



Suitability study on *Melia Dubia* based Agroforestry System in North Karnataka

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ABSTRACT

*As per the National Forest Policy objectives, every state has to endeavour to have at least 33% of its geographical area under vegetation cover. To achieve this it is not only necessary to bring new areas under afforestation activities but also it is necessary to protect and consolidate the existing forest areas. For this agro-forestry is best option for promoting tree based farming in open lands. To motivate farmers to adopt tree plantation along with field and horticulture crops, a participatory research on *Melia dubia* based agro-forestry system was implemented in farmer's field at AEEC, Lingsugur. *Melia dubia* along with cotton, papaya, pomegranate, sweet lime crops were intercropped in North Karnataka region, results showed that, *Melia dubia* did not have any negative effect on growth and yield of inter crops.*

Keywords: *Melia dubia*, Agro-forestry, intercropping, Afforestation

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INTRODUCTION

Agro-forestry is the set of land-use practices involving the deliberate combination of trees, agricultural crops and/or animals on the same land management unit in some form of spatial arrangement or temporal sequence. Cultivating trees in combination with crops is an ancient practice. However, several factors have contributed to a rising interest in agroforestry since the 1970s: the deteriorating economic situation in many parts of the developing world; increased tropical deforestation; degradation and scarcity of land because of population pressures; and growing interest in farming systems, intercropping and the environment. Agro-forestry has made tremendous strides in recent years, but many challenges remain in terms of its wider application. It is necessary to identify and measure the range of benefits, given that they are not well documented. Moreover, additional research is required to quantify the benefits to various stakeholders, to deal with the variability in benefits, to assess the effects and trade-offs of different policies and to examine the impact of agroforestry practices on forest protection, particularly in the tropics. Determining which practices are most suited to particular groups, such as women and poor people, is another area that warrants attention.

Agroforestry has got much attention in India from researchers, policymakers and others for its perceived ability to contribute significantly to economic growth, poverty alleviation, environmental amelioration and biological diversity, which makes it an important tool for integrated and sustainable development [5]. One of the main problems that farmers face today is decreasing income from an acre per year against sudden increase in the value of agricultural lands. Planting certain tree varieties such *Melia dubia* which fetch a handsome price in the market, assured buyback, and require low maintenance expenditure may help in this regard. In addition, the trees also aid the planet by preventing temperature rise and checking gas emission into the atmosphere. *Melia dubia* is a fast growing, indigenous and economically important multipurpose tree species that grows naturally in certain parts of the Western Ghats of South India. It is a moderate light demander in the young stage and grows vigorously in the moist deciduous forest [2]. *Melia* is a money spinning tree of short duration. Since there is a total mismatch between demand and supply for wood, block planting of 300 to 400 trees per acre can ensure a minimum profit of rupees one lakh per year from an acre. Identification of new and alternate industrial wood species such as *Melia dubia*, *Dalbergia sissoo* and *Leucaena leucocephala* have been found superior to traditional Eucalyptus species as

a source of pulp wood that was developed by TNAU under NAIP on industrial Agroforestry [6]. Looking into its importance and need, research on Promoting *Melia dubia* based agro-forestry system through farmer's participatory approach was implemented during 2014-15 at AEEC, Lingsugur in farmer's field with the following objectives,

- To study the suitability of *Melia dubia* in North Karnataka
- To study the suitability of *Melia dubia* in agro-horti-forestry system
- To study influence of *Melia dubia* in disease management of various crops

MATERIAL AND METHODS

The proposed research on "Promoting *Melia dubia* based Agroforestry system through farmer's participatory approach" was conducted in farmer's field at AEEC, Lingsugur during 2014-15. One year plantation of *Melia dubia* was considered for the study.

| Tr.No | Treatments |
|-------|--|
| T1 | <i>Melia dubia</i> as hedge in field crops |
| T2 | <i>Melia dubia</i> as a border crop in field crops |
| T3 | <i>Melia dubia</i> + Papaya (1:1) |
| T4 | <i>Melia dubia</i> as a border crop in papaya |
| T5 | <i>Melia dubia</i> + Pomegranate (1:1) |
| T6 | <i>Melia dubia</i> as a border crop in pomegranate |
| T7 | <i>Melia dubia</i> + Lime (Citrus sps 1:1) |
| T8 | <i>Melia dubia</i> as a border crop in Lime |
| T9 | Sole <i>Melia dubia</i> |
| T10 | Sole field crop |
| T11 | Sole Papaya |
| T12 | Sole Pomegranate |
| T13 | Pomegranate + Papaya (1:1) |

The treatment details are Initial soil samples were collected from farmer's field then analysis being done in Soil Science Laboratory at College of Agriculture, Raichur and analysis report is depicted in Table 1. observations on plant height, stem girth, crop canopy width of *Melia dubia* and influence of *Melia dubia* on yield of field and horticulture crops were recorded.

