INCOME AUGMENTATION IN ARECANUT PLANTATION THROUGH INTER-CROPPING OF MEDICINAL AND AROMATIC PLANTS

S.Sujatha, Ravi Bhat and D.Balasimha

Introduction

Arecanut (*Areca catechu* L.) is grown in 0.38 million hectares with a productivity level of 1268 kg/ha in India. Annual production and profitability of arecanut is undergoing significant changes during the last decade due to recurrent problems like erratic rainfall, pests and diseases and price fluctuations. Crop diversification is the need of the hour for the recurring problems faced by arecanut farmers. Arecanut with its compact crown favours excellent growth of shade loving inter/ mixed crops. Studies indicated only 43 percent light interception by arecanut monocrop, which can be increased to 95 per cent with mixed crops in arecanut. Roots of arecanut are concentrated with 50 cm radius from the base of the palm and utilizes only 40 per cent of the land scape. This implies that 60 percent of land and 57 per cent of light are being unutilized in arecanut sole.

Medicinal and aromatic plants are looked upon not only as a source of affordable health care products but also as a source of income. There is a perceptible tilt towards ancient system of helath care all over the world due to gorwing awareness of problems arising from the use of synthetic drugs. The forests have been the traditional source of 95% of these plants. The position could not be sustained due to shrinking forest lands and steep increase in demand. In India, herbal drug market continues to grow at the rate of 7-30% annually. Similarly, demand for essential oils and natural aroma chemicals used in drug synthesis, food flavouring, fragrances, perfumes, cosmetics and related products is increasing rapidly in world market. As there is no scope for horizontal expansion of cultivated area, it is viable to grow them as intercrops with the predominant crops of the region by devising suitable cropping schedules and agro-techniques. The scope for intercropping in plantation crops is well documented. The congenial microclimate available in arecanut plantations offers great scope for cultivation of medicinal and aromatic plants as intercrop.

Advantages

It is reported that low incidence of pests and diseases, higher net returns and per unit area, suitability for degraded and marginal soils, longer shelf life of end products and foreign exchange earning potential are the important advantages of medicinal and aromatic plants. However, standardized agro technology/cultivation

* **Central Plantation Crops Research Institute, Regional Station, Vittal - 574 243.**

packages, established sources of supply of good quality planting material for large scale cultivation and marketing facilities are lacking despite their high value added status.

Cultivation aspects

The complete details about agro-techniques for medicinal and aromatic plants are given in Table-1. Organic manure in the form of Farm Yard Manure (FYM) was applied as per sole crop recommendation of each crop. Farm Yard Manure @ 10t ha^{-1} $year^{-1}$ was applied to exhau stive crops like *Vetiveria zizanoides, Asparagus racemosus* and *Cymbopogon flexuous.* Other crops were supplied with 5 t ha^{-1} of FYM per year. Arecanut invariably needs irrigation during post monsoon season. Thus, there was no separate irrigation system provided for intercrops. The common irrigation system reduced the cost of cultivation. In this trial, sprinkler irrigation equivalent to pan evaporation was given to arecanut.

Suitable medicinal and aromatic plants for intercropping in arecanut

Vetiveria zizanoides (Vetiver), *Asparagus racemosus* (Asparagus), *Piper longum* (long pepper), *Bacopa monnieri* (Brahmi), *Nilagirianthus ciliatus, Catharanthus roseus* (Periwinkle), *Aloe vera*(Aloe), *Cymbopogon flexuous* (Lemon grass), *Cymbopogon martinii* (Palmarosa), *Ocimum basilicum*(Basil), *Artemisia pallens*(Davana) and *Pogostemon cablin* (Patchouli) are suitable and economical for intercropping in arecanut plantation. (Fig.1). Crops like *Withania somnifera* (Aswagandha), *Cassia anguistifolia* (Senna), *Chlorophytum borivillianum*(Safed musli) and *Pelargonium* sp. (Geranium) did not come up in arecanut garden.

Shatavari produced fresh root yield of 10.7 tonnes from one hectare of arecanut garden and contributed maximum kernel equivalent yield of 1524 kg ha-1 among all medicinal and aromatic plants. *Nilagirianthus ciliatu* produced root yield of 1017 kg ha^{-1} and shoot yield of 7087 kg ha-1, which was equivalent to chali yield of 1429 kg ha^{-1}. Similarly intercropping of aromatic plants like lemon grass, patchouli, davana, palmarosa and basil also performed well with respect to chali equivalent, varing between 398 ha-1 in case of basil to 1218 kg ha-1 in lemon grass. The better performance of medicinal and aromatic plants as intercrops in arecanut plantation might be attributed to congenial microclimate in the plantation and better soil fertility status. The kernel yield of arecanut was not reduced due to intercropping of medicinal and aromatic plants.

