NON-CONVENTIONAL AGRO FORESTRY TREE CROPS FOR MULTI-FUNCTIONAL AGROFORESTRY CONCEPT
JA (R) E.P. No. 6/2021-22

Harur Modern Nursery Centre and Melchengam Research Centre

Introduction:

Multifunctional agroforestry is a land-use system that integrates trees, crops, and livestock to provide a range of ecological, economic, and social benefits. it also offers advantages such as carbon sequestration, climate change mitigation, soil fertility enhancement, biodiversity conservation, and sustainable land use. It also supports rural livelihoods by providing food, fuel, fodder, and income, while enhancing resilience to environmental stresses. To fully realize these benefits, effective management practices are needed, including the study of useful species. and the development of market frameworks for agroforestry products.

Objectives :

1. To enhance the Biodiversity through multifunctional agro forestry
2. To enhance fodder production through fast growing MPT's
3. Carbon sequestration studies under multifunctional agro forestry system
4. Doubling the farmer's income through maximum utilization of land.

Materials and Methods:

A study was conducted in Melchengam Research Centre of Chengam Research Range and Harur Modern Nursery Centre of Dharmapuri Modern Nursery Range during the year 2021-22 with an area of 1 acre. A nursery from the CPTs of few selected plant species and procurement from private nurseries was raised.The targeted species are detailed below:

Table 1:List of species chosen for the study

Timber species	Plywood and Pulp wood species
Swietenia mahogany	*Melia dubia*
Khaya senegalensis	*Neolamarkiacadamba*
Gmelina arborea	*Chukrasiatabularis*
Tectona grandis	*Acrocarpusfraxinifolius*

Medicinal Trees	Fruit trees
Ficus racemosa	*Carissa carandas*
Inga dulce	*Phyllanthus acidus*
Terminalia chebula	*Garcinia gummigutta*
Emblica Officinalis	**Annona muricata**
High-value Timber species	**Economic Valued Fruit Trees**
Santalum album	*Psidium guajava*
Pterocarpus marsupium	*Citrus limon*
Pterocarpus santalinus	*Punica granatum*
Dalbergia latifolia	*Annona squamosa*

A circular layout was established as illustrated in the diagram given below. The total area was divided into four sections, each serving a specific purpose such as fodder generation, flower, vegetable, and grain production. The circular garden comprised four circles, each designated for planting timber species, plywood species, medicinal plants, and fruit trees. Totally 24 number of species has been chosen for the study and each section 6 numbers of different species has been planted with combination of timber, medicinal, secondary timber and fruit trees. This model has been incorporating 24 tree species and 8 intercrops. Based on their provisioning services, the tree species has been established in six concentric circles. The entire circle has been diagonally divided into four equal sections (quadrats) and intercrop components raised in the quadrats.

The experiment plot consists of six circles and the espacement between circles is 4-5 m. Each circle of tree species within the model has its own importance, viz. high-valued timber circle (sixth), timber circle (fifth), plywood (fourth), medicinal value (third), fruits (second) and economically valued fruit trees (first) circle.

The spacing between trees in the sixth, fifth and fourth, circle of trees is 2.5 m and in the remaining circles, the spacing is 1 metre. Number of plants in each circle has varied from plot to plot. The selected planted in the 45 cm^3 with the inputs of FYM MB / 50 Plants, Tank silt-1 M^a / 50 Plants, Vermicasting1/2 Kg. / Pit, VAM- 25 gm. / Pit, Azospirillum: 10 gm. / Pit and Phosphobacteria: 10 gm. / Pit has been applied.

