FRUIT YIELD AND ECONOMIC ANALYSIS OF SELECTED TREE SPECIES (STS) UNDER AGRO-FORESTRY SYSTEM IN TAMIL NADU

FUNDED BY

TN State Forest Department

Neem (Azadirachta indica)

Final Report

Submitted to
The Deputy Conservator of Forest
Agro forestry Research Division
Madurai

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2017
Final Report

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1. INTRODUCTION

Agroforestry combines trees, shrubs, forages, grasses, livestock and crops in innovative and flexible combinations tailored to the needs of the farmers. This ensures sustained availability of multiple products as direct benefits such as food, vegetables, fruits, fodder, fuel, manure, medicine, timber etc. An area of 46.70 million ha has been estimated under wastelands, which is 14.75 per cent of the geographical area of the country. Agroforestry practices are considered as most vital and potential farming system for minimizing the land degradation. It enhances soil fertility, reduce erosion, improve water quality, enhance biodiversity, increase aesthetics and sequester carbon. Efficient versions of agroforestry have been developed around the world, which can be adapted to different agro-climatic conditions. Agroforestry always remain productive for the farmer and generates continuous revenue. With the shrinking per capita land availability, agroforestry system with the integration of perennial woody trees is most suitable technology for increasing total productivity of food, fodder and fuel and thereby reducing the risk of farming.

Among various trees, selected tree species (STS) are widely grown in various agroforestry systems by farmers for profitable income and other benefits. Tree components overwhelmingly produce consumable or saleable products on a regular or seasonal basis. Thus, within fruit-tree-based agroforestry systems, the importance of competitive resource losses to
crops is likely to be diminished because the tree component products are valuable goods in exchange for its competitiveness with the crop over a similar time scale.

1.1 Agroforestry in India

Agroforestry is a traditional practice among farmers in India. The practices adopted may not be well-defined systems like those evolved scientifically in recent times. Nevertheless, they too have followed the same principles and realised the benefits. A comprehensive description of all these practices and systems is found in the documentation of Tejwani (1994). There are many traditional agroforestry systems in practice in arid regions of India (Nandal and Narwal, 1994).

The significance of agroforestry as a land use system has been highlighted extensively in recent years. One of the many favourable attributes of agroforestry, is its suitability for degraded land. In India, the total area under wastelands is estimated at about 70 million ha to about 170 million ha (Radhakrishna, 2006).

Agroforestry technology development has been an active programme in the country for many years (NRCAF, 2004). In recent years, several agroforestry systems have been successfully introduced and accepted by farmers in India. Systems based on Poplar (Populus deltoides) in the north-western region of the country are highly intensive and are suitable for irrigated conditions. An agri-horti-forestry system - where the component species are horticultural crops like mango and cashew, annuals as intercrops and multipurpose trees along the border of the farm - has gained acceptance in Maharashtra and Gujarat (Mahajan et al., 2001). Additionally, there are many innovative farmers who have developed or modified existing agroforestry systems to suit local conditions. Tree Born Oil Seeds (TBO) can fit into
most of these systems, contributing positively towards the overall productivity and farm income.

1.2 Selected Tree Species (STS)

**Neem** (*Azadirachta indica*) has been selected to carry out the study.

**About Neem** (*Azadirachta indica*)

*Azadirachta indica* (neem) of family Meliaceae is native to dry forests of South and Southeast Asia. It has been receiving wide publicity because of the pesticidal properties of azadirachtin and other such constituents in its seeds. Neem can also fit into agroforestry systems as it is a multipurpose tree. It is a medium to large tree of about 20 m height. It can grow on a wide range of soils and climatic conditions. Neem grows on all types of soils, but prefers deep clay soils. It can survive on acidic soils as well as those having pH of 10. The temperature range in its native is between 15-45°C. Best growth of neem is found in areas receiving 750-1000 mm annual rainfall. In India, it grows in tropical dry areas up to an elevation of 1200 m. Neem seed has a very low period of viability and has to be sown within a month after harvest. Stump planting is the best method for neem establishment.

Neem leaves also contain the compounds found in the seed, but their concentration is very low. Therefore, the tree is not totally free of pests. Neem trees usually flower in April and the fruits mature 2-3 months later. The kernel contains about 30-40% oil, which has the same range of uses as that from other TBOS. The seed cakes can also be used as manure. Recent advances in processing technologies can remove the bitter constituents in oil and seedcake and thereby widen their uses. The wood is strong and can be used for furniture,
implements and construction. Seeds, leaves, bark and fruit pulp have medicinal properties. (Hegde, 1995)

**Literature Review on Neem**

Nimboli (Neem fruit) /year yield = 5kg in 5th year, 7 kg in 6th year, 10 kg in 7th year, 15 kg in 8th year, 20 kg in 9th year, from 10th year onwards 30 kgs (Shinde and Biswas. 2011). There are an estimated 25 million trees growing all over India, Rembold (1996), of which 5.5% are found in Karnataka and it is in the third place next to Uttar Pradesh (55.7%) and Tamilnadu (17.8%) occupying the first two places respectively. Neem starts bearing fruits after 5 years and comes to full bearing at the age of 10-12 years. Fruit yield is 5-20 kg per tree per year in the initial years. A mature tree produces 35-50 kg fruit/year.

However we presume a conservative yield of 5, 6, 10, 15, 20 kg/tree respectively from 5th year onwards. Yield generally stabilizes from 9th year. Sale price of the seed may be considered @ Rs.5/kg. Irrigating the young stock, keeping the field clear from competing weeds & soil loosening have been reported to produce good results in neem. Neem seed price is projected to be Rs.10000 / ton in the near future. So, it is high time to exploit the potential of this hitherto neglected tree & to manage neem for higher economic returns to farmers. It has been estimated that 10 yr old tree can yield a timber of 5-6 c.ft / tree.

**Economics of cultivation:** The cost of cultivation will depend upon the extent of the area to be planted. The cost of cultivation for one hectare at spacing of 5mx5m i.e. 400 plants/ha has been worked out at Rs. 2070 0 / ha which

**Financial Analysis:** The financial analysis with the above parameters of the investment cost and techno – economic parameters, the IRR works out to 30.48 %.

