

CARDAMOM AND ARECANUT MIX-CROPPING SYSTEMS

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ABSTRACT

Due to the long pre-bearing period of arecanut and host of other reasons, varieties of intercrops like pineapple, ginger, turmeric, banana, cocoa, black pepper, cardamom etc. are raised in the arecanut gardens. In Uttar Kannada district of Karnataka and Wynad district of Kerala growing of cardamom as mixcrop with arecanut is a common practice. The study reveals that the above combination is highly compatible and profitable one. Arecanut palms allow 30-50 per cent of incident sunlight to pass through their canopy, thus provide an ideal shade condition for the cardamom. In the sole crop of arecanut, nearly 70 per cent of the land space remains unutilized as their effective root spread is of 75 cm radius. This inter space can be effectively utilized for growing cardamom. The root competition in such system is minimum. The drainage requirement of both the crops is similar and growing cardamom in arecanut helps in better soil and water conservation. The arecanut yield increased with mixcropping with cardamom. The minimum age requirement of arecanut garden to introduce cardamom and pepper is 6-7 years, i.e., when adequate shade develops in the arecanut garden. The schedule of management for irrigation, fertilizer, etc. have to be followed separately for both the crops, so that there will not be any competition for growth resources in between them. The total cost of raising a new garden (13th year) is about Rs. 1,40,000/ha whereas gross income per year per ha is Rs. 3,05,000 with cardamom and arecanut as components. There is a vast scope for growing cardamom as mixcrop in arecanut gardens.

INTRODUCTION

The arecanut (*Areca catechu* L.) is a perennial plantation crop (30-35 years), grown mainly in the states of Karnataka, Kerala, Tamil Nadu and Assam. The Western ghats region in South India (elevations upto 1000 m MSL) are famous for its cultivation. The area under this crop in India is 2,22,300 ha. The long pre-bearing age of the main crop arecanut, small income from initial harvests, insecurity against pests and diseases, remoteness from markets and lack of transport were considered to be some of the reasons that might have prompted areca growers to go for different crops in arecanut gardens. In Kerala, especially in southern districts, arecanut is seldom grown as a pure crop. A large number of mix crops are

grown with arecanut due to compelling socio-economic situations resulting in over populated polyculture.

In contrast to the cultivation of cardamom in natural evergreen forest environment, it can also be cultivated along with arecanut, where in the latter provides the necessary shade required for the crop. Till Cocoa was introduced, cardamom was the main crop cultivated beneath arecanut palms in Uttar Kannada district of Karnataka. In a way, taking into consideration unit value of several mix crops tried in arecanut, cardamom has served as a most remunerative and quick yielding spice crop (Korikanthimath, 1990). The amicable combination of cardamom and areca ensures a higher productivity and income per unit area.

Cardamom has been raised as a mix crop with arecanut especially at higher elevations. This crop mix becomes a profitable proposition only upto about 700M, (excluding coastal belt). Such a crop combination can enhance the production of cardamom without any additional involvement of area. A study of a typical arecanut-cum-cardamom plantation reveals that cardamom grows well as a mix crop in areas where sufficient irrigation facilities are available. It is also important to provide drainage channels in these plantations during monsoon seasons. Otherwise, there are possibilities of diseases like clump rot, yellowing, etc. on cardamom. These two conditions viz. the shade provided by areca and adequate moisture in summer months enable successful cultivation of cardamom in areca gardens. Normally, gardens with irrigation facilities during summer or areas which are low lying flat lands with adequate drainage facilities are selected for planting cardamom.

FEASIBILITY OF ARECANUT FOR MIX-CROPPING CARDAMOM

1. Canopy structure and light penetration

Cardamom has medium height, compact bushy size and preference for 50-60% shade on filtered light. The physical appearance of areca viz. its slender and straight trunks, uniform shade and fan like leaves allowing filtered light etc. also conform with the requirements of cardamom.

The photosynthetically active radiation (PAR) which passes through canopy of trees is characterised by large temporal, and spatial variability (Ross, 1980), and spectral quality (Anderson, 1982). Tall palms of arecanut and coconut allow light penetration through their canopies to an extent of around 30% (Nair and Balakrishnan, 1976). In such under storey environment different annual and perennial inter crops have been cultivated. Muralidharan (1980) reported that 32.7-47.8 per cent of incident light rays pass down through the canopy of a 14 years old arecanut garden depending on the time of the day. Normally in a pure arecanut crop spaced at 2.7m x 2.7m this light energy reaches the ground and gets wasted. This energy can be profitably utilised for raising cardamom.

