Available online at www.elixirpublishers.com (Elixir International Journal)

Agriculture

Elixir Agriculture 55 (2013) 12959-12963

ISSN: 2229-712X

Importance of Moringa Oleifera tree to human livelihood: a case study of Isokan local government area in osun state

Azeez, F.A., Nosiru, M.O., Clement, N.A., Awodele, D.A., Ojo, D and Arabomen, O
Forestry Research Institute of Nigeria, P. M. B. 5054, Jericho Hill, Ibadan, Oyo State, Nigeria.

ARTICLE INFO

Article history:
Received: 26 November 2012;
Received in revised form:
2 February 2013;
Accepted: 7 February 2013;

Keywords
Moringa oleifera,
Economic benefits,
Profitability
Farmers.

ABSTRACT

It is a perennial softwood tree with timber of low quality, but which for centuries has been advocated for traditional medicinal and industrial uses Moringa Oleifera is an ideal plant to promote at the household level because it is extremely resilient to harsh growing environments, including drought, poor soil quality and many pests and diseases. It is a complete food in itself. Everything about the moringa oleifera is nutritious. You can eat the cooked leaves, shoots, pulp and seeds. This study seeks to determine the profitability of Moringa oleifera production with a particular reference to the socio economic characteristics of the farmers in the study area. The area covered by this study is Isokan Local Government Area of Osun state. Data for this study were collected from primary source. primary data were colleted using structured questionnaires. A combination of analytical tools were employed. They include descriptive statistics such has mean. frequency and distribution, percentages, budgetary analysis and Tobit model. This study therefore recommends that more technologically improved methods of processing, packaging and preservations should be adopted and encouraged for economic efficiency.

Introduction

Moringa oleifera is the most widely cultivated species of a monogenetic family, the Moringaceae. It is a perennial softwood tree with timber of low quality, but which for centuries has been advocated for traditional medicinal and industrial uses. It is already an important crop in India, Ethiopia, the Philippines and the Sudan, and is being grown in West, East and South Africa, tropical Asia, Latin America, the Caribbean, Florida and the Pacific Islands. All parts of the Moringa tree are edible and have long been consumed by humans. According to Fuglie (1999), the many uses for moringa include: alley cropping (biomass production), animal forage (leaves and treated seed-cake), biogas (from leaves), domestic cleaning agent (crushed leaves), blue dye (wood), fencing (living trees), fertilizer (seed-cake), foliar nutrient (juice expressed from the leaves), green manure (from leaves), gum (from tree trunks), honey- and sugar cane juice-clarifier (powdered seeds), honey (flower nectar), medicine (all plant parts), ornamental plantings, biopesticide (soil incorporation of leaves to prevent seedling damping off), pulp (wood), rope (bark), tannin for tanning hides (bark and gum), water purification (powdered seeds). Moringa seed oil (yield 30-40% by weight), also known as Ben oil, is a sweet non-sticking, non-drying oil that resists rancidity. It has been used in salads, for fine machine lubrication, and in the manufacture of perfume and hair care products Tsaknis J (1999). In the West, one of the best known uses for moringa is the use of powdered seeds to flocculate contaminants and purify drinking water. Berger MR, (1984), Gassenschmidt U (1995), Olsen A (1987). This tree has in recent times been advocated as an outstanding indigenous source of highly digestible protein, Ca, Fe, Vitamin C, and carotenoids suitable for utilization in many of the so-called “developing” regions of the world where undernourishment is a major concern.

Health Benefits

It is believed that this miracle tree has more Vitamin A than carrots, more Vitamin C than oranges, more calcium than milk and more iron than spinach. It is a complete food in itself. Its strong antioxidant properties guard against skin cancer and prostrate growth. Moringa oleifera also prevents the growth of cysts, tumors and glands. It curbs other health complications such as diabetes, anemia and high blood pressure. Liver, kidney, stomach and thyroid problems can also be prevented by taking this medicine.