[http://agritech.tnau.ac.in/banking/PDF/Forestry%20Wasteland_Neem.pdf](http://agritech.tnau.ac.in/banking/PDF/Forestry%20Wasteland_Neem.pdf)
A neem tree normally starts fruiting after 3-5 years. In about 10 years it becomes fully productive. From the tenth year onwards it can produce up to 50 Kg of fruits annually. (Kumar and Gupta (2002)

Neem bears an ovoid fruit, 2cm by 1cm, that has a pericarp containing a resinous substance with a garlicky odour. Each seed contains one kernel. The seed kernels, which weigh 0.2g constitute some 50-60% of the seed weight and 25% of the fruit. The fat content of the kernels ranges from 30-50%.

Tree starts bearing fruits after 3-5 years and comes to full bearing at the age of 10-12 years. Fruit yield is 10-25kg per tree per year in the initial years. A mature tree produces 30-100kg fruit/year.

The short duration and dwarf annual oilseed as well as pulse (leguminous) crops like groundnut, mustard, chickpea, cowpea, horsegram, soybean etc. can be grown successfully as inter-crops upto 4-5 year planting in between sows of neem plantation. The intercropping will increase economic feasibility of neem plantation and will generate additional income during gestation period from same land. It also facilitate maintenance of plantation during initial 4-5 years. (http://www.agrifarming.in/neem-cultivation)

A neem tree generally begins bearing fruits at three to five years of age, and can produce up to 50 kg (110 lbs.) of fruit annually when mature. The shiny dark green pinnately compound leaves are up to 30 cm long. It will grow where rainfall is as little, and thrives in very dry and arid conditions. (Muñoz-Valenzuela et al., 2007).

Fruits bearing in 4–5 years continues for about 100 years. A spacing of 8.0 X 8m is recommended to establish 150 tress per hectare. It is an ideal species for planting along road sides, canals, around farm boundary to establish an effective wind break. Average tree is 8m
tall, gives about 350 kg of dry leaves. Fruit yield per tree, per year is 31 to 55 kg. Fresh fruit gives on an average 60% of dry fruit of which Seed constitutes 40%, Kernel 17% of Seed. A fully-grown tree yields about 50 kg fruits and about 350 kg leaves annually (Parmar and Ketkar, 1993).

At Collection point Market Prices for Neem Fruit hangs between Rs. 0-50 to Rs. 1-50 and for Seed Rs. 2/- to Rs. 2-50 per Kg. Most of the material is going to Karnataka, Tamilnadu and Kerala for oil extraction and use in making Bio- Pesticides. The fruiting age of neem is 3-5 yrs. It turns fully productive in 10 yrs. So the normal production of neem is 30-50 kg of fruit/tree/annum (K.P. Rao, 1990)

Fruiting starts when plants are 2–5 years old and reaches full production at 10–15 years of age. Seed production varies from 11 to 50 kg/year/tree, with an average of 20.5 kg/year/tree. (Steve Csurhes, 2016)

A neem tree normally starts fruiting after 3-5 years. In about 10 years it becomes fully productive. From the tenth year onwards it can produce up to 50 Kg of fruits annually. (Manisha et. al., 2014)

The tree grows upto a height of 30 feet or more and can attain full productivity within 10 years, its fruit-bearing period between 3-5 years which produces 30 to 50 kg of fruit every season. In planted on sites in which rainfall is in between 800 mm/year and 1,500 mm/year. In very favorable conditions, the Neem can reach 10.0 m height in eight years and 12.0 m in ten years, e to produce up to 60 kg of fruits for tree by each crop. As each tree produces, in the average, 30 kg of fruits and 30 kg of seeds per year, this gives an output of 6 kg of oil and 24 kg of cake for each tree. The first flowering of trees occurs in the 4th year. The production of
fruits starts with only 10kg/tree (4.0t/ha), going up to 40kg/tree (16.0t/ha) in the 10th year. (Wilson, 2005)

The Neem tree has a very long life of up to 200 years. Its oils and extracts are among some of the best existing sources for biopesticide, besides presenting antibacterial and antivirus properties. All parts of Neem tree have been used in India on domestic life, ever since thousand years ago making it a multipurpose tree.

Neem components are used as raw material attainment on several industries, as;

a) seed oil,

b) oil, cake or paste from fruit wastes,

c) extracts and syrups from leaves,

d) powder of bark and leaves, and

e) valuable timber (trunk) and

firewood (roosters and branches eventually transformed into charcoal).

The Neem does not require high fertile soils, been grown even in barren lands. It does not support, however, marshy or acid lands. The tree physiology requires temperatures that vary between 8ºC and 40ºC. The more hot and humid climate, the faster is the growth. Worldwide experience shows tolerance to annual rainfall going from a minimum of 150 mm/year (dry climate) to 1,800 mm/year (wet climate). However for reasons of economic exploration it must be planted on sites in which rainfall is in between 800mm/year and 1,500 mm/year. In very favorable conditions, the Neem can reach 10.0 m height in eight years and 12.0 m in ten years, it will produce up to 60 kg of fruits for tree by each crop.
The first flowering of trees occurs in the 4\textsuperscript{th} year. The production of fruits starts with only 10\textit{kg/tree} (4.0\textit{t/ha}), going up to 40\textit{kg/tree} (16.0\textit{t/ha}) in the 10\textit{th} year.

Neem fruit can be harvested after three years, but it takes ten years before the tree reaches its full potential of 30-50 \textit{kg} of fruit a year. It will live 150-200 years and usually reaches 20 meters in height. (Discover Neem 2010).

Adult Neem trees attain heights of 7 to 30 \textit{m} and stem diameters of 30 to 80 \textit{cm} (Ahmed and Grainge 1986; Anon, 1988). Mature trees usually produce 30 to 50 \textit{kg} of fruit annually and may live for 200 years or more (Ahmed and Grainge 1986).