When sole and intercrop yields were compared to actual area basis, yield advantage was noticed in intercropped vetiver (23%) and shatavari (20.7%) over sole crop. Yield advantage was 2.6-3.4% in intercropped lemon grass over sole crop in two years. However, yield of palmarosa was reduced by 2% (2004-05) and 17% (2005-06) in intercropping situation over sole crop. For intercropping of palmarosa in arecanut plantation, it needs to be replanted once in every two years. Medicinal and aromatic plants are found to suppress the plant pathogens and sustain a significantly large population of the antagonistic

Table 1 : Agro-techniques adopted for medicinal and aromatic plants as intercrops in arecanut plantation

Crop	Family	Uses	Spacing (cm)	Planting material	Habit and duration	Price of economic product (Rs.kg-1)
Vetiver *(Vetiveria zizanoides)*	Poaceae	Ulcers and skin diseases, essential oil used in perfume and cosmetics,	45 x 30	Root slips	15 months	45 (dry roots)
Asparagus *(Asparagus racemosus)*	Liliaceae	Lactogogue, improves lost body weight, aphrodisiac, dysentery, diabetes.	60 x 60	Roots	18 months	10 (fresh roots)
Indian long pepper *(Piper longum)*	Piperaceae	Bronchitis,muscular pains, insomnia, epilepsy, stomach disorders, tuberculosis	60 x 60	Rooted cuttings	Perennial	80 (dry spikes)
Brahmi *(Bacopa monnieri)*	Scrophulariaceae	Epilepsy, insanity and memory loss	20 x 10	Rooted cuttings	Perennial	20(dry herbage)
Nilagirianthus ciliatus	Acanthaceae	Rhumaltagia, Lumbago, chest congestion cough, bronchitis.	60 x 60	Cuttings	15 months	35 (shoot&root
Periwinkle *(Catharanthus roseus)*	Apocynaceae	Cancer and high blood pressure	30 x 20	Seed	12 months	10 (dry leaves) 20 (dry roots)
Aloe *(Aloe vera)*	Liliaceae	Used externally to treat skin cuts, burns and eczema. Sap reduces inflammation.	60 x 45	Suckers	Perennial	2000/t freshleaves
Lemon grass *(Cymbopogon flexuous)*	Poaceae	Used in soaps and cosmetics. For synthesis of ionones and Vitamin A.	45 x 45	Root slips	Perennial	300 (oil)
Palmarosa *(Cymbopogon martini)*	Poaceae	Essential oil used in soaps and perfumes.	45 x 30	Seed	Perennial	450 (oil)
Basil *(Ocimum basilicum)*	Lamiaceae	Aromatic, stomachic, cough and cold.	45 x 30	Seed	3 months	350 (oil)
Davana *(Artemisia pallens)*	Asteraceae	Perfumes, food flavouring and medicine	30 x 15	Rooted cuttings	Perennial	8000 (oil)
Patchouli *(Pogostemon cablin)*	Lamiaceae	Oil of patchouli is extensively used in perfumery industry.	45 x 45	Rooted cuttings	12 months	10(fresh leaves)

fungi like *Trichoderma viride and T.harzianum* and antagonistic bacteria viz., *Pseudomonas fluorescens, Bacillus subtilis* and *B.amyloliquefaciens*. Periwinkle and Vetiver harbored the maximum populations of the antagonistic fungi and bacteria. Aromatic plants were more effective in suppressing the pathogens than the medicinal plants.

Crops like shatavari and vetiver are exhaustive due to removal of roots as economic products and deplete soil fertility in terms of soil organic matter and available K in laterite soils. To avoid this problem, crop rotation has to be followed with application of higher quantity of organic manures.

Economic feasibility

Highest net return to rupee invested was registered with lemon grass (4.25) when average over three years. This was followed by brahmi (3.64) and basil (3.46). All the crops except palmarosa and aloe had more than Rs.2.0 net return per rupee invested. Crops like aloe and long pepper which had less than one rupee return per rupee invested in the first year recorded more than Rs.1.9 return per rupee invested. This indicates the intercropping of medicinal and aromatic plants is highly profitable under arecanut system.

The three year study indicated that intercropping of value added medicinal and aromatic plants in arecanut plantation not only results in increased productivity per unit area but also contributes to increased net income due to higher resource use efficiency. The advantages observed were absence of pests and diseases, less or no irrigation requirement, reduced cost of cultivation from second year onwards and high returns. It is advisable to grow variety of medicinal plants like shatavari, vetiver, brahmi, nilagirianthes and long pepper in small areas based on local demand. However, if State Medicinal Plants Board are procuring the economic products of medicinal plants, the medicinal plants with export potential can be grown in large areas. As the market demand for aromatic plants is huge, it is advisable to grow them in large areas. Distillation of essential oils can also be taken up if community approach is adopted locally. Central Institute for Medicinal and Aromatic Plants (CIMAP) which has centres at Bangalore and Hyderabad, helps in establishing distillation units at affordable cost.

***