The anti-inflammatory properties of moringa oleifera reduce different body pains. It is very effective for treating arthritis, rheumatism and joint pain. It can also control other severe diseases such as epilepsy, migraine and other headaches. Its detoxification properties make it suitable to treat scorpion and snake bites. Almost all parts of the tree have been utilised within traditional medicine practices. D'souza,J. and Kulkarni, A.R., (1993)

Nutritional Benefits

Everything about the moringa oleifera is nutritious. You can eat the cooked leaves, shoots, pulp and seeds. You could also dry these parts, turn them into powder and use in several food preparations. Moringa oleifera contains all essential vitamins and minerals. You can even have it in capsule form. The moringa oleifera is an alternative medicine that is fast becoming popular in the West. “Imagine a tree in your backyard that will meet all your nutritional needs, take care of you medicinally, and purify your water for you. “The ancient traditional medicine of India called ayurveda says the leaves of the moringa tree prevent 300 diseases. Christopher Alford (2010). Modern science is confirming that these leaves could help prevent untold suffering and death caused by malnutrition and related diseases. Christopher Alford (2010) wrote that modern science is confirming that these leaves could help prevent untold suffering and death caused by malnutrition and related diseases, hence it is

Tele:
E-mail addresses: olumosek@yahoo.com

tagged 'Trees for Life'. Nearly all parts of the Moringa tree have a high degree of nutritional value. Together, the edible parts of the tree contain high amounts of the 8 "essential amino acids" that your body does not produce but must be replenished daily

Purifying Water

When crushed into a powder, the seeds from Moringa trees act as a natural flocculentwhich can be used to purify dirty water, eliminating between 90-99% of bacteria. The powder joins to the solids in the water and sinks to the bottom. Jahn, et all (1986), The residue (seed cake) left over from making Ben Oil from the seeds can be used in the same way. The sludge left over from the water after treatment can also be used as a bio-fertilizer/bio-compost which has been shown to increase yields of other staple food crops. This therefore presents an excellent cycle for the seeds which can be used by rural communities: firstly using the seeds to make Ben Oil (which can be sold on); then using the seed cake from the oil extraction process to purify water and then finally using the sludge left over from the water purification process as a bio-fertilizer for other crops.

Small and Medium Scale Agric. Enterprises: Moringa Powder Production And Packaging

The moringa plant (Moringa oleifera) is known worldwide for its nutritional and medicinal benefits and industrial uses. Almost every part of the moringa plant has nutritional value. The pod is cooked as a vegetable, fresh or canned. The root can be used as substitute for horseradish. Foliage is eaten as greens, boiled, fried, in soups or for seasoning. Dried leaf powder can be added to any kind of meal as a nutritional supplement. The seed can be roasted and eaten like a peanut. The seeds can be used as a flocculent to clarify water and as a source of non-drying and very stable oil, known as Ben oil. This oil, which was once used for lubricating watches and other delicate machinery, is clear, sweet and odourless, almost never going rancid. It is edible and it is becoming increasingly popular in the cosmetics industry. Leaves and young branches are used as fodder. Moringa may also be used in fish and poultry feeds. Foidl, *et all* (2001)

Moringa young plants are available for sale at N300 per seedling in most South Western states of Nigeria.(Olatoye 2011) .This study therefore seeks to determine the profitability of Moringa oleifera production with a particular reference to the socio economic characteristics of the farmers in the study area.

Cultivation

Moringa oleifera is an ideal plant to promote at the household level because it is extremely resilient to harsh growing environments, including drought, poor soil quality and many pests and diseases. They are also very fast growing, with normal growth ranging from 3-5 meters per year if left uncut. It is one of the fasted growing biomasses on the planet if thoroughly nourished and can grow up to 7 meters a year. Furthermore, in warm climates the trees are evergreen if they are kept well nourished and can therefore continue to provide poor families with access to food even in times when other food is scarce. The moringa tree grows best in temperatures between 25-35°c, but can tolerate heat up to 48°c in the shade. It prefers a well-drained sandy-loam or loam soil, but tolerates clay as well. However, its saplings do not tolerate flooding and poor drainage well, so precautions should be taken when growing young moringa trees in tropical climates with prolonged monsoon seasons. Moringa trees can be grown by planting seeds directly into the ground, by growing them in a nursery and then transplanting them or by growing them from a cutting. When transplanting the saplings, particular care should be taken with the roots as the saplings can quickly wither and potentially die if the soil around their roots is disturbed. If available, moringa trees should be planted with compost as this has been shown to increase yields by up to 3times. It is also advisable to put a fence around young moringa trees, as livestock find the leaves very tasty and can quickly destroy a young tree if it is not protected. When moringa trees are cultivated for food production they need to be regularly pruned in order to ensure a bushy, rather than upright growth which will produce more leaves/flowers/pods within easier reach as a result. When a moringa tree stops bearing pods/flowers these branches also need to be cut back in order to restart the growth process. These cuttings can also be used to grow new moringa trees. Moringa leaves can be harvested roughly one year after planting. Pods and flowers tend to be produced in the second year of growth and the tree will continue to bear them for several years

