of economic importance, namely *Acacia senegal*, *Acacia seyal* and *Acacia seberina* (Bello, 1998); otherwise called grades 1, 2 and 3 gum Arabic respectively. Sudan is the world chief producer and exporter of gum Arabic produce followed by Chad and Mali. Nigeria also earns some reasonable foreign exchange from gum Arabic export (Umar, 2006). Gum Arabic is produced in eleven states but the major ones are Jigawa, Yobe, Borno, Kebbi, Sokoto and Katsina states. The plant is highly susceptible to weed at tender stage, but at maturity, weed stress becomes a favorable factor for optimum production. Among its production and marketing prospects include the highly valued gum Arabic noodles termed the *desert gold* (Acacia market report, 2006) that has the capacity of changing the economic fortunes of any nation *(*Daily Trust, 2006). In addition, the establishment of gum Arabic research substation at Jawa and the formation of the National Association of Gum Arabic Producers, Processors and Exporters of Nigeria (NAGAPPEN) offer the gum Arabic industry comparative advantages (YBSES, 2008). However, in spite of its strong production and marketing potentials exploitation remains grossly inadequate. For instance, of the state`s total land area of 45, 502 square kilometers, only 848 ha is under gum Arabic production (YBSES, 2008). The major producing areas have been conveniently grouped into three zones: Afunori, Nangere and Damaturu otherwise called gum Arabic plantation areas.

MATERIALS AND METHODS

Study Area

Yobe State is located between latitudes 10^0 27^1 and 13^0 23^1 North and longitudes 9^0 40^1 and 12^0 30^1 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 remarkable 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 300mm to 500mm and the rainy season lasts for only 90 days. In the southern part, the range per annum falls between 500mm and 1000mm 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. Temperatures are particularly very high throughout the year ranging from 39^0 C to 42^0 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.

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 is 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 gum Arabic plantations in each of the plantation areas of APA, NPA and DPA. The second stage relates to the sampling of gum Arabic farming respondents. Of the 489 total number of gum Arabic 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.

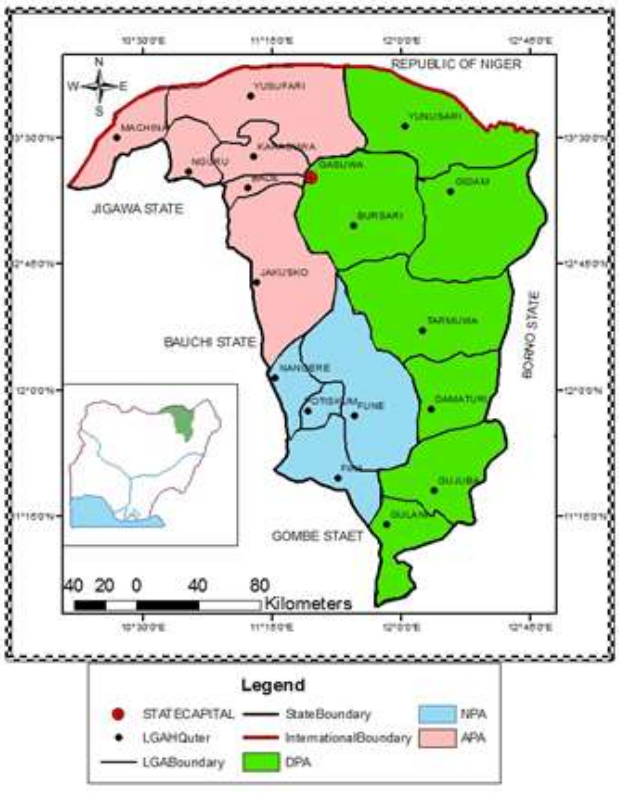

Figure 1: Map of Yobe State showing the study area

Tools for data analysis

A combination of both descriptive and financial tools was used in analyzing the data. Analytical tools such as means, percentage and frequency distribution tables were the major descriptive statistics used in analyzing the socioeconomic variables of the respondents. Gross margin and profitability analyses on the other hand, constituted the main financial tools applied in assessing the profitability of gum Arabic production in the State.

