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CONTRIBUTION OF *Tamarindus indica* PRODUCTS TO THE RURAL LIVELIHOOD OF WAMAKKO COMMUNITY OF SOKOTO STATE – NIGERIA

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ABSTRACT

The study examined the contribution of *Tamarindus indica* products to the rural livelihood of people in Wamakko community of Sokoto State. Structured and open ended questionnaires were distributed. Twelve villages were purposively selected from eight districts. Simple random sampling was used to select ten 10 respondents from each village giving a total sample size of 120 respondents. The primary data collected were analyzed using descriptive statistics (frequencies and percentages). The results of the study indicated that, 66.6% of the respondents were within the age range of 15 – 35 years. 88.3% were male and married and 64.2% had a family size of 6 – 10 persons. Majority of them were farmers (96.7%) while 75% obtained Qur'anic education. In contribution to livelihood, the species serves as source of income to 82.5% of the respondents. About 40.5% of the respondents have an income range of N15,001 to -25,000 and 81.7% source their products from the market. However, apart from medicinal value, 68.3% of the respondents used *Tamarindus indica* as food (pulp). The major problems faced by the respondents in the study area include pest and disease infestation and lack of storage facilities. The paper recommended regeneration of *Tamarindus indica* through afforestation, reforestation and social forestry for an improved livelihood of people in the study area.

Keywords: Indigenous tree; *Tamarindus indica;* Rural livelihood

INTRODUCTION

Development plans in the past two to three decades tended to promote urban development at the expense of the rural areas. This can be gleaned from investments into infrastructural development, job availability, siting of industries and income disparity in favor of the urban areas. Yet, it has been argued that maintaining this rigid occupational dichotomy siphoning of resources from the rural areas to develop the urban sector, to the detriment of the rural sector and its population would negate the process of development (Akhakpe, 2012). Chandler (2007) sees development as a broader concept that recognizes psychological and material factors that measure human well-being. Development therefore is a multifaceted phenomenon and man centered. It is the process of empowering people to maximize their potentials, and develop the knowledge capacity to exploit nature to meet daily human needs (Ake, 2001).

Socio-economic development is a product of development and can be defined as the process of social and economic transformation in a society. Socio-economic development embraces changes taking place in the social sphere mostly of an economic nature. Thus, socio-economic development is made up of processes caused by exogenous and endogenous factors which determine the course and direction of the development (Chandler, 2007).Socio economic development is a multi dimensional phenomenon. Some of it indicators include the level of economic growth, level of education, level of health services, degree of modernization, status of women, level of nutrition, quality of housing, distribution of goods and services, and access to the communication (Abhiman, 1999). In this case the study of socio-economic development includes the advancement or improvement in the standard of living and increase in economic life of the people. Standard of living refers to the level of wealth, comfort, materials goods and necessities available to certain socio-economic class in a certain geographic area. The standard of living includes the factors such as income, quality and availability of employment, class disparity, poverty rate, quality and affordability of housing, access to quality health care, quality and availability of education, infrastructure, and environmental quality. The standard of living is closely related to quality of life (Anon, 2011).

Trees play an important role in human and economic development of any nation, for the simple reason that they (trees) provide many basic needs for life such as medicine, food, fodder, timber, environmental protection and stability. Based on this, trees touch almost all part of life, (Wilson, 1988). Economic trees provide man with fuel wood, fiber, charcoal, gum, resin, rubber, medicine and employment (Evans, 1992). *Tamarindus indica* (Tamarind) of the Fabaceae family and sub family Caesalpinioideae, known as *Tsamiya* in Hausa, is an important food in the tropics. It is a multipurpose tree of which almost every part is put into some uses either nutritional or medicinal (Kumar and Bhattacharya, 2008). *Tamarindus indica* is usually evergreen legume tree. It grows slowly, up to 25-30 m height, and can live up to 200 years, with large alternatively arranged and pinnately compound leaves (5 to 11 cm long) each of which is composed of 10 to 20 pairs of oblong leaflets (each leaflets 1 to 2 cm long and 30 to 60 mm wide). The flowers, which are around 2.5 cm across, are pale yellow and streaked with red. When in full bloom, the flower gives a yellowish colour to the tree. The flowers are 4 to 13 cm long and usually curved. Each pod contains 4 to 10 seeds embedded in a brown, sticky, fibrous edible but (sour) pulp surrounding the seeds (NRC, 2008). Tamarind is widely planted in the tropics and subtropics not only for it fruits but also as ornamental shade tree. Tamarind trees are sometimes clipped into Gnarled Bonsai in Thailand (Marberlly, 2008).