2. Root distribution pattern

(i) Arecanut

Bhat and Leela (1968) observed that more than 80% of the areca roots are within a radius of 75cm from the base in palms placed at 2.7m x 2.7m. The normal cultural operations are also confined within about 75-85 cm radius from base. Thus, the areca palms exploit only 2.27m² (r=0.85m) of land area out of 7.29m² land available to each palm. This estimate suggests that about 68.9% of land is not effectively utilised by the areca root system. Hence, multiple cropping system can be resorted for effective utilization of the same.

(ii) Cardamom

Findings of Cardamom Research Centre, Appangala reveal that full bearing, eight year old cardamom clump has 80% of its lateral root spread within 25cm radius, 14% in a zone of 25-50cm radius, and only 6% in a zone of 50-75cm. Vertically cardamom roots penetrate only upto 40cm. Though areca is also more or less a surface feeder, there will not be much competition for nutrients and water since the requirements of cardamom are very less compared to that of areca and also lateral root spread does not intermingle with each other. Sannamarappa and Muralidharan (1982) also reported that the cardamom appeared to have no adverse affect on the yield of arecanut, provided, package of practices for both the crops are followed.

3. Soil and moisture conservation

Most of the cardamom growing areas are situated in high rainfall regions on hill slopes and at higher altitudes. Here, the erosion of substantial amount of soil along with nutrients is expected. Such losses are less in plateaus and where the intercrops are also taken up. As areca is grown in valley bottoms it may not be necessary to take up stringent soil conservation measures as practiced in the hilly regions. Cardamom, if included as an intercrop, further reduces the erosion losses.

4. Drainage

Arecanut also requires adequate drainage. Therefore, in most areca gardens, adequate drainage as well as soil and moisture conservation measures already exist. Of late many growers have been resorting to underground drainage, facilitating efficient draining of excess soil water, thus in many respects cardamom and areca appear to be compatible.

SEQUENCE OF PLANTING ARECANUT AND ASSOCIATED MIXED CROPS

Though the practice of raising multiple crops in arecanut gardens has prevailed since long time, if the crop plan and layout are not chalked out properly, the production potential of the entire system gets affected.

(i) Banana as a shade plant

Establishing of banana before planting arecanut seedlings at a spacing of 5.5m x 5.5m will not only provide adequate shade to young areca but also fetches sizeable initial income for the grower. While peg marking for planting areca, care should be taken to ensure that two rows of arecanut are accommodated between two drainage channels.

The main drainage channel should be at 10m intervals, and lateral at 4-6m depending on the extent drainage required. Depth can also be varied according to the water table.

(ii) Planting of arecanut

To begin with, areca palms should be planted in North-South direction with a 35 tilt towards west, at a spacing of 2.7m x 2.7m. In certain cases areca is also planted at 12' x 6' spacing. September-October is the most ideal time for planting areca. However, wherever adequate drainage facilities exist, arecanut can as well be planted during May-June. Coconut may be planted at a distance of 6m all along the border of garden while planting.

(iii) Introduction of cocoa

If banana is not thinned out after 4 years of planting areca, the growth of the latter will be affected considerably due to excess shade and competition from banana for soil moisture, nutrients, etc. Hence, after 5th year of planting areca, half of the population of banana plants may be removed and replaced with cocoa, by planting at a spacing of 6m x 6m. After 6th year entire banana may be removed and only cocoa retained.

(iv) Introducing cardamom

After 7 years of planting areca i.e. establishment the areca palms putforth adequate shade, cardamom seedlings may be planted between two arecanut palms. In old gardens cardamom is planted in alternate rows at a spacing of about 2m from plant to plant. In new areas cardamom is planted between rows of arecanut plants. About 1250 to 1500 plants are accommodated in a hectare of areca.

In high production technology (HPT) demonstration plots involving only cardamom and areca, cardamom is planted also on the heaping of fresh soil used for spreading in Areca garden and all along the drainage channels, thus accommodating more number of cardamom plants. This system has been proved to give better growth and yield.

(v) Introducing pepper

When areca palms attain 10 years age (the trunk of the palm would be grown up sufficiently taller to give a swing) the rooted pepper cuttings may be planted at the base of each palm.

After establishing areca garden it takes 12-13 years to get the full potential production of all the associated crops in the areca based cropping system.

CULTURAL OPERATIONS

During the first two years of planting areca, adequate shade and mulch cover to retain soil moisture and to prevent weed growth should be provided. Irrigation needs to be provided once in a week during summer months. Adequate drainage is essential, particularly during monsoon to drain out excess moisture. Light digging may be resorted to once in five years. Based on soil test results (once in 3-4 years) adequate quantity of lime should be applied to maintain the pH in the neutral to near neutral condition. A thin layer of fresh soil may also be applied once in five years.