Fresh fruit yield per neem tree ranges between 37 and 50 \textit{kg} per year. 40 \textit{kg} fruit yields nearly 24 \textit{kg} of dry fruit (60\%), which in turn gives 11.52 \textit{kg} of pulp (48\%), 1.1 \textit{kg} of seed coat (4.5\%), 1 \textit{kg} of husk (25\%) and 5.5 \textit{kg} of kernel (23\%). The kernel gives about 2.5 \textit{kg} of neem oil (45\%) and 3.0 \textit{kg} of neem cake (55\%). (Subbulakshmi et.al., 2012)
2. OBJECTIVES

The main objective of the study is to prepare fruit yield of selected tree species under agroforestry system in Tamil Nadu. The specific objectives are

1. To analyze fruit yield of Neem (*Azadirachta indica*)
2. To estimate the economics of Neem
3. To study the marketing practices followed by the farmers

3. RESEARCH METHODOLOGY

Virudunagar district was purposively selected since it was one of the leading district in growing Neem (*Azadirachta indica*) in Tamil Nadu. (Table.1) Among various blocks in Virudhunagar district Vembakkotai Block was purposively selected based on the highest area under Neem. Primary data was collected from eight sample respondents from two villages viz., Melachathiram and Siddireddipatti. For both villages ten farmers were selected at random.

Different intermediaries viz., primary local traders, primary wholesalers and local village level collectors in the marketing channels were also studied.
Table 1. Area under Neem (*Azadirachta indica*) in *Tamil Nadu* [2009-10]

### Area under STS [2009-10]

(Source: G Return, 2009-10, Data Entry and Reporting software, Department of Economics and Statistics, Chennai-6.)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Virudunagar District</th>
<th>Thoothukudi District</th>
<th>Tirunelveli District</th>
<th>Madurai District</th>
<th>Others</th>
<th>Total Area (Ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neem</td>
<td>643 (34.34)</td>
<td>427 (22.80)</td>
<td>216 (11.53)</td>
<td>182 (9.72)</td>
<td>404</td>
<td>1872 (100.00)</td>
</tr>
</tbody>
</table>

(Source: G Return, 2009-10, Data Entry and Reporting software, Department of Economics and Statistics, Chennai-6.)

Table 2. Study Area and sample respondents

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Selected Species(STS)</th>
<th>Tree (Azadirachta indica)</th>
<th>District Covered</th>
<th>Sample Farmers (Nos.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Neem</td>
<td>Virudunagar</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intermediaries</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>
3.1. Method of collection of data

The study was conducted the agricultural year 2016-17. Two sets of interview schedules were prepared, one for enquiry at the farmers level and other at the level of market functionaries. The interview schedules were pretested and then finalized. Primary data was gathered from sample respondents through personal interview and Focus Group Discussion. Case analysis was conducted to identify the sample farmers with regards to production and marketing of Neem.

From the selected sample farmers, data regarding crop pattern, expenditure incurred in cultivation of Neem, method of marketing, agencies involved in marketing process, prices included in marketing at various stages, places of disposal and problems in production and marketing were also studied.
[STS: Selected Tree Species (Neem)]

**Note:**

- Based on the suggestions given by the Conservator of Forest SFRI Chennai, Siddireddi patti Village of Madurai also included for the Survey.
- Sample size was not restricted to 8
4. GENERAL DESCRIPTION OF THE DISTRICT

4.1. Introduction

The District of Virudhunagar was carved out as a separate district in the year 1985 as a result of trifurcating Ramanathapuram district of Tamilnadu state (vide State Government Notification, G.O. Ms. 347 dated 8.3.85). According to the said notification, eight taluks viz. Rajapalayam, Srivilliputtur, Virudhunagar, Tiruchuli, Kariapatti, Aruppukottai, Sattur and Sivakasi were separated from Ramanathapuram district and formed as a new district. At present, the district consists of eight taluks and eleven Community Development Blocks.

4.2. PROFILE OF THE DISTRICT

4.2.1 Rainfall

The normal rainfall of Virudhunagar district is 812 mm mainly contributed by north east monsoon. The monthly average rainfall in the district worked out to 74.58 mm. The months of October, November and December receive a rainfall that is more than the annual average rainfall. Nearly 53 percent of the total rainfall is received during the NEM season. The remaining 40 percent of the rainfall is received during south west and summer season. The distribution of rainfall in virudhunagar District month wise is presented in the Table 1.

Table 1. Year wise Rainfall (2010-2012)

<table>
<thead>
<tr>
<th>S.No</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
<th>Average(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>940.35</td>
<td>876.09</td>
<td>564.16</td>
<td>2380.60</td>
<td>793.53</td>
</tr>
</tbody>
</table>
4.3. Land Use Pattern - 2008-09 to 2010-11

The land utilization pattern of Virudhunagar district for four years (2008-09 to 2010-11) is furnished in Table 2.

Table 2. Land Use Pattern –2008-09 to 2010-11(Area in Ha)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Classification</th>
<th>2008-2009</th>
<th>2009-2010</th>
<th>210-2011</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Forest</td>
<td>26466</td>
<td>26466</td>
<td>26466</td>
<td>26466</td>
</tr>
<tr>
<td>2.</td>
<td>Barren and Uncultivable uses</td>
<td>4525</td>
<td>4525</td>
<td>4525</td>
<td>4525</td>
</tr>
<tr>
<td>3.</td>
<td>Land put to Non-Agricultural uses</td>
<td>70510</td>
<td>70510</td>
<td>70511</td>
<td>70510</td>
</tr>
<tr>
<td>4.</td>
<td>Cultivable Waste</td>
<td>9684</td>
<td>9543</td>
<td>9543</td>
<td>9590</td>
</tr>
<tr>
<td>5.</td>
<td>Permanent Pastures and Other Grazing Land</td>
<td>804</td>
<td>804</td>
<td>804</td>
<td>804</td>
</tr>
<tr>
<td>6.</td>
<td>Land Under Miscellaneous Tree Crops and Groves not included in Net Area Sown</td>
<td>6580</td>
<td>6460</td>
<td>6327</td>
<td>6455.66</td>
</tr>
<tr>
<td>7.</td>
<td>Current Fallows</td>
<td>10264</td>
<td>19526</td>
<td>10596</td>
<td>13462</td>
</tr>
<tr>
<td>8.</td>
<td>Other Fallow Lands</td>
<td>162162</td>
<td>167394</td>
<td>172718</td>
<td>167424.67</td>
</tr>
<tr>
<td>9.</td>
<td>Net Area Sown</td>
<td>133328</td>
<td>119095</td>
<td>122833</td>
<td>125085.33</td>
</tr>
<tr>
<td>10.</td>
<td>Area sown more than once</td>
<td>6662</td>
<td>3205</td>
<td>3374</td>
<td>4413.66</td>
</tr>
<tr>
<td>11.</td>
<td>Gross Area Sown</td>
<td>139990</td>
<td>122300</td>
<td>126207</td>
<td>129499</td>
</tr>
<tr>
<td></td>
<td>Total Geographical Area</td>
<td>424323</td>
<td>424323</td>
<td>424323</td>
<td>424323</td>
</tr>
</tbody>
</table>
4.4. Irrigation