Tamarind is indigenous to tropical Africa but it has been introduced and naturalized in over 50 countries of the world, the major production areas are in the Asian countries which includes India, Thailand, Bangladesh, Sri Lanka and Indonesia (NRC, 2008). America, Mexico and Costa Rica are the biggest producers. Africa on the whole does not produce tamarind on a commercial scale, though it is widely used by the local people (El-Siddig *et al.*, 2006). Tamarind pulp is valued and widely used in food, beverages and medicine. It has therapeutic uses for constipation, abdominal pains, bowel obstruction, pregnancy vomiting and intestinal disorders among others (Nacoulma, 1999). In India, many studies have been carried out on Tamarind; seeds are used as cattle feed because of the high protein content, (Krithika and Radhai, 2007). Tamarind seeds contain 63% starch, 16% protein, and 5.5% fats. They can be eaten as pulse, but tamarind is better known for the pod pulp which constitutes around 40% of the pod. The pulp which is rich in vitamin C

contains tartaric, malic, citric acids and sugars has a sweet sour flavor and is used in drinks, sweets meats, curies and chutneys. It is an essential ingredient in Worcestershire sauce. The fruits pulp is the richest known natural source of tartaric acid (8 to 18%) and is the main acidulant (food additives used to increase tartness or acidity) used in preparation of foods in India. Tamarind pulp is rich in protein (around 8%); it has a crude fat content of around 1% and carbohydrate content around 56%, (Amoo and Nkechi, 2012).

In spite of the importance of the indigenous tree *Tamarindus indica* found in the study area, there are challenges and bottlenecks hindering its greater contribution, innovative approaches as well as strategies to recognize the contribution and value that this tree bring. However, the many ways in which indigenous trees contribute to socio-economic development are poorly understood, under estimated and adequately not considered in policy decision related to development. Government and non-governmental organizations have limited understanding of the important role that this tree can play in improving the standard of living of rural people especially in developing countries like Nigeria (Amoo and Nkechi, 2012).

Wamakko local government is an area with many stands of tamarind. This indigenous species is integral part of their rural house hold economy and contributes to the standard of living as it is significant to households in providing timber and non timber products. The fruits, leaves, bark and roots of tamarind have various uses such as food, firewood, fodder, charcoal, poles, timber and herbal medicine (Katende *et al.*, 1999).

The functions of this specie (*Tamarindus indica*) in social and economic development are not systematically documented, but they are thought to play a significant role in contributing to household economy. The research work will provide the rural dwellers with opportunity on ways of generating income through the appropriate methods of collections, processing and marketing. However, the research can serve as baseline information for other researches as it may be fitting to other areas having the same indigenous trees and socio-economic background. The objective of this paper is to determine the contribution of *tamarindus indica* products to the rural livelihood of people in Wamakko community of Sokoto State.

MATERIALS AND METHOD

Study Area

Wamakko Local Government Area is one of the 23 LGAs of Sokoto State, Nigeria. It has an area of 697 km² and an estimated population of 179,619 people (NPC, 2006). The Local Government Area was created out of Sokoto state in 1991. It has 10 districts: Dundaye, Gumburawa, Gumbi, Gwuiwa, Wajake, Gedawa, Kalambaina, Arkilla, Gidan Bubu, and Wamakko. Its headquarters is located in Wamakko town, about 10km from Sokoto city, the state capital. The Local Government Area is located to the extreme North West part of the state on the latitude of $13^{0}7.5528$ N and longitude 5^{o} 12.5400$^{'}$E using GPS Device. It is bordered on the North by Tangaza Local Government Area, to the South by Bodinga Local Government Area and Yabo Local Government Areas, to the West by Silame Local Government Area and to the East by Sokoto north and Kware Local Government Area.