Model specifications

(i) Gross Margin/profitability analysis; the formula is expressed as;

(a) GM = TR – TVC…… (i)

Where;

GM = gross margin of gum Arabic production (₦)

TR = Total Revenue realized from gum Arabic production (₦)

TVC = total variable cost incurred in gum Arabic production (₦)

(b) NP = TR – TC……(ii)

Where;

NP = net profit generated from gum Arabic production (₦)

TR = total revenue realized from gum Arabic production (₦)

TC = total cost incurred in gum Arabic production (₦)

(i) Yero Yemenis model of sample size determination

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

Where;

n = Sample size

N = Population size

e = Sampling error (0.05)

RESULTS

Socioeconomic Characteristics of the respondents

Age distribution

The modal age class of the sampled gum Arabic farmers was 36 – 46 years (48%), closely followed by the most active age class (25 – 35 years) which constituted 38% of the respondents. The remaining age classes of 47 – 57 years and 58 years and above formed 10% and 4% respectively (Table 1).

Gender distribution

The male gender dominated the gum Arabic production scenarios in all the three plantation areas. It constituted 93.18% against 6.82% participation of the female gender (Table 1).

Educational distribution of respondents

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 (37.73%) compared to the individual scores of the other group with varying levels of education (Table 1). Collectively, the educated group formed 62.27% which was outstandingly higher than the percentage of individuals with NFE.

Occupational Distribution of Respondents

Table 1 summarizes the occupational distribution of the respondents. Results have shown that 38.64% were public servants, followed by farming (22.73%), trading (20.45%) and those engaged in both farming and trading (15.91%). Other occupations such as fishing and hunting attracted a staggering 2.27%.

Farm size distribution

The majority (81.82%) of the gum Arabic 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 (15.91%) controlled gum Arabic farms ranging from 4 to 6.99 ha.

Gum Arabic production constraints

Respondents identified six (6) constraints to commercial production of gum Arabic in the state. Four of them were ranked high, namely land tenure problem (50%), poor extension services (25%), lack of improved planting stocks (11.37%) and poor support on the part of government (9.09%) (Table 1).

Table 1: Socioeconomic characteristic respondents

Variable	Gum Arabic Farmers	
	Frequency	**Percentage (%)**
Age class		
25 – 35	84	38
36 – 46	105	48
47 – 57	22	10
58 and above	9	4
Total	220	100
Gender		
Male	205	93.18
Female	15	6.82
Total	220	100
Educational Qualification		
No Formal Education	83	37.73
Primary	40	18.18
Secondary	75	34.09
Tertiary	22	10
Total	220	100
Occupation		
Public servant	85	38.64
Farming	50	22.73
Trading	45	20.45
Farming & trading	35	15.91
Others	5	2.27
Total	220	100
Farm size (ha)		
1 – 3.99	180	81.82
4 – 6.99	35	15.91
7 – 9.99	5	2.27
Total	220	100
Production constraints		
Land tenure problems	110	50
Poor extension services	55	25
Lack of improved seedlings	25	11.37
Poor market	5	2.27
Poor yield	5	2.27
Lack of government support	20	9.09
Total	220	100

Table 2: Gross margin and Profitability Analysis for gum Arabic production in Yobe state

Variable	Value (₦)
Total hectares	848
Quantity of gum Arabic produced and sold	685.41 tones
Fixed cost	337, 417.2
Total variable cost	502, 830.31
Total cost	840, 247.51
Total revenue	1, 186,196.39
Gross margin	683, 366.08
Gross margin/ha/year	805.86
Net profit	345, 948.88
Net profit/farmer	1,572.49

Gross Margin and Profitability analysis

Gross margin (GM) and profitability analysis models were used to determine the relative economic worthiness of gum Arabic production in the study area. Results reveal GM value of US$ 683, 366.08 (₦205, 009, 824.00). This generates US$ 805.86 GM/ha./yr (₦241, 758.00). The total net profit (NP) realized was US$ 345, 948.88 (N103, 784, 664.00). On the average, each respondent earned of US$1, 572.49 (₦ 471, 747.00) (Table II).