Soil test has been done initially and drip irrigation provision was made to entire plantation for the growth and development of the experiment plot. Intercrops has been cultivated like bhendi, jasmine, curry leaf etc., in between the spacing available in the rows and harvested & sold to the local market.
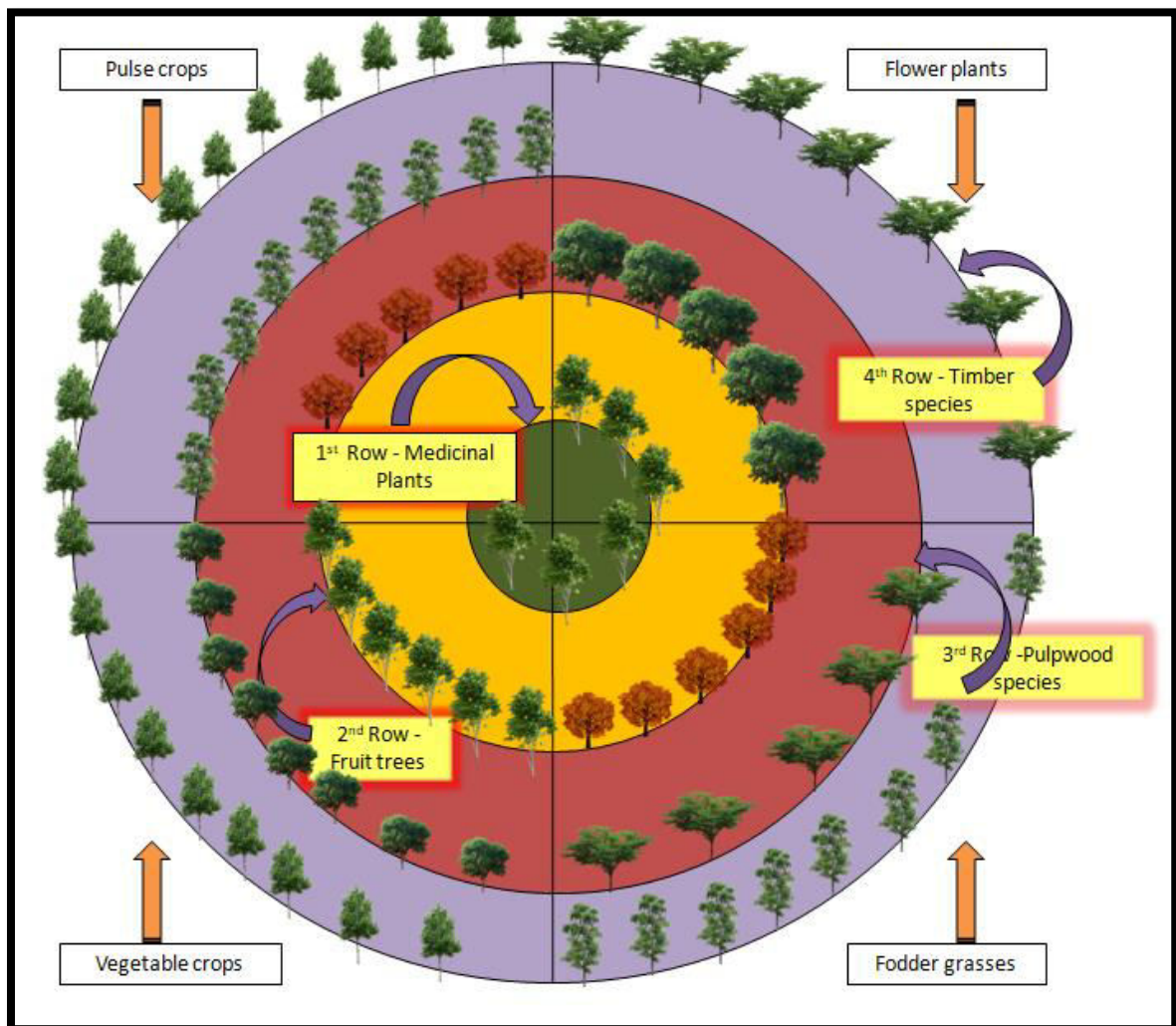
Intercrop details

Sub Plot 1: - Curry Leaf/ Vegetables (Season based)

Sub Plot 2:- Napier /Guinea Grass/ Lemon grass

Sub Plot 3: - Jasmine (2 Varieties)

Sub Plot 4: - Nerium oleander (Pink Variety)

