Bullion

Volume 28 | Number 3 Article 5

9-2004

Employment creation and opportunities in the manufacturing sub-sector: The case for neem tree in Nigeria.

Okonkwo E. M
National Research Institute for Chemical Technology (NARICT), Zaria.

Follow this and additional works at: https://dc.cbn.gov.ng/bullion

 Part of the Entrepreneurial and Small Business Operations Commons

Recommended Citation

Okonkwo, E.M. (2004). Employment creation and opportunities in the manufacturing sub-sector: The case for neem tree in Nigeria. CBN Bullion. 28(3), 30-35.

This Article is brought to you for free and open access by CBN Institutional Repository. It has been accepted for inclusion in Bullion by an authorized editor of CBN Institutional Repository. For more information, please contact dc@cbn.gov.ng.

EMPLOYMENT CREATION AND OPPORTUNITIES IN THE MANUFACTURING SUB-SECTOR: *THE CASE FOR NEEM TREE IN NIGERIA*

BY
DR. E. M. OKONKWO*

Dr. E. M. Okonkwo

INTRODUCTION

Neem, (**Azadirachta indica A. Juss**), commonly called "Dogonyaro" in Nigeria, belongs to the Mahogany family Meliaceae. It is one of the most versatile and ecofriendly trees, and is widely distributed in south Asia and parts of Africa including Nigeria. Neem is a large evergreen and fast growing tree native to Indian subcontinent. It is universally accepted as a wonder tree exhibiting a high degree of heterogenicity and can tolerate a long dry season with rainfall as low as 130mm. It thrives well on both dry and shallow soils. Neem begins to bear fruit in 3 to 5 years and becomes fully productive in 10years. Neem tree yields between 30-50Kg of seed per tree yearly. The neem tree is known to contain several classes of useful chemicals such as carbohydrates, proteins, sulphur compounds, alkaloids, phenolics, aromatic esters, steroids, trepenoids etc, which gives the tree its plethora of biological activities. Virtually all parts of the plant are useful in various ways and for different purposes. Medicinally, it is said to be used for heart diseases, lowering of cholesterol, skin ailments, anti-malarial, anti-bacterial and anti-fungal infections, arthro-rheumatism and similar body ailments. Its extracts are reputed to inhibit increases in blood sugar levels. Its dentistry properties are very well known as we use it as local mouth cleaner (chewing stick) before the popularization of modern toothpastes.

The leaves, seed, fruit, flowers, bark, root, etc. are all used in various preparations and concoctions or portions for a number of medicinal purposes. For thousands of years, millions of Asians and indeed people in other parts of the world, have used neem for the cure of various ailments ranging from dental, stomach, dermatological, and to such diseases like malaria. Locally in Nigeria, its leaves are boiled and taken for cure of malaria and jaundice..

Neem has many industrial uses. Since it grows rapidly, it can be cut for timber after about 5 to 7years, while its uses as fuel, wood, masts and poles are commonplace. Its most prominent large-scale use nowadays is in shelterbelts and general afforestation projects and is a great asset in providing shade in the extremely hot cities and towns in Northern Nigeria. You only need to go to Maiduguri, Katsina, Sokoto, Yola and other towns in that ecological belt to appreciate this quality of the neem tree.

In the area of agriculture, neem and neem extracts are found to be extremely useful. Neem oil is one of the best organic pesticide but its other products such as leaf extract are also used on stored products. Its cake (after oil extraction) when mixed with the soil rebuilds soil nutrition and improves its composition/structure generally and controls nematodes.

Environmentally, neem has a reputation as a natural air purifier, exhaling out oxygen and keeping the oxygen level in the atmosphere balanced. Neem's ability to rehabilitate degraded wastelands has been established. It also plays a vital role in controlling soil erosion, salination and preventing flood.

**Dr. E. M. Okonkwo is the Director General/Chief Executive of National Research Institute for Chemical Technology (NARICT), Zaria.*

2.0 OPPORTUNITIES IN THE MANUFACTURE OF NEEM BASED PRODUCTS

The neem tree is suggestive of a biochemical factory producing several active compounds. All these compounds can be formulated into end products for human use. Consequently a large number of manufacturing outfits, at micro, small, medium and even large-scale levels are possible. The neem industry therefore provides opportunities for livelihood for our citizens whether rich or poor.