4.4.1 Source of Irrigation

4.4.1.1 Rivers, Canals and Waterways

The Arjuna Nadi and Sevalaperi River flowers across Srivilliputtur and Sattur taluks and join Vaipar in Sattur taluk and then enters the Tirunelveli district, east of Sattur. The Mudangiar is a drainage channel in Srivilliputtur taluk and Uppodai is a drainage channel in Sattur taluk. The Vijaya Nadi and Mannarkottai Nadi are the two affluent of the Arjuna Nadi in Sattur taluk. The Gundar originates in the eastern slopes of the Varushanadu and Andipatty ranges above Watrap flows through Aruppukottai and empties into the Gulf of Mannar. The Kanal Odai is a drainage channel in Aruppukottai taluk.

4.2 River Basins and their Catchment Areas

Catchment Areas: Arjuna, Gundar, Vaigai and Vaippar are the four catchment areas of the river basins in the district. Details of Dams and Reservoirs

There are three reservoirs existing in this district - namely Anaikuttam, Vembakkottai and Kullur Sandai reservoir, which gets water from Arjuna and Vaippar. There are 156 Tanks existing in this district. Out of 156 Tanks, 76 Tanks are rainfed tanks. Total area of tanks spread in the district is 10068.85 Ha. Area of rainfed tanks and panchayat tanks are 5981.20 Ha. and 4087.65 Ha. respectively in the district.

4.3 Irrigation by Different Sources

The main sources of irrigation in Virudhunagar district are Tanks and Wells. Canal system is not used for irrigation in the district. The total area irrigated by tanks, wells and other sources is 73,284 hectares. The gross area irrigated by tanks and wells are 28,292
hectares, 31,841 hectares respectively. On an average about 50.81 percent of the total cropped area is irrigated.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEMS</th>
<th>STATISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>GENERAL INFORMATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. Geographical area (Sq. km)</td>
<td>4243.23</td>
</tr>
<tr>
<td></td>
<td>ii. Average Annual Rainfall (mm)</td>
<td>799.8</td>
</tr>
<tr>
<td>2.</td>
<td>GEOMORPHOLOGY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. Major physiographic Units</td>
<td>Structural hills, Deep Burried Pediments, Shallow Burried Pediments, Bazada and Flood Plain.</td>
</tr>
<tr>
<td></td>
<td>ii. Major Drainages</td>
<td>Vaippar, Gundar, &amp; Arjuna Nadhi.</td>
</tr>
<tr>
<td>3.</td>
<td>LAND USE (Sq. km)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. Forest area</td>
<td>264.66</td>
</tr>
<tr>
<td></td>
<td>ii. Net area sown</td>
<td>1428.82</td>
</tr>
<tr>
<td></td>
<td>iii. Cultivable waste</td>
<td>96.63</td>
</tr>
<tr>
<td>4.</td>
<td>MAJOR SOIL TYPES</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>AREA UNDER PRINCIPAL CROPS (Ha) (2005-2006)(Figures in bracket are % to the total Geographical area of the district)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Paddy -30433 (50.6%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Groundnut - 467 (0.78%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Pulses - 467 (0.78%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Sugarcane - 3209 (5.33%)</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>IRRIGATION BY DIFFERENT SOURCES</td>
<td>Number</td>
</tr>
<tr>
<td></td>
<td>i. Dug wells</td>
<td>36087</td>
</tr>
<tr>
<td></td>
<td>ii. Tube wells</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>iii. Tanks</td>
<td>997</td>
</tr>
<tr>
<td></td>
<td>iv. Canals</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>vi. Net irrigated area</td>
<td>55365 Ha</td>
</tr>
<tr>
<td></td>
<td>vii. Gross irrigated area</td>
<td>60188 Ha</td>
</tr>
<tr>
<td>7.</td>
<td>NUMBER OF GROUND WATER MONITORING WELLS OF CGWB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. Number of dug wells</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>ii. Number of piezometers</td>
<td>11</td>
</tr>
</tbody>
</table>
### 8. PREDOMINANT GEOLOGICAL FORMATIONS

**Recent Alluvium, Sandstones, Gneisses Complex, Basic metamorphic rocks, Granites and Charnockites.**

### 9. HYDROGEOLOGY

**i. Major water bearing formations**

Sandstone, weathered & fractured granitic gneisses etc.

**ii. Pre- monsoon depth to water level (m. bgl)**

0.67 - 12.12

**iii. Post- monsoon depth to water level (m. bgl)**

0.49 - 8.78

**iv. Long term water level trend in 10 years (1998-2007) in (m/year)**

<table>
<thead>
<tr>
<th>Rise</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min : 0.0009</td>
<td>Min : 0.0635</td>
</tr>
<tr>
<td>Max : 0.3944</td>
<td>Max : 0.2693</td>
</tr>
</tbody>
</table>

### 10. GROUND WATER EXPLORATION BY CGWB

**i. Number of Exploratory wells**

26

**ii. Number of Observation wells**

5

**iii. Number of Piezometers under Hydrology Project.**

11

**iv. Depth range (m bgl)**

120 - 200

**v. Discharge (lps)**

0.004 - 1.142

**vi. Storativity (S)**

$3.41 \times 10^{-5} - 0.7 \times 10^{-2}$

**vii. Transmissivity (m²/day)**

1 - 518.3

### 11. GROUND WATER QUALITY

**i. Presence of chemical constituents more than permissible limit**

Cl, F & TH as CaCO₃ & NO₃.