Processing:

Processing should start immediately after harvesting and transporting the leaves to the processing point. This involves the followings:

1.Strippingtheleaflets: Strip all the leaflets from the leaf petiole. This can be done directly from the branches if the leaves have not been stripped off the main branch before transportation. At this stage, diseased and damaged leaves are discarded.

2.Washing: Wash leaflets in troughs using clean potable water to remove dirt. Wash leaves again in 1% saline solution for 3-5 minutes to remove microbes. Finally wash again in clean water. Leaves are now ready for drying. Drain each trough after each wash: fresh leaves must always be washed with fresh water.

3.Draining: Strain water from the leaves in buckets that have been perforated, spread leaflets on trays made with food-grade mesh and leave to drain for 15 minutes before taking them to the dryer.

4.Drying:There are three main methods for drying moringa leaves. Room drying Spread the leaflets thinly on mesh tied on racks (mosquito net mesh can be used) in a well-ventilated room. This room should be insect, rodent and dust proof. Air circulation can be improved by using ceiling and floor level vents protected with a clean filter to keep the sun and dust out. It is possible to use a fan, but the air must not be directly oriented towards the leaves, as it can increase contamination with germs in the air. It is advisable to turn the leaves over at least once, with sterile gloves, to improve uniformed drying. Leaves should be completely dry within a maximum of 4 days. The loading density should not exceed 1 kg/m2. However, room-dried leaves cannot be mould-free guaranteed with the maximum recommended moisture content of 10 per cent. Therefore, we do not advise this method. In Solar drying: Spread the leaves thinly on mesh and dry in the dryer for about 4 hours (Temperature range is 35°C–55°C on a very sunny day). The final product should be very brittle. We recommend solar drying for both small and large scale processing, particularly for those in rural communities where there is no electricity. Loading density should not exceed 2 kg/m2. Mechanical drying involves the use electric or gas hot-air dryers. Drying temperatures should range between 50°C and 55°C. If temperature exceeds 55°C, leaves will "burn" and turn brown. Leaves should be dried until their moisture content is below 10%. We recommend this method for large scale leaf processing as this ensures year round production. Loading density should not exceed 2.5 kg/m2.

5. Milling Mill dry leaves using a stainless steel hammer mill. For personal or household use, leaves can be pounded in a mortar, or milled with a kitchen blender. Small-scale processors can use a burr mill or rent a commercial hammer mill for routine milling of their products.

Table 1: Distribution of farmers according to their Socio- economic characteristics

Age	Frequency	Percentage (%)	Average efficiency level
30-49	54	45.0	1.88
50-69	55	45.9	1.85
>= 70	11	9.2	1.11
Total	120	100	
Marital status			
Married	118	98.3	0.93
single	2	1.7	0.96
Total	120	100.0	
Gender			
Male	102	85.0	0.98
Female	18	15.0	0.82
Total	120	100.0	
level Education			
Primary edugation	68	56.6	0.98
No formal education	29	24.2	0.85
Tertiary education	23	19.2	0.91
Total	120	100.0	
Years of farming			
< 1	67	55.8	0.92
1-2	24	20.0	0.73
3-4	17	14.2	0.83
5 +	12	1.0	0.98
Total	120	100	
Farm Size			
< 0.10 ha	25	20.8	0.93
0.11-0.30	50	41.7	0.98
0.31-0.50	30	25.0	0.93
0.51-0.80	15	12.5	0.92
Total	120	100.0	