Both areca and cardamom share together the common cultural operations like weeding, mulching, irrigation etc. and bring down the total cost of cultivation.

FERTILIZER MANAGEMENT

Many growers do not apply both organic and inorganic fertilizer during the pre-bearing period. It is quite essential to apply adequate quantities of both during this period to ensure early bearing and continuous yield over a long period. Only the organic manure and green leaf manure may be applied while planting of areca. During the first year of planting areca, 33g nitrogen, 13g P₂O₅ and 46g K₂O per plant may be applied, followed by double the dose of these during the second year along with organic manures. However, from 3rd year onwards, full dose of fertilisers viz. 100g nitrogen, 40g P₂O₅ and 140g K₂O and 12 kg organic manures per palm may be applied. Organic manures may be applied during Sept-Oct, and chemical fertilizers in two splits i.e. Sept-Oct and March-April. Both organic and inorganic manures may be applied around the base in a dug out basin (4-5" deep) at a radius of 3' without injuring the roots, followed by covering with soil. Recommended dose of fertilizer has to be applied to each component crop to prevent inter crop competition for nutrients.

COST OF CULTIVATION

The total cost for raising one hectare of new garden (13 years) would be around Rs. 1,40,000.

YIELD

In Uttar Kannada Dist. (Sirsi and adjoining areas) of Karnataka, regular replanting of cardamom is taken up once in 5-7 years due to heavy incidence of "Katte" disease. Here the growers pick 2-3 crops of cardamom and take up replanting. As against the average yield of 35 to 100 kg dry cardamom per ha by resorting to

conventional management, yields as high as 625 kg dry cardamom and 3750 kg of arecanut per hectare/year under irrigated condition and 375 kg dry cardamom and 2250 kg arecanut per hectare under rain fed conditions were obtained by resorting to intensive cultivation (Korikanthimath, 1987). The HPT demonstration plots around Sirsi (Karnataka) on cardamom have revealed that yield of both arecanut and cardamom can be increased substantially.

If we take into consideration potential yield and a moderate price for arecanut and cardamom, following estimate of income can be realised:

Yield of	(i) Areca = 37 q
(per ha)	(ii) Cardamom = 375 kg
Price of	(i) Areca = Rs. 5000/- per q
	(ii) Cardamom = Rs. 400/- per kg.
Total Income =	Rs. 1,85,000 + Rs. 1,50,000
	= Rs. 3,35,000

If the average cost of cultivation per year is Rs. 30,000/- per ha, Net income would be Rs. 305,000/-. This is one of the highest obtainable from any cropping system.

Remunerative price offered both for cardamom and arecanut and HPT in cardamom evolved and evaluated at NRCS—Cardamom Research Centre, Appangala, Kodagu, Karnataka have boosted the interest and enthusiasm of areca and cardamom growers to go in for mix cropping and intensive cultivation. Thus the potentiality of increasing the production and productivity of both arecanut and cardamom is great and vast.

REFERENCES

1. ANDERSON, M.C. 1982. Reflections on the shade cast by tree. In Proc. Int. workshop on special problems in physiological investigations of Tree crops, Kottayam (India).
2. BHAT, K.A. and LEELA, M. 1968. Cultural requirements of arecanut, Indian farming, 18(1) 8-9.
3. KORIKANTHIMATH, V.S., 1987. Present status of Cardamom Agronomy - A Review presented at the VIII workshop of the All Indian Co-ordinated Spices Improvement. Project held at A.A.P.A.U.R.A.R.S., Lam, Guntur, A.P. 31st Jan. — 1 Feb. 1987.
4. KORIKANTHIMATH, V.S. 1990. Efficient management of natural resources for cardamom production presented at International Symposium on Natural Resource Management for a sustainable Agriculture Feb. 6-10 1990 ISA, New Delhi.
5. MURALIDHARAN A, 1980. Biomass Production Plant interactions and economics of inter-cropping in arecanut, Ph.D. Thesis U.A.S., Bangalore, India, p.p. 271.
6. NAIR P.K.R. and BALAKRISHNAN, T.K. 1976. Pattern of light interception by canopies in coconut — Cocoa crop combination. Indian J. Agric. Sci. 46 453 - 462.
7. ROSS, J. 1980. The radiation regime and architecture of plant stands. Tasks for vegetation Science 3, Dr. W. Junk Publishers the Hague 1980.
8. SANAMARAPPA, M. and MURALIDHARAN, A. (1982). Multiple cropping, in the Arecanut palm. Bavappa *et al* (ed) CPCRI, Kasaragod, Kerala, Published by ICAR, New Delhi pp-340.