Diagrammatic representation of the Multifunctional Agroforestry model

Findings/Interim Findings – Melchengam (R) Centre

Table 2 - Growth performance of various species as of 31.03.2024

S. No.	Species name	Planted	Survival	Average Height in cm	Average Girth in cm
High value Timber species					
1.	*Tectona grandis*	16	16	466.8	18.2
2.	*Santalum album*	19	16	127.1	-
3.	*Dalbergia latifolia*	19	19	326.2	14.50
4.	*Pterocarpus santalinus*	17	17	290.6	11.50
	Total/ Mean	**74**	**71**	**247.1**	**09.55**
Secondary Timber species					
1.	*Swietenia mahogany*	16	16	442.8	14.6
2.	*Pterocarpus marsupium*	19	19	244.5	12.2
3.	*Adina cordifolia*	16	16	326.8	18.5
4.	*Khayasenegalensis*	14	14	310.7	15.10
	Total/ Mean	**62**	**62**	**386.77**	**16.66**
Plywood and pulp wood species					
1.	*Neolamarkiacadamba*	13	13	394.6	23.6
2.	*Chukrasiatabularis*	12	12	280.9	15.8
3.	*Gmelina arborea*	12	12	463.7	26.50
4.	*Melia dubia*	11	11	619.1	33.0
	Total/ Mean	**48**	**48**	**439.575**	**24.725**
Medicinal Trees					
1.	*Emblicaofficinalis*	15	15	268.5	22.6
2.	*Ficus racemosa*	15	13	270.4	37.7
3.	*Terminalia chebula*	15	15	212.0	-
4.	*Inga dulce*	12	12	347.9	14.4
	Total/ Mean	**57**	**55**	**274.7**	**24.9**
Fruit Trees					
1.	*Garciniagummigutta*	14	14	109.6	-
2.	*Annona murigata*	15	14	200.5	16.1
3.	*Phyllanthusacidus*	14	14	187.0	-
4.	*Carissa carandas*	12	09	135.10	-
	Total/ Mean	**55**	**51**	**158.05**	**16.1**
Economic valued fruit trees					
1.	*Psidium guajava*	06	06	168.50	10.5
2.	*Punica granatum*	7	07	132.1	-
3.	*Citrus limon*	06	06	81.20	-
4.	*Annona squamosa*	05	05	184.4	-
	Total/ Mean	**24**	**24**	**141.55**	**10.5**
Border Plantations (Tree born oil trees)					
1.	*Calophylluminophyllum*	24	24	143.7	9.4
2.	*Simarouba glauca*	19	19	183.5	11.8
3.	*Azadirachita indica*	25	24	106.3	-
4.	*Derris indica*	28	28	138.3	-
	Total/ Mean	**96**	**95**	**142.95**	**10.6**

Table 3: Intercrop Revenue details:

S. No	Name of the crop	Yield (in kg)/year	Revenue generated (Rs.)
1.	Bhendi	149.2	2320
2.	Brinjal	38	988
3.	Jasmine	49.22	11577.2
4.	Currly leaf	-	3600
5.	Jasmine	48	3972
6.	Currly leaf	60	1800
	Total	**344.4**	**24257.20**

1. After the two years of establishment of the experiment plot, the overall survival percentage of the Multifunctional Agroforestry experiment plot during the year 2024 is 97.50% and among the 4 circles circle I had registered highest survival percentage 100% and circle II had registered lowest 94%. (Table 2).

The PCCF (R&E), Chennai inspection of the plot on 20.07.2023

View of Emblica officinalis in the plot – 2 years after planting.

2. After the two years of establishment of the experiment plot, all the primary and secondary timber species had performed well with respect to survival percent (100%) compared to medicinal and fruit trees.3. Intercrops like, Bhendi, Curryleaf and Jasmine has been cultivated past 2 years. Jasamine intercrop has been performed well in this locality and harvested regularly and sold to local marker with rate of 250 per kg. The daily yield of jasmine is 200 to 250 gm with a small area. Based on the performance of the jasmine the flower crops may be suitable to this locality.

4. The average height of the tree species in each circle was approximately 2.5 m within the two years of establishment. This is clearly indicating that intercropping

within agroforestry systems has demonstrated significant effects on the growth of various tree species at the initial stage.

View of Garcinia gummigutta in the plot – 2 years after planting.

View of Chukrasiatabularis in the plot – 2 years after planting

View of Neolamarkiacadamba in the plot – 2 years after planting.

View of Gmelina arborea in the plot – 2 years after planting.

5. During the study period no pest and disease has been observed in the experiment plot which shows that he symbiotic relationships between different plant species can result in improved nutrient cycling, pest management, and overall ecosystem stability.

6. The experiment is ongoing.