The climate of the study area is characterized by a long dry season (October/November-April/May) with a short rainy season (May-September/October),

(Singh, 1995). Rainfall starts in late May and ends in late September or early October with annual rainfall ranging from 400 to 700 mm (Singh, 1995). The minimum and maximum temperatures are 19 and 34°C respectively with mean annual temperature of 27°C with relative humidity of 52 to 56%. The study area experiences harmattan wind (N-E Trade winds), which are dry, cold, and dusty blowing between the months of November to February. The soil of study area is predominantly sandy to sandy-loamy with low fertility level particularly poor in primary nutrients like Nitrogen, Phosphorus and Potassium (Ango *et al*., 2014). The vegetation of the area falls within the Sudan Savannah vegetation zone characterized by soils that are mostly sandy to loamy in texture with some patches of clayey subsoil. An assortment of various species of grasses and legumes, patches of bushes and sparsely distributed indigenous tree species majority of which are thorny tree species, such trees include *T. indica, Acacia species, Balanites aegyptiaca, Adansonia digitata* and *Faidherbia albida* (Ango *et al*., 2014).

Sampling Design

Wamako local government Area has ten 1 districts; Dundaye, Gumburawa, Gumbi, Gwuiwa, Wajake, Gedawa, Kalambaina, Arkilla, Gidan Bubu, and Wamkko. Purposive sampling was used to select eight districts base on the concentration and existence of producers and marketers of this tree species. Twelve villages were randomly selected from each district and random selection was also made of ten respondents in each village. The sample size for the study stood at 120 respondents for the work.

Data Collection and Analysis

Structured and open ended questionnaire were distributed for data collection. Statistical package for social science (SPSS) was used for the analysis. Primary data collected for this study were subjected to descriptive statistics by using tables, frequency distribution and percentages, using statistical package for social sciences.

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

Demographic characteristics of the respondent are important human attributes that played a significant role in measuring the contribution of this indigenous tree species (*Tamarindus indica*) towards enhanced livelihood of the community. The variables identified and analyzed includes age , sex (gender), marital status, house hold size, level of education, primary occupation and secondary occupation.

The results from table 1 indicated that 66.6% of respondents are within the age range of 15-35 years. This showed that they are in their active age although the use of tamarind in the study area is very common irrespective of age. This was supported by Ogungbile *et al.* (2002) who asserted that younger farmers are more likely to adopt an innovation than older farmers because of better education and more exposure to new ideas. While 7.5% were above 55 years old.

The results also indicated that 88.3% of the respondents for *T. indica* were male while females represented the remaining 11.7%. The highest percentages (88.3%) of respondents

were male because they participate more in outdoor activities than female. This could be attributed to the religious and traditional background of the study area; it is difficult to get the responses of women especially house wives except older women and mostly in the market place.

Table 1: Demographic characteristics of the respondents

	Frequency	Percentage
Age		
15-25	43	35.8
26-35	37	30.8
36-45	20	16.7
46-55	11	9.2
Above 55	9	7.5
Sex		
Male	106	88.3
Female	14	11.7
Marital Status		
Single	6	5.1
Married	106	88.3
Widower	7	5.8
Divorcee	1	0.8
Household size		
2-5	29	20.0
6-10	77	64.2
11-15	10	8.3
16-20	3	2.5
Above 20	1	0.8
Education level		
Qur'an	90	75.0
Primary	7	5.8
Secondary	15	12.5
Tertiary	8	6.7
Primary occupation		
Farming	116	96.7
Mining	0	0.0
Fishing	4	3.3
Secondary occupation		
Civil service	15	12.5
Trading	105	87.5
Total	120	100.0

Source: Field survey, 2015

The results indicated that 88.3 % of the respondents were married. In traditional settings married people are assumed to be more committed to their responsibilities.