Farmers planted *Melia dubia* in red soil which contains nitrogen ranges from 75.81 to 157.62 kg/ha, P₂O₅ from 13.74 to 27.48 and K₂O from 172.2 to 277.2 kg/ha, results indicated that these soils are low in N, low to medium in P and low to medium in K content. After third year again soil samples will be collected and analysis will be done to know influence of *Melia dubia* on soil physical, chemical, biological properties and carbon sequestration.

Table 1: Soil pH, EC and nutrient status

| Sl.No | Name farmer | Village | pH | Ec (ds/m) | N (Kg/ha) | P2O5 (Kg/ha) | K2O (Kg/ha) |
|-------|-------------------------|--------------|------|-----------|-----------|--------------|-------------|
| 1 | Anand Doddappa | Nagaral | 8.30 | 0.11 | 127.68 | 24.73 | 180.6 |
| 2 | Basavaraj Shivappa | Anwari | 8.50 | 0.26 | 99.75 | 25.64 | 177.0 |
| 3 | Ramanna | Narkaldinni | 7.35 | 0.10 | 155.61 | 18.32 | 146.4 |
| 4 | Sharangouda Venkanna | Basapur | 8.15 | 0.25 | 131.67 | 22.9 | 277.2 |
| 5 | Nagaraj Somsekhar | Santhekellur | 8.30 | 0.15 | 103.74 | 27.48 | 204.0 |
| 6 | Devanna Gundappa | Nagaral | 8.40 | 0.22 | 157.62 | 22.9 | 220.8 |
| 7 | Shantamma Veerayyaswamy | Goudur | 8.11 | 0.28 | 59.85 | 19.23 | 172.2 |
| 8 | Sharanappa Nagappa | Upperi | 7.37 | 0.13 | 91.77 | 23.81 | 226.2 |
| 9 | Rachappa Shivaraj | Neerlkeri | 7.12 | 0.10 | 75.81 | 24.73 | 246.0 |
| 10 | Vasudev | Sheelhalli | 7.40 | 0.14 | 139.65 | 13.74 | 185.4 |

RESULTS AND DISCUSSION

The proposed research was conducted in farmer's field during 2014-15 in Lingsugur taluka. One year plantation of *Melia dubia* was considered for the study. Observation on plant height, stem girth and canopy width of *Melia dubia* was recorded when plant was at 8 months and 12 months old. At 8 months age, plant height ranges from 5.10 to 6.58 m while at 12 months old it was ranges from 5.45 to 8.18 m. It indicates how fast it grows. Stem girth ranges from 0.23 to 0.38 m in 8 months old and 0.27 to 0.41 at 12 months old age. It indicates increase in girth of stem of about 0.03 to 0.04 m (3-4 cm). Canopy width ranges from 0.74 to 1.81 m and from 1.15 to 1.98 m at 8 and 12 months old age respectively. *Melia dubia* plant had only 1.5 to 2 m canopy width, so inter crops and crops in hedge did not affected due to its shade. Observations on influence of *Melia dubia* on field (cotton) and horticulture (Papaya, Pomegranate and Sweet lime) crops were recorded (Table 3). *Melia dubia* positively influence the yield of horticulture crops rather than that of field crop. Cotton crop did not affected by *Melia dubia* crop, but due to accommodation of *Melia dubia* plants, number of cotton plants were reduced so there was less yield of cotton (1.75 t/ha) was recorded compared to sole cotton (2.1 t/ha) .

Melia dubia showed positive effect on quality of pomegranate fruits by reducing scorching by sunlight which saves farmers up to Rs one lakh per ha. In general, farmers protect their pomegranate fruits from sunlight by spreading clothes, which cost around Rs one lakh per ha. Incidence of bacterial blight was not noticed in new plantations but anthracnose (2 to 7%) was noticed in few gardens. Papaya crop did not influenced by *Melia dubia* but due to shade effect sweet lime crop was affected which reduced the yield of sweet lime by 8.4 per cent. Farmers in Hunsur taluka of Mysore district have planted *Melia dubia* over an area of 25 acres gaining advantages [1]. Prahalad *et al.* [4] and Parthiban *et al.* [3] reported advantages of plantation of *Melia dubia* in agroforestry system.