**ii. Type of water**

Ca-CI, NaCl & Ca-HCO₃

### 12. DYNAMIC GROUND WATER RESOURCES (As on 31.03.2004) in MCM

**i. Annual Replenishable Ground Water Resources**

469.78

**ii. Total Annul Ground Water Draft for all purposes**

312.51

**iii. Projected demand for Domestic and Industrial Uses up to 2029**

271

**iv. Stage of Ground Water Development**

67%

### 13. AWARENESS AND TRAINING ACTIVITY

**i. Mass Awareness Programmes Organized**
<table>
<thead>
<tr>
<th>Year</th>
<th>2002-03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
<td>Rajapalayam.</td>
</tr>
<tr>
<td>Number of Participants</td>
<td>300</td>
</tr>
<tr>
<td>ii. Water Management Training Organized</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>2002-03</td>
</tr>
<tr>
<td>Place</td>
<td>Rajapalayam.</td>
</tr>
<tr>
<td>Number of Participants</td>
<td>30</td>
</tr>
</tbody>
</table>

14. EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING

Technical Guidance were provided as when sought

i. Projects completed by CGWB

<table>
<thead>
<tr>
<th>Number of structures</th>
<th>Rs 6,510 (Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ii. Amount spent</td>
<td>Vadapatti in Sivakasi Block.</td>
</tr>
</tbody>
</table>

15. GROUND WATER CONTROL AND REGULATION

i. Number of OE Blocks | 1 |

ii. Number of Critical Blocks | 1 |

iii. Number of Blocks Notified | Nil |

16. MAJOR GROUND WATER PROBLEMS AND ISSUES

| Virudhunagar district is characterised by relatively high level of ground water development in both hard rock and sedimentary aquifers. |
| Presence of Black Clayey Soils has resulted in reduced natural recharge to groundwater system |
| It has also resulted in water quality problem |
| Water scarcity in part of the district due to unfavorable hydrogeological set up. |
Neem \textit{(Azadirachta indica)} A. Juss

Family: \textbf{Meliaceae}

\textbf{Neem (Azadirachta indica)} is one of the most suitable and valuable tree species found in India. It can grow on wide range of soils upto \textit{pH} 10 which makes it one of the most versatile and important trees in Indian sub-continent. Due to its multifarious uses, it has been cultivated by Indian farmers since vedic period and it has become now part of Indian culture. In India, it occurs throughout the country and can grow well in every agro-climatic zones except in high and cold regions and dam sites. In fact in India, \textit{Neem} trees are often found growing scattered in the farmers fields and on the boundaries of fields without much affecting the crops. Farmers practice this system just to meet the local demand for timber, fodder, fuelwood and also for various medicinal properties. Due to its deep tap root system, it does not compete with annual crops for scarce soil moisture.

\textit{Neem} tree can be labelled as wonder tree for its multi purpose uses in real sense. This has been used as a medicinal plant for long time and provides almost all the requirements of rural areas - be the \textit{timber, fuelwood, fodder, oil, fertilizers, pest repellant or the ubiquitous 'datun'}. Today, it has been recognised as the most potential tree of India due to its ever green nature (deciduous in drier areas) and ability to grow in even the most arid and
nutrient deficient soils as well as for its many commercially exploitable by-products and environmentally beneficial characteristics (it has therefore been labelled as tree of the future). If plantation of this tree has to be taken up on large scale, it has to be integrated as an important component of agriculture under various agro-forestry systems.

It has been estimated that India’s Neem bear about 3.5 million tonnes of Kernels every year. From this about 7 lakh tonnes of oil might be recovered. The annual production in the late 1980’s was only around 1.5 lakhs tonnes. To increase the amount of oil harvesting, Khadi and Village Industries Commission (KVIC) has pioneered various aspects of processing the fruit and seeds of neems over the past two decades. The major difficulty as observed in most of the tree borne oil seeds including neem is that neem fruits must be harvested during the wet season. Without locally available drying facilities the fruit and seeds rapidly deteriorate and become contaminated with aflotoxin. Ideally, the fruits should be depulped without delay and the seeds have to be thoroughly dried. KVIC has popularised simple methods for depulping, drying and decorticating neem products even in the rearmost villages of the country. The sales and turnover of neem seeds in India has been estimated by various agencies. Based on random survey at major neem seeds market by independent agencies the quantity of neem seed sold during 1996 was 5.5 lakh tonnes with turnover of Rs.137 crores.
Distribution:

In India, it occurs throughout the larger parts of the country in the states of Uttar Pradesh, Bihar, West Bengal, Orissa, Delhi, Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu. The tree is mostly evergreen except in dry localities where it becomes almost leafless for a short period during February - March and the new leaf appears immediately. Flowering spread over January - March in the southern parts of the country and later towards the north. Neem is a light demander and in the young stage it grows very fast. It is hardy but frost susceptible and cannot withstand excessive cold especially during seedling and sapling stage. In the international and national provenance trials raised by Arid Forest Research Institute, Jodhpur it was observed that all neem trees had branches near the base because of frost damage. It coppices well and produces root suckers and withstands pollarding well.

Description:

A large evergreen tree, 12 to 18 meter in height and 1.8 to 2.4 meter in girth with a straight bole and long spreading branches forming a broad crown as much as 20 metres across, commonly found throughout greater parts of India.

- Bark Grey or dark reddish brown with numerous and scattered tubercles. The bark exudes a gum known as East India gum. Leaves alternate 20 - 30 cm long, leaflets 8 - 19 alternate or opposite ovate glossy, bluntly serrate.
• Flowers: white or pale yellow, small, scented, numerous on long axillary panicles, have a honey-like scent and attract many bees.

• Fruit: Fruit is a ovoid bluntly pointed, smooth drupe green when young and turns yellow with a very thin epicarp, mesocarp with scanty pulp and a hard bony endocarp, enclosing one seed.

• The timber is relatively heavy with a specific gravity varying from 0.56 to 0.85 (average 0.68) when freshly cut, it has a strong smell.

The flowering season of neem varies from place to place. Generally it flowers from January to May and the ripening time of fruits is from May to August. The fruit pulp is edible.