Source: field Survey 2012

Table 2: Determinant Of Moringa Output

Predictors	Co-efficient	Std. Error
In the farm size	0.6593***	0.0000178
In seed	0.0540***	0.0000199
In hired labour	0.0843***	0.00000140
In family labour	0.1801***	0.0000633
In fertilizer	0.1807***	0.00000673
In pesticide	0.03668***	0.00000417
Constant	4.4126	0.0000251
Diagnostic statistics, log likelihood = 48.794825 Wald chi square = 8.056e+10 Significant at 1%, N=120		

Source : field Survey 2012

Table 3: Distribution of Budgetary Analysis

ITEMS	NAIRA
Total revenue	62,258.30
Hired Labour (11288.66)	
Cost of Seed (1123.42)	
Cost of Pesticide (4029.21)	
Cost of Ferterlizer (2279.4)	
Total Variable Cost	18,720.79
Gross Margin	43,537.31
Total Fixed Cost	(10,000)
Profit	33,537.51
Efficiency Level = profit	33,537.51
Total Cost	28,720.79
	1.17

Source : field Survey 2012

6.Sieving : Sieve the leaf powder if need be. When you mill with a hammer mill, the fineness of the product will depend on the size of the screen used in milling. If too coarse, sift using a sifter with the desired screen size. Moringa leaf powder can easily be contaminated by moulds as it strongly attracts moisture.

Methodology

Study Area:

The area covered by this study is Isokan Local Government Area of Osun state. This study took place in six towns /villages which include: Olugbin, Aiyepe, Faaru, Alapomu, Sunkade, Maun and Kongo. Geographically, the LGA is between Longitude 4 degrees 15' East and Latitude 7 degrees 30' North and 7 degrees 38' North. It shares boundary with Oyo and Osun state precisely to the north at Irewole Local Government and to the south at Ago-Owu forest reserve. To the East of Isokan LGA is Iwo Local government and to the west is Ayedaade local government. The predominant ethnic group is Yoruba. It lies in derived savannah with both favourable rainfall and large areas of the vegetation which have been degraded by fire and intensive farming activities into derived forest. The study area is characterized by two discrete seasons, the rainy and the dry season. The rainy season spans from February to November while the dry season is from December to march. The rain forest has a characteristic bimodal distribution with peak in June and September and a period of lower precipitation in august. Also the annual rainfall is about 1130mm, which falls with 78 to 110 days each year.

The major occupation of the people In the area is farming, though some of them also engage in some other minor occupations like trading, food processing, blacksmith and hunting. The rural populace in this area is mostly subsistence farmers that grow crops. The farmers who operate commercial farming grow permanent (cash) crops such as cocoa and oil-palm while food crops include maize, yam, cassava, cowpea, pepper, melon and fruits such as pawpaw, banana, orange etc. and cereals. The system of farming is mainly traditional with the farmers having very small holdings and using traditional technology (hoe and cutlasses) for cultivation.

Sources and Method of Data Collection

Data for this study were collected from primary source. primary data were colleted using structured questionnaires personally administered with an assisting officer.Input-Output data were collected on each farm- These include hectare of moringa oleifera cultivated, quantity of fertilizer application of seed, quantity of pesticide applied and labour in manday.Price of input and output were obtained in addition to information on household characteristics such as firmly size educational status farm-size and farmers experience.

Sampling Procedure

A two stage sampling procedure was adopted for this study. The first stage involves the random selection of six villages from the list of the villages in the local government area sourced from the LGA Secretariat .The second stage involves a random selection of an average of twenty farmers per village making a total of one hundred and twenty respondents.

Analytical Techniques and Model Specification

A combination of analytical tools was employed. They include descriptive statistics such has mean . frequency and distribution, percentages, budgetary analysis and Tobit model. Descriptive analysis were used to analyse and make comparison on the socio-economic characteristics of the farmer.