Graph 1. Showing economics of *Melia dubia* based agro-forestry system

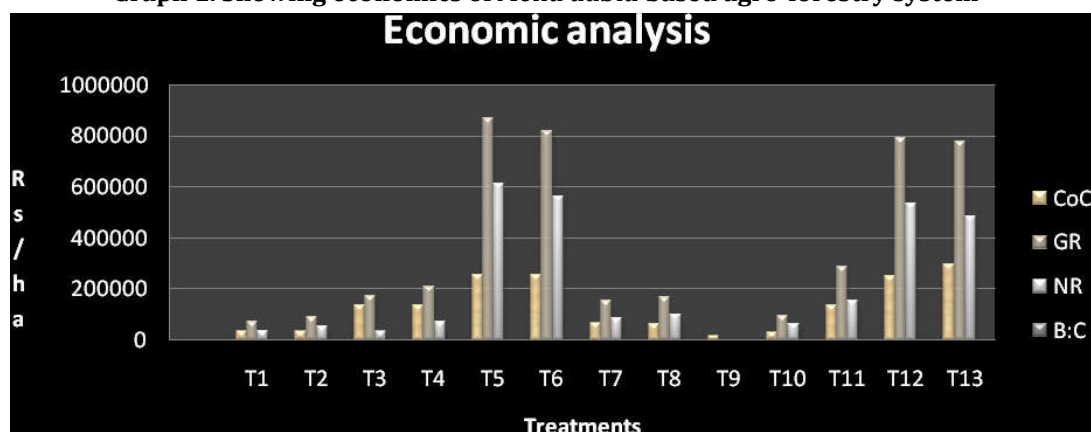


Table 2: Growth parameters of *Melia dubia* at different stages

| Tr No | Treatments | Plant height (m) | | Stem girth (m) | | Canopy Width (m) | |
|-------|--|------------------|-----------|----------------|-----------|------------------|-----------|
| | | 8 months | 12 months | 8 months | 12 months | 8 months | 12 months |
| T1 | <i>Melia dubia</i> as hedge in cotton | 5.35 | 5.76 | 0.23 | 0.27 | 0.74 | 1.15 |
| T2 | <i>Melia dubia</i> as a border crop (cotton) | 5.20 | 5.87 | 0.18 | 0.21 | 0.56 | 1.02 |
| T3 | <i>Melia dubia</i> + Papaya (1:1) | 5.25 | 6.26 | 0.26 | 0.35 | 1.28 | 1.77 |
| T4 | <i>Melia dubia</i> as a border crop in papaya | 5.05 | 5.45 | 0.21 | 0.30 | 0.80 | 1.00 |
| T5 | <i>Melia dubia</i> + Pomegranate (1:1) | 6.57 | 6.77 | 0.38 | 0.41 | 1.81 | 1.98 |
| T6 | <i>Melia dubia</i> as a border crop in pomegranate | 6.24 | 6.89 | 0.25 | 0.32 | 1.28 | 1.57 |
| T7 | <i>Melia dubia</i> + sweet lime (1:1) | 5.10 | 5.98 | 0.27 | 0.28 | 0.56 | 1.00 |
| T8 | <i>Melia dubia</i> as a border crop in sweet lime | 5.32 | 5.45 | 0.22 | 0.29 | 0.87 | 1.02 |
| T9 | Sole <i>Melia dubia</i> | 6.58 | 8.18 | 0.30 | 0.33 | 1.17 | 1.36 |
| T10 | Sole field crop (Cotton) | - | - | - | - | - | - |
| T11 | Sole Papaya | - | - | - | - | - | - |
| T12 | Sole Pomegranate | - | - | - | - | - | - |
| T13 | Pomegranate + Papaya (1:1) | - | - | - | - | - | - |

Table 3: Influence of *Melia dubia* on yield and economics of different crops under agroforestry system

| Tr No | Treatments | Yield of particular crop(t/ha) | Cost of cultivation Rs/ha | Gross returns Rs/ha | Net returns Rs/ha | B:C |
|-------|--|--------------------------------|---------------------------|---------------------|-------------------|------|
| 1 | <i>Melia dubia</i> as hedge in cotton | 1.75 | 36720 | 75250 | 38530 | 2.05 |
| 2 | <i>Melia dubia</i> as a border crop cotton | 2.1 | 34600 | 90300 | 55700 | 2.61 |
| 3 | <i>Melia dubia</i> + Papaya (1:1) | 35 | 139550 | 175000 | 35450 | 1.25 |
| 4 | <i>Melia dubia</i> as a border crop in papaya | 42 | 137600 | 210000 | 72400 | 1.53 |
| 5 | <i>Melia dubia</i> + Pomegranate (1:1) | 10.9 | 257050 | 872000 | 614950 | 3.39 |
| 6 | <i>Melia dubia</i> as a border crop in pomegranate | 10.25 | 255100 | 820000 | 564900 | 3.21 |
| 7 | <i>Melia dubia</i> + sweet lime (1:1) | 15.5 | 67050 | 155000 | 87950 | 2.31 |
| 8 | <i>Melia dubia</i> as a border crop in sweet lime | 16.8 | 65100 | 168000 | 102900 | 2.58 |
| 9 | Sole <i>Melia dubia</i> | - | 17832 | - | - | |
| 10 | Sole field crop (Cotton) | 2.25 | 32000 | 96750 | 64750 | 3.02 |
| 11 | Sole Papaya | 58 | 135000 | 290000 | 155000 | 2.15 |
| 12 | Sole Pomegranate | 9.88 | 252500 | 790400 | 537900 | 3.13 |
| 13 | Pomegranate + Papaya (1:1)- Pomegranate equivalent yield | 52 | 295500 | 780000 | 484500 | 2.64 |

CONCLUSION

Melia dubia did not have any negative effect on growth and yield of crops grown in agro-forestry system, this multipurpose crop can be grown in agro-forestry system in North Karnataka.

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