Uses:

**Neem extracts as insecticides.** Neem products are unique in that they are not outright killers. Instead, they alter an insects behaviour or life processes in ways that can be extremely subtle. Eventually, however, the insect can no longer feed or breed or metamorphose & can cause no further damage.

• Azadirachtin: One of the first active ingredients isolated from neem, Azadirachtin has proved to be the trees main agent for battling insects. It appears to cause some 90% of the effect on most pests.

• Fungicides: Neem has proved effective against certain fungi that infect the human body. Such fungi are an increasing problems & have been difficult to control by synthetic fungicides.
- **Antibacterials**: In trials neem oil has suppressed several species of pathogenic bacteria including *Staphylococcus* & *Salmonella* spp.

- **Antiviral agents**: In India, there is much interesting, but anecdotal information attributing antiviral activity of *Neem*. Its efficacy particularly against pox viruses is strongly believed, even among those of advanced medical training. Small pox, chicken pox have traditionally been treated with a paste of neem leaves - usually rubbed directly on to the infected skin.

- **Dermatological Insects**: In India, villagers apply neem oil to the hair to kill head lice, reportedly with great success. *Neem* seed oil and leaf extracts may be the wonder cure for psoriasis. It relieves the itching and pain while reducing the scale and redness of the patchy lesions.

- **Dental Treatments**: In India, millions of people use twigs as "tooth brushes" every day. Dentists have endorsed this ancient practice, finding it effective in preventing periodontal disease.

- **Malaria**: Practitioners of the Indian Ayurvedic Medicine system have been preparing neem in oral doses for malarial patients for centuries. *Neem*s antimalarial activity was reported in Ayurveda books as far back as 2000 BC (by Charaka) & 1500 BC (by Sushruta).

- **Pain Relief & Fever Reduction**: *Neem* may also be a ready source of low cost analgesic (pain relieving), or antipyretic (fever reducing) compounds. In trials, positive results have been obtained for significant analgesic, antipyretic & anti-inflammatory effects.
• Contraceptive Agents: Indian scientists from the Defence Institute of Physiology & Allied Sciences (DIPAS) have applied for patents on chemicals isolated from the neem oil which have proved to be promising contraceptive agents which are DK-1 & DNM-5. A third active agent coded as DNM-7 acts as an abortifacient causing abortion if administered orally after implantation has already occurred. A Neem oil formulation called "Sensal" is now sold in India for contraceptive purposes.

• Veterinary Medicine: Ancient practice & initial testing of neem derivatives against various livestock pests indicated that this is an area of particular promise for the future. Insects of veterinary importance are obvious targets for neem products.

• Cosmetics: Neem is perceived in India as a beauty aid. Powdered leaves are a major component of at least one widely used facial cream. Purified neem oil is also used in nail polish & other cosmetics.

• Lubricants: Neem oil is non drying and it resists degradation better than most vegetable oils. In rural India, it is commonly used to grease cart wheels.

• Fertilizers: Neem has demonstrated considerable potential as a fertilizer. Neem cake is widely used to fertilize cash crops particularly sugarcane & vegetables. Ploughed into the soil, it protects plant roots from nematodes & white ants, probably due to its contents of the residual limonoids. In Karnataka, people grow the tree mainly for its green leaves & twigs, which they puddle into flooded rice fields before the rice seedlings are transplanted.

• Other products

• Resin: An exudate can be tapped from the trunk by woundings the bark. This high protein material is not a substitute for polysaccharide gum, such as gum arabic. It may
however, have a potential as a food additive, and it is widely used in South Asia as "Neem glue".

- Bark: *Neem* bark contains 14% tannins, an amount similar to that in conventional tannin yieldings tree (such as *Acacia decurrens*). Moreover, it yields a strong, coarse fibre commonly woven into ropes in the villages of India.

- Honey: In parts of Asia neem honey commands premium prices & people promote apiculture / apiary by planting neem trees.

- Neem fruits: The fruits are recommended for urinary diseases, piles, intestinal worms, leprosy etc. The dry fruits are bruised in water & employed to treat cutaneous diseases.

- Soap: India's supply of neem oil is now used mostly by soap manufacturers. Although much of it goes to small scale speciality soaps, large scale producers also use it, mainly because it is cheap. Generally, the crude oil is used to produce coarse laundry soaps.

- Neem Leaf Tea: Several companies have started processing neem leaves for Tea production and selling as neem leaf Tea. Although it tastes bitter, in the long run it may catch up with the masses especially to the health conscious people. (Source: [http://www.keralaagriculture.gov.in/htmle/bankableagriprojects/fw%5Cneem.htm](http://www.keralaagriculture.gov.in/htmle/bankableagriprojects/fw%5Cneem.htm))
5. RESULT AND DISCUSSION

5.1 Cropping Pattern Followed by the sample respondents

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neem</td>
</tr>
<tr>
<td>2</td>
<td>Cotton</td>
</tr>
<tr>
<td>3</td>
<td>Maize</td>
</tr>
<tr>
<td>4</td>
<td>Black gram</td>
</tr>
<tr>
<td>5</td>
<td>Red gram</td>
</tr>
<tr>
<td>6</td>
<td>Field Bean</td>
</tr>
<tr>
<td>7</td>
<td>Cholam</td>
</tr>
<tr>
<td>8</td>
<td>Tamerind</td>
</tr>
</tbody>
</table>

5.2. Fruit Yield Table of Neem

From the primary survey conducted in the villages viz., Keelachathiram, Melachathiram and Siddireddipatti of Virudunagar District. The data regarding the average yield of neem is given in the table 5.2. The data regarding the average yield of individual neem tree is given in table 5.3. The data was obtained by random sampling of respondent in the three villages. A total of ten farm holdings were surveyed. And information’s related to the yield of neem was collected. The distribution of neem tree species was also observed in mainly farm lands intercropped with Maize, cotton, field bean, Reg gram, Black gram and roadsides etc., Besides this a few trees were grown in the near residential places has individual scattered trees.