For example a living can be made daily from just collecting the ripe seeds which fall on the ground. It has been estimated that an individual can generate up to N6,000 in one month through picking the seeds. The Nigerian neem seed and indeed the West African variety have greater export potential than those of the rest of the world. This is due to its higher active ingredient content of three times over. The neem oil from the seed is a marketable product on its own and can be extracted from the seed through cold press or by using solvents. Expellers for the cold press extraction are obtained locally, whose prices can be as low as N20,000.00.Other neem-based products manufacture of moderate investment are the soap, toothpaste, cosmetic, animal feeds etc. Investments of medium to large scale which require discussing in more details are the neem-based pesticide and the fertilizer.

3.0 INVESTMENT PROFILE OF A NEEM BASED PESTICIDE COMMERCIAL PLANT

Neem seeds contain bio-active fractions that can help in pest management strategies and help save our environment. The bio-activity of neem based products has been extensively evaluated and proven. Because of the fear of toxic residues in food products associated with the use of chemical pesticides, there is a growing need for pest control agents of plant origin which do not leave any toxic residues. Although many plant chemicals have been reported to be suitable for this, neem is the only plant from which the bio-pesticides are commercially manufactured, found effective, eco-friendly and acceptable to the farmers. Neem pesticides are now increasingly used in India.

The most active ingredient of the neem seed is azadirachtin. It belongs to the group of compounds called tetranor-triterpenoids. It is structurally similar to insect hormones called ecdysones which control the process of metamorphosis as the insect pass from larvae to pupa to adult. Azadirachtin seems to be an ecdysone blocker, preventing the vital hormones from being released. Insects then will not molt, thus breaking their cycle and causing the death of the insect after some days.

Pest control, as practiced today in Nigeria and most developing countries, relies mainly on the use of synthetic pesticides. Their use often leads to the contamination of terrestrial and aquatic environments, damage to beneficial insects and wild biota, accidental poisoning of humans and livestock and the problems of pest resistance and resurgence. A World Health Organisation and United Nations Environmental Programme report (WHO/UNEP 1989) estimated there are 1 million human pesticide-poisoning cases each year in the world, with about 20,000 deaths, mostly in developing countries.

3.1 Production Process of Neem-Based Pesticide

Production of a neem based pesticide begins with crude neem oil solvent extraction batch process. Briefly the process is as follows:

i. Cleaning

Dry neem seeds are cleaned before processing. The cleaning involves removal of stones and other foreign matter from the seeds. Cleaning process generally takes place manually using sieves.

ii. Dehulling

Dehulling is the process of breaking the seeds without damaging the kernels. The kernels are isolated from the shells with the aid of a blower.

iii. Pulverization

After the separation of the kernels, they are passed through a pulverizer where the kernels are turned into fine uniform powder.

iv. Extraction

This is a batch process operation in which solvent is added gradually to the neem seed kernel powder. After the extraction, the extract, now called miscella, pass through the evaporators for the separation of the solvent. The technical grade liquid product is collected in a storage tank.

v. Formulation

The above technical grade liquid azadirachtin concentrate is blended with a diluent, an ultra-violet screener and a surfactant to obtain the bio-pesticide formulation.

Fig. I. Shows the process flow chart for the bio-pesticide formulation.

3.2 Project Details

i. Plant size

The size of the neem bio-pesticide plant being advocated is for a 400MT on seed consumption per annum. This is a small to medium scale factory and will require a land allocation of at least 100 x 150m^2 to accommodate the solvent extraction, formulation, and enrichment plants as well as the storage, utilities and laboratory facilities and an office.

ii. Plant and Machinery

The plant and machinery required for the construction of a 400MT capacity pesticide plant are as follows:

a. Seed Receiving and Processing sections

- Weigh bridge
- Platform weighing machine
- Moisture testing meters
- Rotary seed drying
- equipment
- Small conventional expeller
- Dehullers
- Hull and kernel separator
- Pulverizer.

b. Active Ingredient Extraction Plant

- Extractors
- Miscella receiving tanks
- Solvent storage tanks
- Intermediate tanks
- High vacuum falling film evaporator
- De-solventizer
- De-solventised cake remover
- Mechanical seal pumps
- Oil transfer pump
- Instrumentation
- Insulation and safety installation

c. Formulation Plant

- Technical holding tank
- Formulating solvents holding tank
- Mixing vessel in carbon steel
- Capacity SS tank
- Closed Neutch Filter
- Formulation receiving tank
- Packing machine
- Mechanical seal pumps
- Vacuum pump
- Instrumentation
- Insulation and safety installation

d. Utility Services Equipment

- Steam Boiler
- Water softner with pumps and re-generation tank
- Cooling tower with water circulation pumps
- Water chilling plant
- Hot water tank
- Electrical control panel

e. Quality control Lab Equipment

- High performance Liquid Chromatograph (HPLC)
- Metler Analytical Balance
- U.V. spectrophotometer
- Soxhlet Apparatus
- Glassware and Miscellaneous items.