Budgetary Analysis

This is used to determine the profitability of moringa olifera production in other to analyse the cost and return of the farmers. This is very important in farmer decision making with regard to output expansion. The budgetary analysis was done using:

GM=TR-TVC

π = GM-TFC

Where π = profit

TR= Total revenue

TVC = Total variable cost

GM = Gross margin

TFC= Total Fixed Cost

Empirical Tobbit Model

The linear tobit regression model was used in investigating the effect of socio- economic characteristics of the moringa oleifera farmers on the level of cultivation and output of moringa oleifera in the study area.

The relationship between the binary status variable (wi) and its determinants (Qi) is specified as:

C = f(x_1 x_7 x8 x9 x10 x11 x12 en)

C is the participation in the cultivation index of farmer i

X_1 = farm size in (ha)

X_7 = Age of the farmer (yrs)

X_8 = gender grouping Male - 1, otherwise - 0

X_9 = Extension awareness visitation. Awareness - 1, others - 0.

X_{10}= Level of education. Dummy variable = 1, if educated = 0, otherwise

X_{11}= cooperative membership, membership = 1, otherwise = 0

X_{12} = farmers farming experience (yrs)

E_n = error term

Table 1 shows that the mean age of the farmers was 49.2. About 45% of the farmers were below 50 years of age. That is majority of the farmers are in the active age. The average technical efficient seem not to be different across the age groups.

Marital status is directly linked with the farmers' performance in that it affects their level of productivity. Married farmers can engage the family labour in carrying out some of the farming operation. Table 1 shows the marital status of the sampled farmers indicates that majority of the farmers are married. Infact, only 2 percent of the farmers are singles. The average technical efficiency of the singles farmers is more than the married farmers.

The Table also revealed that 15% of farmers were females while the remaining 85% were male. This means that most of the moringa farms' owners were male and this may be attributed to the fact that women were generally treated as part of the labour available to the head of the household at a specify time such as during harvesting and processing. The result also received that male were efficient in input combination than female farmer in moringa production.

The table revealed that moringa farmers that had primary education were more technically efficient in moringa production than those with no formal education.

Farming experience can be said to measure the number of years of active participation in the cultivation of moringa with a view to determining how such experience has contributed to farmers productivity in terms of yield and input use. Through experience, skill are developed. It was observed in the study area that more experienced farmers are better managers of farm resources than the less experienced ones. 55.8% of respondents have less than 10 years of farming experience in moringa production. Infact, those with 31 – 40 and 41 – 50 years of experience have higher technical efficiency than below 10 years of experience in moringa production as shown in Table 1.

It was also revealed that about 41.7% of the farmers had their farm size between 0.11 – 0.30 and also have higher technical efficiency in moringa production.

It can be observed that majority of the farmers (76.6%) obtain their land through family inheritance and also having higher technical efficiency than other sources of land for production. This indicates that communal land tenure system is still operating in the area and among the problems associated with this system is that individual farmers have small fragmented farm holding which explains while they have small farm size as revealed in Table 1.

Results of regression analysis :

$$\ln Y = 4.4126 + 0.06593 I_n X_1 + 0.0540 I_n X_2 + 0.01843 I_n X_3 + 0.1801 I_n X_4 + 0.1087 I_n X_5 + 0.0368 I_n X_6$$

(0.0000251) (0.0000178) (0.0000199) (0.00000140) (0.0000633) (0.00000673) (0.00000417)

***indicate statistical significant of the coefficient at 1% level

Figures in parentheses represent the standard errors

From the regression equation above, all the variables (farm size, seed, hired labour, family labour, fertilizer and pesticides) have significant coefficient at 1% level respectively.

The analysis revealed that 10% increase in land area cultivated, seed, hired labour fertilizer and pesticide will respectively increase the output of Moringa by 6.593, 0.54. 0.184. 1.8, 1.1 and0.37 percent. This shows that the output of Moringa is inelastic to the inputs used. In addition, the scale co efficient is 1.12 signifying that there is increasing returns to scale to Moringa production.