According to Olarinde *et al.* (2008) reported that one of the most important factors which determine the efficiency of any business is marital status of individual. It is because married people worked hard in order to meet up the demand of their family members and this will improve their social and economic status. 5.1% of the respondents were single.

The results indicated that 64.2% had household size of 6-10 persons and 10.8% had 11 - 20. With respect to labour, these findings could mean that there was readily available family labour thereby reducing the cost of hired labour in a business. This finding agreed with Anley *et. al.* (2007) and Birunji (2007), who indicated that larger family size is expected to take up labour intensive activities,

The results from table 1 revealed that Majority of the respondents had Qur'anic education with 75%, this may be due to the fact that majority of the respondents are Muslim and therefore attach greater importance to Qur'anic education. The level of education (western education) of the respondents which is expected to influence their social and economic development is lacking, therefore any social changes, ideas, innovations etc. cannot be easily accepted as Farinde *et al.* (2005) revealed that education is positively related to the adoption of innovation.

The results also showed that the highest percentage of the respondent's primary occupation is farming with 96.7%. The implication is that during the rainy season the labour force is diverted to farming activities and this will affect other businesses such as petty trading. This agreed with the work of Abdullahi (1998) which said majority of the occupation of the rural people was farming activities. The results explained that the secondary occupation of most people in the study area is trading with 87.5%, while 12.5% engaged in civil service occupation.

Contribution to Livelihood of the Respondents

Indigenous trees contribute immensely to the human development in the standard of living as well as food security in any nation. The results from Table 2 explained the contribution of the species, 82.5% of the respondents contribute to their livelihood as source of income. This would assist in improving their economic status and way of life while 14.2% considered it as food for consumption, this goes in line with the work of katende *et. al.*, (1999) who reported that *T. Indica* has various uses including medicine and source of food (pulp for fruit drink, porridge and spicing sweet potato and cassava bread).

Table 2: Contribution of *Tamarindus indica* to the livelihood of the respondents

Contribution	Frequency	percentage
Source of income	99	82.5
Food for consumption	17	14.2
Medicinal purpose	4	3.3
Total	120	100.0

Source: Field Survey, 2015

Medicinal Uses

Table 3 and 4 presents the information on the various medicinal uses of *Tamarindus indica*. These uses help in the health sector which is one of the social indicators of development.

Table 3: Uses of *T. indica* parts for medicine

Disease	Pods		Pulp		Bark		Leaves		Roots	
	Freq	%	freq	%	Freq	%	freq	%	freq	%
Stomachache	45	37.5	40	33.3	--	--	10	8.3	--	--
Dysentery	20	16.7	33	27.5	20	16.7	--	--	45	37.5
Cancer	15	12.5	20	16.7	40	33.3	--	--	20	16.7
Loss of appetite	12	10.0	--	--	--	--	--	--	--	--
Vomiting	11	9.7	--	--	--	--	--	--	--	--
Coughing	11	9.7	--	--	--	--	--	--	--	--
Diarrhea	3	2.5	--	--	--	--	40	33.3	--	--
Sore throat	--	--	10	8.3	--	--	--	--	--	--
Typhoid	--	--	11	9.7	--	--	--	--	--	--
Ulcer	--	--	--	--	11	9.7	15	12.5	--	--
Catarrh	--	--	--	--	11	9.7	--	--	--	--
Headache	--	--	--	--	11	9.7	--	--	--	--
Genital problems	--	--	--	--	11	9.7	--	--	--	--
Rashes	--	--	--	--	--	--	11	9.7	--	--
Pregnancy treat	--	--	--	--	--	--	11	9.7	--	--
Wound treatment	--	--	--	--	--	--	15	12.5	20	16.7
Rheumatism	--	--	--	--	--	--	--	--	11	9.7
Body relief	--	--	--	--	--	--	--	--	11	9.7
Non compliance	3	2.5	6	5.0	16	13.3	18	15.0	3	2.5
Total	120	100.0	120	100.0	120	100.0	120	100.0	120	100.0