3.3 Investment Cost

The cost of plant and machinery listed above, is N40million. The raw materials per annum as feedstock to the plant are: neem seed (400MT), methanol (32,400Kg), Butanol (16,200Kg), Aromax (56,980Kg) and Emulsifiers (32,400Kg). The cost of these inputs is given as N51 million, including taxes and duties on import.

Utilities, overhead and labour expenses have been estimated at N 44million while a contingency of N 3.0million has been allowed.

4.0 PRODUCTS

The total Bio-pesticide produced per annum is estimated at 162,000litres on one-shift basis. The selling price of the pesticide is N950/litre.

Also generated is the cake residue by-product. About 126,000Kg cake is generated and is sold at N13,000/MT

5.0 ORGANIC FERTILIZER PRODUCTION

Neem cake, by-products of bio-pesticide and expeller productions, is an excellent source of organic fertilizer. The dual activity of the cake as fertilizer and as pest repellent has made it a favoured input. Neem leaves are also being used to enrich the soil. Together, they are widely used in India to fertilize cash crops. When Neem Cake is ploughed into the soil it also protects plant roots from nematodes and white ants. Neem seed cake also reduces alkalinity in the soil, and acts as a nitrification inhibitor, thereby reducing ammonia volatilization, urea hydrolysis and leaching when urea is coated with it.

As a fertilizer, one tonne of neem cake contains the following:

Nitrogen (as Nitrogen)	35.60Kg
Phosphorus (as phosphoric acid, P_2O_5)	19.00Kg
Potassium (as potassium oxide K_2O)	20.007Kg
Calcium (as calcium oxide, CaO)	10.78Kg
Magnesium (as Magnesium oxide, MgO)	12.78Kg
Sulphur	20.00Kg

This is over seven times the Nitrogen, phosphorus, and magnesium contents of farmyard manure and over three times the potassium content and over twice calcium content of the same farmyard manure.

Neem cake coated urea are commercially available in India. Neem cake can be used as fertilizer by applying it alone to the crops or in blending with other natural organic matter or solid mineral resources. It can be applied in the powder form or in granular or briquettes form. Investment cost for establishing a neem cake based fertilizer plant varies from as low as N10,000.00 to as much as N100m depending on size and type.

The basic steps in the production of fertilizer using Neem Cake are pulverization of the cake to the desired particle size and blending the pulverized material with other nutrients in a blend feeder. The product is then granulated using drum or pan granulator, and dried in a dryer. Next is the screening to obtain final product of uniform size and finally cooling in a cooler.

The National Research Institute for Chemical Technology (NARICT), Zaria is currently constructing a 5tonne per hour plant based on the Neem cake.

6.0 NEEM ENTERPISE DEVELOPMENT IN NIGERIA

Although the neem tree has been known in Nigeria for several decades, having been introduced in the late 1920s from Burma and subsequently from Ceylon and India, no attempts has been made to develop a trade in its by-products. With exception of the neem leaves being used locally for the cure of malaria and a few herbalists adding some other parts of it in the their concoctions, there has been virtually no appreciation of the multiple benefits of this tree.

The reality of the benefits of Neem has been brought to the knowledge of Nigerians by no other than the President and Commander-in-Chief of the Armed Forces of Nigeria when on 20th April, 2004, he presided over a meeting with selected Governors, Ministers, his key officials, a few Government Agencies and an International Company interested in investing on Neem in the country. Mr. President " Stressed that at this time, when government was trying to widen the country's base of revenue generation and promote export and import substitution activities, it was expedient to see what could be done on the area of Neem" . He thus directed that Neem trees and products be commercialized on small, medium and large scale bases so as to popularize their uses as has been done in India and some other Asian countries. Mr. President constituted a committee with the following terms of reference:

i. Develop and popularize the growth of the Nigerian high quality species of neem generally in Nigeria, but specifically in the four states of Borno, Katsina, Kebbi, and Zamfara.

ii. Develop medium and small scale processing facilities in the four states for Neem to produce fertilizer, pesticides and Neem oil for soap making and any other products that could be produced for internal market.

iii. Promote export market for Neem products.

To further practicalise his commitment to the project, Mr. President approved the

establishment of two Pilot demonstration plants for the production of neem pesticide and neem oil in Katsina and Kebbi States respectively. He also challenged the four target States to raise large numbers of neem seedlings for planting to ensure sustainability of the new industry.