The neem trees were categorized based on the different age classess viz., 3-5, 6-10, 11-15, 16-20 and 21-25.
The data revealed that, the tree starts bearing between the age of 3-5 years and the average economic yield was found to record in the age class of 11-15 years.(14700 Kg of Neem fruit /Ha/Year/Tree). As the age increases the fruit yield also increases. The maximum average fruit yield was obtained in trees with age class between 16-20 years with 132 kg of neem fruits per tree per annum. (i.e.19800 kg of neem fruits/Ha/Year/ Tree).

Later as the age of tree increased the fruit yield started declining. This increase in the fruit yield the gradual decline may be due to the interaction between the tree (genetic resources) and the environment, edaphic factors, climatic factors, silvicultural practices etc.,

The data in the table 1. Revealed that, the neem tree starts bearing 3-5 years onwards from the date of planting. The average economic yield is high in 16-20 years age category neem trees. (132 kg of neem fruits/Ha/Year/ Tree).

From the fifth year onwards the yield gradually increases as the age of the neem tree increases. The maximum fruit yield was recorded during 16-20 years of age. Afterwards the fruit yield was declined over the years. It may be due to the neem tree canopy/ crown size expanded cyear by year this interferes the yield of intercrops such as tamarind, field bean, black gram, green gram, red gram, maize and cotton in the field under agro-forestry conditions. To avoid this farmers are frequently pruned the side branches of neem tree this practice heavily affects the fruit bearing ability of the neem tree.

During the drought period for want of money farmers felled down the more than 15 year old tree for want of money. Every 15 years farmers grow new neem tree saplings in their field. The leaves are used as fodder for their cattle during lean seasons as well as these trees withstand drought.
At present in the survey areas (Siddireddipatti, keelachathiram and melachathiram) found only less than 10 year age old neem trees. So the fruit yield calculations was done through farmers given opinion by recall basis.

The data regarding the average fruit yield of neem trees was obtained by interviewing ten farm holdings. The distribution of neem tree species was also observed in mainly farm lands intercropped with Maize, cotton, field bean, Reg gram, Black gram and roadsides etc., Besides this a few trees were grown in the near residential places has individual scattered trees.

Based on the availability of trees, groups of trees were categorized under different age categories namely 3- 5 years, 6-10 years, 11-15 years, 16-20 years and 21-25. Though the tree starts yielding from 3-5 years age category and the economic yield was recorded in the neem trees of the age group of 11-15 years. In general higher yields were obtained as the age of trees advances.

Table5.2. Average Yield* (Kg of Neem fruit/tree/annum) of Neem in the study area.

<table>
<thead>
<tr>
<th>Average age of Neem Tree (yrs)</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
<th>F7</th>
<th>F8</th>
<th>F9</th>
<th>F10</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 5</td>
<td>6</td>
<td>7.5</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>6 to 10</td>
<td>15</td>
<td>20</td>
<td>15</td>
<td>61.6</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>4.5</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>11 to 15</td>
<td>150</td>
<td>80</td>
<td>150</td>
<td>75</td>
<td>50</td>
<td>55</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>125</td>
<td>98</td>
</tr>
<tr>
<td>16 to 20</td>
<td>120</td>
<td>115</td>
<td>210</td>
<td>180</td>
<td>100</td>
<td>50</td>
<td>95</td>
<td>125</td>
<td>120</td>
<td>200</td>
<td>132</td>
</tr>
<tr>
<td>21-25</td>
<td>150</td>
<td>100</td>
<td>86</td>
<td>120</td>
<td>100</td>
<td>145</td>
<td>110</td>
<td>130</td>
<td>100</td>
<td>90</td>
<td>113</td>
</tr>
</tbody>
</table>

(Note: *Based on the farmer’s opinion by recall basis the table were generated.)
Table 5.3 Per Hectare Average Yield* (Kg of Neem fruit/tree/annum) of Neem in the study area.

<table>
<thead>
<tr>
<th>Average age of Neem Tree (yrs)</th>
<th>Average Fruit Yield Kg / Tree</th>
<th>Avg. Yield/Acre (Kg/yr) (spacing 8X 8 m) 150 trees per Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 5</td>
<td>6</td>
<td>900</td>
</tr>
<tr>
<td>6 - 10</td>
<td>20</td>
<td>3000</td>
</tr>
<tr>
<td>11 - 15</td>
<td>98</td>
<td>14700</td>
</tr>
<tr>
<td>16 - 20</td>
<td>132</td>
<td>19800</td>
</tr>
<tr>
<td>21- 25</td>
<td>113</td>
<td>16950</td>
</tr>
</tbody>
</table>

(Note: Based on the farmer’s opinion by recall basis the table were generated.)

CASE STUDY OF NEEM FARMERS

CASE STUDY I

Name: Ragavan

Area: Melachathiram, Kovilpatti

Crop : Neem tree; Intercrop: Maize, cotton

The farmer is having 250 tree of Neem in the spacing of 15 X 15 feet. The age of neem tree is around 4 year old. Neem yields fruits 1-2 kg /tree every year. In fifth year the yield averages 2-3 kg/tree. And tenth year yield is 10 kg/tree. Tree could be cut at the age of 20 year old.

CASE STUDY II

Name : Arunachalam,
The farmer is having 700 trees in 14 acres. Fruit yield is 50-60 kg/tree in 12 to 15 years old. Twenty year old tree yields 50 kg /tree in the area of Melakkadu. Neem trees are maintained under rainfed condition. Intercrops are also cultivated by the farmer viz., black gram, green gram and yield is half and 1 bag respectively. In vadakadu region market price of neem seed is Rs.7-10 per kg and with seed coat will be Rs. 4-5 per kg. Neem intercrops with cotton, maize, blackgram and green gram. During the season July- September intercrop is mostly practiced in the study area. 100 trees is maintained at the age of 10-12 years old. Price of tree is Rs 300-400/tree. Six years back(2010) , the fruit yield of 50 year old tree is 2 bags ie., 200 kg ( 100 kg / bag). In 7-8 years old individual tree can yield 25-30 kg. In 15 year old tree will yield one quintal (100 Kg of Neem fruit) per tree.