Source: Field Survey, 2015

The results from table 3 revealed the medicinal uses of *Tamarindus indica* parts in the area. 16.7% used pods for dysentery, while 12.5% used it for cancer, 33.3 used pulps for stomach ache and 27.5% used it for dysentery and 9.7 for typhoid, 33.3% used bark for cancer, and leaves have 33.3% for diarrhea while 37.5% used roots for dysentery. It was observed that most people in the study area used traditional herbal medicine to cure different diseases. This goes in line with Siddhuraju (2007) who reported that Tamarind is used in herbal medicine in many parts of the world. It is a multipurpose tree of which almost every part finds at least some use (Kumar and Bhattacharya, 2008), either nutritional or medicinal. Medicinal uses of tamarind can be found in many cultures and for a wide array of applications (Morton, 1987).

Uses of the Obtained Parts

This provides information on the mostly utilized parts of *Tamarindus indica* in the study area. The different parts recognized by the respondents were pods, wood, bark, seeds, leaves and pulp.

The findings from table 4 showed that 82 respondents (68.3%) used *T.indica* as food (pulp) apart from medicinal uses. The pulp of tamarind is widely mixed with millet porridge (kunun tsamiya) consumed as food and this improved the livelihood of the people in the area. Many researchers have proved the use of tamarind as food. Tamarind fruit pulp is used for seasoning, as a food component, to flavour confections, curries and sauces, and is a main component in juices and certain beverages (El-Siddig *et al.*, 2006). Its pulp is much appreciated in condiments which is used to make juice, and is a good source of proteins, fats, and carbohydrates that could be used to alleviate malnutrition in children (Jama *et al*., 2008).

Table 4: Mostly utilized parts

Parts	Frequency	Percentage
Pods	20	16.7
Leaves	10	8.3
Seeds	8	6.7
Pulp	82	68.3
Total	120	100.0

Source: Field Survey, 2015

Production, Marketing and Access to *Tamarindus indica* Products

Depending on the social arrangement, market can be situated either at the village, districts or local government area. Table 5 provides information on Business of the respondents in relation this tree species which has been categorized according to producing, processing or selling and access to tamarind products. The market places were also categorized for the respondents as farm gate, local market, national market or international market.

The results from table 5 explained the information on the business of respondents in relation to the tree species and market place. 74.7% engage in selling of *Tamarindus indica* as their business, this is according to field survey that most people in the study area consider trading as their secondary occupation while 7.6% involved in processing; the pulp is processed and serve as drinks to some people in the study area. This goes with the work of El-Siddig *et. al.* (2006) reported that In Ghana, the pulp is mixed with sugar and honey to make a sweet drink. Table 5 also revealed that 82.5% disposed their products at the local markets, this agreed with finding of El-Siddig *et al.* (2006) that Africa on the whole does not produce tamarind on a commercial scale, though it is widely used by the local people.

The results from table 5 revealed that 81.7% of the respondents source *Tamarindus indica* from the market. This is because *Tamarindus indica* trees found in the study area are less when compared to previous time. This finding agreed with Jaeger, (1999) who indicated that sheabutter processors source shea nuts directly from the nut gatherers on market days. Tamarind fruits are widely utilized especially during the period of fasting (Ramadan period). None of the respondents source the product from the forest.

Table 5: Distribution of respondents by production, marketing, source of Tamarind products and monthly income of the respondents

Business	Frequency	Percentage	Monthly income(₦)	Frequency	Percentage
Non compliance	1	0.8	Non compliance	13	10.8
Producing	1	0.8	less than 5000	7	5.8
Processing	118	98.4	5001-15000	20	16.7
Market place			15001-25000	70	58.3
Non compliance	2	1.7	25001-35000	10	8.3
farm gate	19	15.8	Total	120	100
local markets	99	82.5			
Source					
Market	98	81.7			
Farmland	22	18.3			
Forest	0	0.0			
Total	120	100.0			

Source: Field Survey, 2015

Income is the amount of money or equivalent received during a period of time in exchange for labor or services or from the sales of goods or property. However for households or individuals, income is the sum of all wages, salaries, profits, rents or other forms of earnings received in a given period of time (Faire and Case, 2007).