DISCUSSION

Socioeconomic characteristics

The gum Arabic production scenario in the state was dominated by youth (Table I). Therefore, high productivity was expected for two reasons: abundance of active labor needed for hectic farm operations and the high youth tendency to accept and experiment change programmes of proven values widely reported in the early works of Aturamu and Daramola (2005) as well as Adegeye and Dittoh (2005). However, this contradicts the rural urban drift phenomenon that significantly reduces labor size available for agricultural production (Ruma, 2008). The increasing global demand for gum Arabic produce might have encouraged the youths to participate in gum Arabic production (Hill & Ray, 1987).

There was gross under involvement of women in gum Arabic production in Yobe state and this contravenes the principle of gender equality enunciated in the Millennium Development Goals (UNDP, 2008).

The high engagement of individuals with varying level of education in gum Arabic production business was attributed to greater awareness about the economic value of the crop occasioned by its high global demand. This agrees with Hill & Ray (1987) assertion that the global demand for a product can stimulate high elite participation in its production. Again, the educational experiences they have had equipped them with efficient technical and managerial skills needed for higher output (World Bank, 2005). All these could be part of the reason for higher productivity and profitability of gum Arabic production in the study area.

The production of gum Arabic was mostly accomplished by public servants due to their greater access to gum Arabic production packages compared to non public servants. This further agrees with Aturamu and Daramola (2005) who established that perception of a specific package is a significant factor in determining the adoption of any technology. Again, the domestication and large scale cultivation of gum Arabic conforms with economic diversification strategies earlier proposed by Ogbebahu (2009). Thus, gum Arabic cultivation in Yobe state is in its developmental stage where only the educated elite showed deeper interest in the production business (Umar, et. al., 2011).

Gum Arabic production was predominantly accomplished by smallholders. This can be attributed to a number of factors including the prevailing hereditary land tenure system, domination of gum Arabic production business by public servants (with limited time and resources needed for large scale production) and the general peasantry nature of most farming communities in the state. These conditions are unfavorable for economic production.

The six production constraints identified by the farming respondents point to the fact that urgent measures need to be taken to pave way for

economic production of gum Arabic in the state. Policy recommendations against these constraints have already been made.

Gross Margin and Profitability analyses

The above analyses indicated that gum Arabic production in Yobe state was highly profitable and can therefore be incorporated into its economic diversification strategies. This agrees with both the Acacia market report (2006) and the Daily Trust`s forecast (2006) that gum Arabic is a desert gold and a promising desert flora that can change the economic fortunes any nation respectively. The diversification program targets unprecedented agricultural growth of up to 25% by 2025 (YBSES, 2008) against single digit growth rate recorded for many years. To achieve this, policies need to focus on measures that could step up both production and marketing operations besides full exploitation of gum Arabic resources.

CONCLUSION

Results have shown that gum Arabic production was highly profitable in Yobe state. Therefore, it can be produced at commercial scale to diversify the state`s economy and to counteract the excesses of desertification. In other words, the tree can guarantee revenue generation besides sustainable environmental management.

Recommendations

Based on findings, the following recommendations were made—

1. The gender disparity observed can be overcome by incorporating gum Arabic production into various women empowerment programs of the state.
2. There was a need for greater awareness on the economic potentialities of gum Arabic production to stimulate high participation of individuals engaged in other occupations.
3. The existing land use act needs total and comprehensive review to ease land acquisition process particularly for commercial production. Moreover, intensive empowerment programs should be part of the overall production and marketing strategies

REFERENCES

Abdul Gasim, S. E and Manar, Z. (2002). Production and Commercialization of gum Arabic in Sudan. In: Domestication and commercialization of non – timber forest products in agro forestry system. File: // A. / commercial of gum.

Acacia Market Report (2006, May 18).Grade 1 Acacia senegal.Article 102.Retrieved August 22, 2006, from: *http://www.agricproducts.com/whatsnews/news-2000-03-acacia-market-report.html.*

Adegeye, A.J. and Dittoh, J.S. (2005).Essentials of Agricultural Economics.Impact Publishers (Nig.).Ltd, Ibadan, Nigeria.

Aturamu, O.A. & Daramola, A.G. (2005).*Tobit Analysis of Factors Influencing the Adoption of Alley Farming in South Western Nigeria.*In Proceedings of the 1st AnnualConference on Development in Agriculture and Biological Sciences.School of Agriculture and Agricultural Technology, Federal University of Technology Akure, Nigeria.