**CASE STUDY III**

Name: Narayanaswamy

The farmer is having 1000 trees in that 100 trees are tamarind trees population per acre varies 100 -200. Fruiting starts from 8-9 year. Growth is very high in every individual tree. During rainy season vegetative growth is high. Farmers are mostly going for seedlings than cuttings. 8 year tree could yields 10 kg of neem fruits/tree. 15 year old tree could yield 50-100 kg. 20-25 year old tree could yield 200 kg/tree. It is an alternative bearing in nature. Price of fruit is Rs 12(with seed coat) Rs.25 (without seed coat). Fruiting will be upto 40-45 days . price of fruits will highly dependent on demand. Local traders are from Kovilpatti, Virudhnagar, Saathur, Thiruvengadam. Fruit kernel is used for oil extraction. Tamarind starts yield at the age of 8 yrs. Economic yield starts from 10-15yrs.(100 kg/tree). Rate of fruit is Rs 100(without seed).
Last decade forest department gave seedlings to farmers at free of cost. 15-20 year old tree could yield 1 to 1.5 quintals. Without rain trees will be dried within 6 months. The income is 10000/ acre (good rainy season). Yield from intercrop of cotton, maize is 2-3 quintals and 10 quintals respectively.

Major issue is scarcity of labors. Cultivation is carried out in rainfed area. Over exploitation of ground water is an issue. Loss of trees due to natural calamities has also decreased yield. Neem is cultivated traditionally, as there was crop theft. Hence farmers shifted to tree cultivation. Moreover important issue is migration of labour. This has forced farmers grow tree crops in the study area.

**Problems faced by the farmers in production of Neem**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not followed silvicultural practices</td>
</tr>
<tr>
<td>2</td>
<td>Poor Rain Fall</td>
</tr>
<tr>
<td>3</td>
<td>Labour Problem</td>
</tr>
<tr>
<td>4</td>
<td>Low productivity</td>
</tr>
<tr>
<td>5</td>
<td>Farmers are migrated</td>
</tr>
<tr>
<td>6</td>
<td>Crop theft</td>
</tr>
</tbody>
</table>

**Marketing related problems faced by the Farmers**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low price</td>
</tr>
<tr>
<td>2</td>
<td>Fluctuation in price</td>
</tr>
<tr>
<td>3</td>
<td>Not getting the money in time from Middle mans</td>
</tr>
<tr>
<td>4</td>
<td>Market access</td>
</tr>
</tbody>
</table>
PILOT SURVEY RESULTS

The survey on fruit yield of neem was carried out at Melachathiram and Siddhireddipatti villages of Virudhunagar District.

Four village farmers have farm holdings in Siddhireddipatti. They grow neem in agroforestry model traditionally for generations. Neem tree in grown in field cultivated with cotton, maize, green gram, red gram, field bean.

Until few years back around 10-20 years old trees were felled for revenue to meet out family expenditure. Pruning of the side branches was also carried out periodically. Due to shade effect for underground crops trees were also felled. Hence there is a variation in the age of standing neem trees.

- Rainfall pattern also influence fruit yield. Farmers revealed that low rainfall yielded more fruit
- Timber merchants from nearby saw mill approach farmers with a price tag of
  - Rs 5000-6000 for a bole of diameter 40” height 6 ft
  - Rs 12000-15000 for a bole of diameter 60” height 9 ft
- Seedlings come up naturally. Healthy seedlings with clear spacing were allowed to grow. Rest were thinned. Farm holdings don’t have border. Usually crop of redgram in grown as border.
- Since soil in black cotton soil with lesser water availability. Farming is limited to dry farming growing trees, collection of seeds fetched them additional livelihood.
- Cost of neem seed with pulp pre processing was priced Rs 25/kg, neem seed with pulp, processed and dried was priced Rs 50/kg.
- Flowering of trees happen during march-april, fruiting occurs during September and seed extraction gets completed by November. Hence season in between sep-nov. Buyers from virudhunagar and near by area purchase seeds directly from farmers.

- Trees were never allowed to grow fully as tree canopy brings shade for crop, blocks sunlight and rainfall, which is detrimental for intercrops.

- Even though there a government order prohibiting tree felling in patta land without permission of VAO, RDO or Forest Department official, felling in being carried out.

- Neem trees are grown at the interval of 15”×15” (Melachathiram) and 20”×20” (Siddireddipatti) spacing under agro-forestry. Trees start yielding gradually from 3-5 years at Siddhireddipatti.

- Yield increases till 25 years of age and gradually decreases thereafter. But the trees are felled early to meet out family expenses viz., Children’s education, marriage and health expenditures.

- Trees yield between 10-60 kgs of seed neem fruit yield from 6-10 years of age with annual increment of 10 kgs. Between 11-15 years of age yield varies between 70-100 kgs.

  When age advances beyond 15-20 years yield differs between 100-200kgs.

- Bearings are good in alternate years. Price of unprocessed neem fruit varies between Rs.10-12 per Kg. Where for processed (Grading, drying and cleaning) fruit the price varied between 20-25 Rs.
6. POLICY SUGGESTIONS

- Scientific cultivation
- Train the farmers pertain to package practices of neem
- Research has to be strengthening in the area of new variety suitable to all factors.
- Pest and disease control measures to increase the yield.
- Formation of Farmers Producers Company/ Farmers Group to increase the price of the product.
- Government provides loan facility to establish neem based industries to support the neem farmers for getting good price.
- Farmers having organized platation of tree crops may be given with carbon credit by the State/Central government. This will encourage the other farmers to go for Neem tree plantation.
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http://shodhganga.inflibnet.ac.in/bitstream/10603/17487/9/09_chapter%204.pdf


Wilson (2005) The neem project – reforestation and orchard plantation in Brazil for industrial purposes on Sustainable basis
Neem plantation at siddireddipatti, Virudunagar District

Neem tree under Agro forestry conditions
Neem tree with different age group in the study area.

Discussion had with the Neem Farmer in Melachathiram Village, Kovilpatti Block of Virudunagar Dt
25 year age Neem tree under Agro forestry conditions

A view of Neem plantation at Keelachathiram village Virudunagar Dt.
Data collection in the field

Field view of neem plantation at melachathiram
New saplings in the field with agricultural crops
Weeding operation done in the field
Six year old Neem tree at Field.

Had discussion with TN State forest department officials
40 year old Neem tree at near temple at the study area