The results indicated that 58.3% obtained an income between ₦15001-₦25000 while 8.3% obtained between ₦25001- ₦35000 for *Tamarindus indica* this implies that, profit would be realized although many respondents complained of stagnant price in the market but they believe that the income is satiable. 5.8% of the respondents obtained less than ₦5000 per month. This agreed with Senchi (2014) who reported that sheabutter marketers earn a very low income (₦1,500 – ₦1,999 per week) in their business (Table 5).

Impact of *Tamarindus indica* to the Environment

Indigenous trees have profound influence on the environment. By preventing erosion, recharge ground water, provision of cover, windbreak, they can help preserve the integrity of agricultural land. The respondents describe the impact of the tree specie as either erosion control, provision of cover or wind break.

The result from table 6 revealed that 74.2% responded that *Tamarindus indica* prevent erosions. This agreed with the work of Pandey *et al.* (2000) that higher nutrient concentration under canopy compared to canopy gap is mainly a consequence of increased above and below ground organic matter input, nutrient cycling through leaf litter and protection of soil from erosion. 9.1% responded that *Tamarindus indica*, serves as wind break, while 16.7% revealed that, it provide cover or shade to the rural people; this is in line with the finding of Anon (2009), which pinpointed that *Tamarindus indica* is suitable to stabilize soils and to make wind breaks. It is also a fire break since grass does not grow under it dense crown.

Table 6: Impact of tree specie to the environment

Environmental impact	Frequency	percentage
Control erosion	89	74.2
provide cover	20	16.7
wind break	11	9.1
Total	120	100.0

Source: Field Survey, 2015

Communication and Housing

Successful means of communication and housing type are among the social indicators which determine the standard of living in a population of an area.

Table 7: Means of communication and housing type of the respondents

Communication Means	Frequency	percentage
By using mobile phone	85	82.3
Verbally	35	17.7
Letters	0	0.0
Housing type		
Mud brick walled with thatched roof	5	4.2
Wood and mud wall with corrugated roof	9	7.5
Mud brick wall with corrugated roof	90	75.0
Cement brick wall with corrugated roof	16	13.3
Total	120	100.0

Source: Field Survey, 2015

The results from table 8 showed that, the users of mobile phones have the highest percentage with 82.3%. This is because the use mobile phones can save transport costs. A small study in Morocco found that farmers with mobile phones increasingly dealt directly with wholesalers or larger-scale intermediaries than smaller intermediaries (Ilahiane, 2007). While the lower percentages communicate to buy and sells their products verbally, this could be attributed to the challenge that the rural communities have faced impeded mobile application due to language barrier and illiteracy. No communication through letters.

The results showed the housing type of the respondents with 75% for *Tamarindus indica* respondents living in mud brick walled with corrugated roof while 4.2% lived in mud brick walled with thatched roof.

CONCLUSION

The findings of this study revealed that the tree specie contribute immensely to the socio-economic development of Wamakko Local Government area. Virtually every part of *Tamarindus indica*. (Wood, root, leaves, bark and fruits) has either nutritional or medicinal value and also serve as source of income to many respondents, which is an indicator of economic development. The density of *Tamarindus indica* tree stands are found to be reducing over time. Problems like: disease and pest infestation, storage facilities, change of colour, short supply of the products, etc were found in the area.

Based on the findings of this study, the following recommendations were made; Regeneration of *Tamarindus indica* through afforestation, reforestation and social forestry should be emphasized, since it is in a state of scarcity in the study area. The use of *Tamarindus indica* as food in the study area need the introduction of new methods and tools (modern techniques) to improve its productivity and quality as well as improving food security.

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