Thus the advent of the enterprise development in the Neem industry has begun in Nigeria, with a lot of prospects. The local population could gain materially by collecting the seeds which fall from the trees on daily basis; unemployment and unskilled youths could be engaged in the many low capital cost enterprises that would spring up producing oil, soap, neem extracts and other products.

The development of a neem enterprise industry is likely to lead to a huge extension in tree planting by small peasant farmers who would now know that they would not have to wait for 10 to 15 years for the tree to develop as in other forestry projects. This can be achieved in the second year when by carefully plucking some of the leaves of the tree, they will already have a saleable raw material which, after the fourth year would be enhanced by the collection and sale of the seeds. There is a tremendous market for the large branches for use as timber. All these factors could have a significant effect on enhancing the livelihood of rural people.

Given the favourable government support in the development of this promising industry, we as citizens must seize the opportunity and invest on it. In the 1980's and 1990's, India produced and exported neem oil, generating well over USD2billion a year.

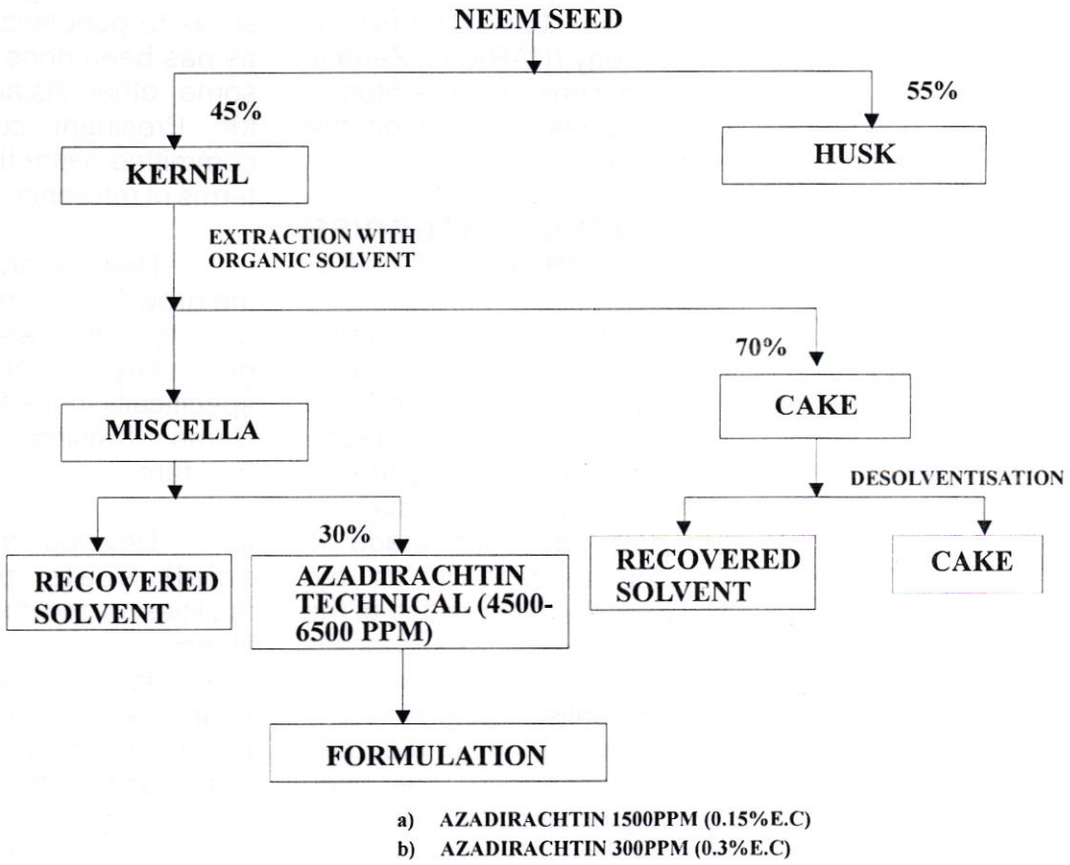

Fig. 1. Process Flow Chart for Azadirachtin
Source: NARICT* Project Report
**National Research Institute for Chemical Technology, Zaria.*

SELECTED REFERENCES

1. Verdia S. (2002) Neem Foundation Publications, Mumbai 400 049, India.

2. Mustapha S. (2001) The neem Tree, Its Various Uses and Potentials. Presented at the Workshop organized by UNIDO and Jigawa State Government.

3. Neem Foundation (2002), World Neem Conference held in India.

4. NARICT (2004), Project Report, Zaria.