NON-CONVENTIONAL AGRO FORESTRY TREE CROPS FOR MULTI-FUNCTIONAL AGROFORESTRY CONCEPT

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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.

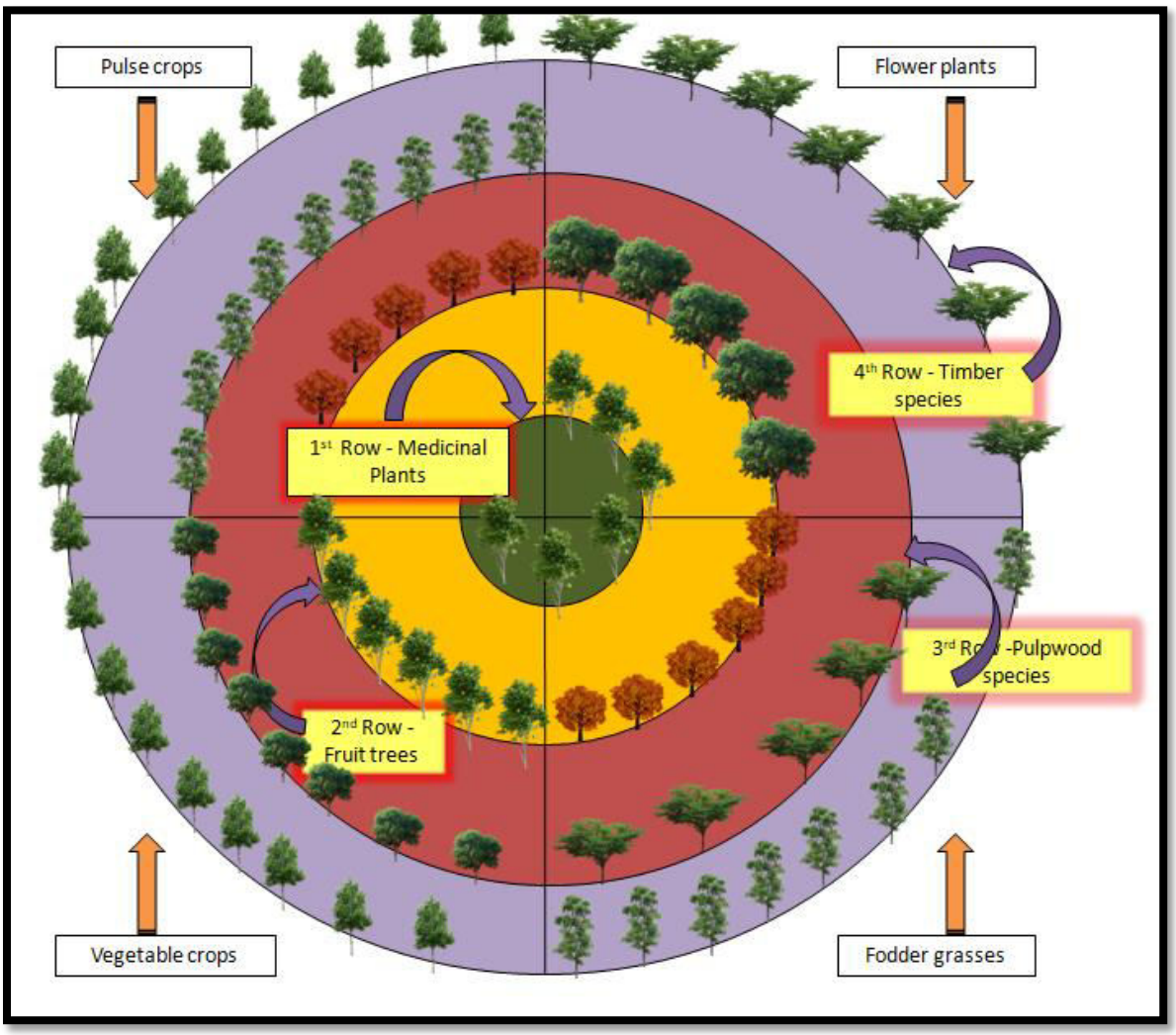
Intercrop details

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 – Harur Modern Nursery Centre