Bichi, S. S. (2009).Issues in overcoming the Effects of Global Economic Downturn in Nigeria: Sciences, Technical and Vocational Education Options. *Journal of Sciences, Technical and Vocational Education (JOSTEVE.* 01, 1 – 20.

Bello, Y: (1998). Extraction of gum Arabic. A paper presented at a Seminar organized by Afforestation Programme Coordinated Unit (APCU) Kano

Central Bank of Nigeria (CBN) (2006). Annual Reports and statement of Account for the Year ended 31st December 2005. Central Bank of Nigeria, Abuja, Nigeria.

Daily Trust (2006). Nigeria: Growing potential of `desert gold'. Retrieved May 09, 2006, from: *www.allafrica.com/stories/200604270177.htm*

Encyclopaedia Britannica (2006).Yobe State.Retrieved January 07, 2007, from: http://www.britannica.com/es/articles-9077978/yobe.

Hill, B. and Ray, D. (1987). Economics of Agriculture, Food and Rural Economy. Macmillan Education Limited.

Iloeje, M. (1992) Regional Geography for West Africa; Impact Publishers, NIG.Ltd., Ibadan, Nigeria. Conference of Agricultural Society of Nigeria, Badeggi, Niger State

Jama`are, A.S. (2000). Mechanization for Sustainable Agricultural Production in the 21st Century. Paper presented at the 33rd Annual Conference of Agricultural Society of Nigeria, Badeggi, Niger State.

Leadership (2008). Executive Summary on the National Food Security Program dated 23/05/2008

Ogbebuhu, D. (2009). Global Recession: Its Implications on Nigeria's Economy and the Way Forward. Retrieved July16, 2009, from: *http://www.nigeriansinamerica.com/articles/articles/3505/1/Global-Recession-Its*

Polycarp, M. I. (2009). Global Economic Downturn and the Nigerian Educational System: Paper presented at a Conference on Issues and Effects of Economic Meltdown in Nigeria, Umar Suleiman College of Education Gashua, P.M.B 02 Gashua, Yobe State, Nigeria.

Ruma, S .A. (2008). Key note address delivered by the honorable Minister of Agriculture and Water Resources. In: Nigerian Association of Agricultural Economists on Economic policy series, October, 2008; Vol.1 No.1

Umar, H. (2006). Economic Analysis of gum Arabic marketing in Nigeria (A case study of Borno State). A master thesis at the Federal University of Technology School of Agriculture and Agricultural Technology, Department of Agric Economic and Extension, Akure, Ondo State, Nigeria.

United Nations Development Program (UNDP)(2008).Millennium Development Goals. Retrieved May 15, 2009, from: *http://www.undp/mdg/goal 1.Shtml*.

Umar, H.Y.; Audu, S. I. and Waizah, Y. (2011). Economic Analysis of Gum Arabic Production in Jigawa State, Nigeria. In New *York Science Journal*, 4 (4) accessed @ *http://www.sciencepub.net/newyork*, pp 45 – 49, on 25/12/2019 at 4:00 pm

World Bank (2005) World Development Indicators. Retrieved January 7, 2006, from: *http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20523710~hlPK:1365919~menuPK:64133159~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html*

Wilkinson, K. and Elevitch, C. (2012).Multipurpose Trees. Retrieved December 31, 2012, from: ejournal of Agroforestry @ www.Overstory Online No. 16

Yemeni, Y. (1967). *Statistics:* An Introductory Analysis. (Rev.ed.) Harper and Row.

Yobe State Afforestation Project and FAO (2008).*Outlook Study of Desirable Tree Species for Sand Dune Fixation and Stabilization in the Sahel*.GPP publication No.17.Government Printing Press Damaturu, Yobe State, Nigeria

Yobe State Economic Submit (YBSES) (2008). The Yobe Environment: Problems and Proposed Intervention. Spectrum Books Limited Ibadan, Nigeria.

Yobe State Government (YBSG)(2004). Brief Description of Climate. Retrieved December, 11, 2006, from: *http://www.yobestategov.com/climate.htm.*

Yusuf, B. U. (1990). Nigeria against the IMF: The home market strategy. Ahmadu Bello University Zaria, Nigeria.