Distribution of budgetary analysis

It can be seen from table 3 above that on moringa enterprise every farmer on the average would realized a total revenue of ₦62.258.3o per hectare while the total cost of production is ₦ 28.720.79 on every hectare of land cultivated made up of*18,720.79 for total revenue cost and ₦ 10.000 as total fixed cost. The enterprise economic efficiency is 1.17. This means that for every ₦ 1 spent by the farmer in the study area on moringa production, 17 kobo was realized as profit. moringa oleifera enterprises is exceedingly profitable so much that little or no other Timber and Non Timber Forest Products could match its economic profitability. A very close example could be cited between the economic efficiencies for wood craft enterprises with only 1.10 compared to 1.17 gotten from moringa oleifera enterprises. This simply implies that there is difference of 70 kobo profit margin between the two enterprises as reflected in the earlier research findings carried out by Azeez F. A.(2011) in the same geographical zone

Conclusion And Recommendations

It was discovered from the results of the study that the benefits derivable from Moringa oleifera tree are inexhaustible if all its usefulness are to be considered. No wonder some researchers regarded it as a miracle tree. Imagine a tree in your backyard that will meet all your nutritional needs, take care of you medicinally, and purify your water for you. The benefits endowed with this tree actually needs to be explored in all ramifications most especially its economic importance going by its profitability index in the study area as shown in Table 3 above. Therefore, in order to explore this vast economic potentials, a well developed entrepreneurial mechanisms (such as all encompassing advocacy, seminars, workshops among others) and sustainable marketing strategies must be put in place for optimum exploration of all possible economic potentials endowed with this tree. This study therefore recommends that more technologically improved methods of processing, packaging and preservations should be adopted and encouraged for upward economic efficiency.

References:

Azeez F. A., Ojo O. B.1, Onajobi A. A.1, Ajibola A. O.2 and Amoo M. A.(2011) "Wood craft enterprises participation and return analysis in Oyo State" Journal of Ecology and the Natural Environment Vol. 3(10), pp. 332-336, 26 September, 2011.

Berger MR, M Habs, SA Jahn, S Schmahl (1984) Toxicological assessment of seeds from Moringa oleifera and Moringa stenopetala, two highly efficient primary coagulants for domestic water treatment of tropical raw waters. East African Medical Journal 61: 712-716.

Christopher A (2010) – Making a Difference for Good Cambodia

D'souza,J. and Kulkarni, A.R.,(1993), Comparative studies on nutrtive values of tender foliage of seedlings and mature plants of Moringa oleifera Lam. J.Econ.Tax.Bot., 17 (2) pp479-485.

Foidl, N., Makkar, H.P.S. and Becker, K. (2001) The potential of Moringa oleifera for agricultural and industrial uses, pp 45-76, In: The Miracle Tree: The Multiple Uses of Moringa (Ed) Lowell J. Fuglie, CTA, Wageningen, The Netherland

Fuglie LJ (1999) The Miracle Tree: Moringa oleifera: Natural Nutrition for the Tropics. Church World Service, Dakar. 68 pp.; revised in 2001 and published as The Miracle Tree: The Multiple Attributes of Moringa, 172 pp.

Gassenschmidt U, Jany KD, Tauscher B, and Niebergall H (1995) Isolation and characterization of a flocculating protein from Moringa oleifera Lam. Biochimica Biophysica Acta 1243: 477-481.http://www.moringatreeoflife.com/Page_4.html

Jahn,S.A.A., Musnad,H.A. and Burgstaller,H., 1986, The tree that purifies water; Cultivating multipurpose Moringaceae in the Sudan. Unasylva, 38, pp23-28

Olsen A (1987) Low technology water purification by bentonite clay and Moringa oleifera seed flocculation as performed in Sudanese villages. Effects on Schistosoma mansoni cercariae. Water Research 21(5): 517-522.

Oluwatomi Olatoye: The Nigerian Tribune; Tuesday, 26 April 2011 .

Tsaknis J, S Lalas, V Gergis, V Douroglou, and V Spiliotis (1999) Characterization of Moringa oleifera variety Mbololo seed oil of Kenya. Journal of Agricultural and Food Chemistry 47: 4495-4499.