Table 4: Species wise growth performance as of 2024

S. No.	Species name	Planted	Survival	Average Height in cm	Average Girth in cm
High value Timber species					
1	*Pterocarpus marsupium*	19	14	324.3	08
2	*Santalum album*	18	06	290.00	12.83
3	*Dalbergia latifolia*	*17*	17	243.5	8.05
4	*Pterocarpus santalinus*	17	1	290	09
	Total/ Mean	**71**	**37**	**286.95**	**9.47**
Timber species					
1	*Swietenia mahogany*	21	20	325	12.2
2	*Tectona grandis*	19	19	513.7	18
3	*Adina cordifolia*	22	22	311	15.7
4	*Khayasenegalensis*	19	19	504.7	16.3
	Total/ Mean	**81**	**80**	**413.6**	**15.5**
plywood and pulp wood species					
1	*Neolamarkiacadamba*	19	15	360.7	26.3
2	*Chukrasiatabularis*	23	16	238.4	10.25
3	*Gmelina arborea*	20	20	425	19
4	*Melia dubia*	20	18	552.8	25.2
	Total/ Mean	**82**	**69**	**394.225**	**20.18**
Medicinal Trees					
1	*Emblicaofficinalis*	25	25	376.2	14.6
2	*Ficus racemosa*	24	24	381.7	16.08
3	*Terminalia chebula*	26	22	101	5.41
4	*Inga dulce*	17	15	536.0	18.6
	Total/ Mean	**92**	**86**	**348.7**	**13.67**
Fruit Trees					
1	*Garciniagummigutta*	17	-	-	-
2	*Annona murigata*	20	15	218.7	6.8
3	*Phyllanthusacidus*	17	15	335.3	12.7
4	*Carissa carandas*	18	18	107.4	4.9
	Total/ Mean	**72**	**48**	**220.4**	**8.13**
Economic valued fruit trees					
1	*Psidium guajava*	13	12	260	7.83
2	*Punica granatum*	12	12	134	04
3	*Citrus limon*	12	11	103.4	7.82
4	*Annona squamosa*	12	11	246.4	9.0
	Total/ Mean	**49**	**46**	**185.95**	**7.16**

Table 3: Intrecrop Revenue details

S. No.	Name of the crop	Year	Crop yield (in months)	Yield (in kg)	Revenue (Rs.)
1	Ridge gourd	2022	3 months	35.270	1027.00
2	Kothavarai	2022	3 months	68.280	1529.00
3	Bottle gourd	2022	3 months	32.000	997.00
4	Snake gourd	2022	3 months	33.500	689.00
5	Thevana pul	2022	3 months	-	1319.00
6	Kundu Maligai	2022	3 months	16.900	1900.00
7	Katharikai	2022	3 months	49.350	1033.00
8	Zea mays	2022	3 months	3.250	65.00
9	Bhendi	2022	3 months	33.370	559.00
10	Cow pea	2022	3 months	10.950	328.00
11	Nerium leander	2022	3 months	-	2647.50
12	Nerium leander	2023	3 months	-	1756.00
13	Nerium leander	2024	3 months	-	8040.00
14	*Phyllanthus acidus*	2024	3 months	0.500	40.00
15	*Annoa squamosa*	2024	3 months	4.500	360.00
16	*Psidium gujava*	2024	3 months	2.000	130.00
			Total	**289.970**	**22419.50**

View of Sweitenia macrophylla in the plot – 2 years after planting.

View of Inga dulce in the plot – 2 years after planting.

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 82.48%.
2. After the two years of establishment of the experiment plot, high value timber species Red sanders and Sandal shows poor growth performance with respect to survival and morphological characters. The survival percentage of sandal is 33.33 percent and red sanders is less than 10% (only one survived out of 17).

Damages by wild animals particularly Chitals is the main reason attributed to the poor survival.

3. The survival percentage of *Garcinigummigutta*is nil (2024). Not suitable for this locality.

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

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

4. More than 10 Intercrops have been cultivated past two years and total yield of intercrops is 289.97 kg and totally Rs. 22419.50/- generated as revenue. Average intercops yied per annum is approximatley Rs.11000 rupees.
5. Among the intercops jasmine and nerium speceis have been shows better yield..Based on the performance of the jasmine and nerium the flower crops fetch more revenue than vegetable crops. Vegetable crops also face immense biotic pressure from wild animals such as Chitals, Black Naped Hare, Wild Boar etc.
6. Fruit crop species performed better in terms of survival compared medicinal plants.
7. The average height of the tree species is around 3 m within the two years of establishment. This is clearly indicates that intercropping within agroforestry systems has demonstrated significant effects on the growth of various tree species at the initial stage.