

VII. MULTISTOREYED CROPPING

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In the light of the successful growing of a number of annuals and perennials in coconut stands, a high intensity cropping system was conceived and put to practice in 1970-71 with the main objective of greater utilisation of solar energy and soil resources. In this cropping system a new dimension in crop production—air space—was identified. Crops having different stature and rooting pattern were selected to form compatible combinations.

Nelliati (1973) enumerated the differences in multiple cropping practices in field and plantation crops, and presented the details of the strategy adopted in multi-storied cropping in coconut stand. The performance of this high intensity cropping system in the early years was reported by Nelliati et al (1974).

The four crop combinations included coconut, pepper, cacao/cinnamon (single or double hedge), and pineapple. The coconut palms were about 20 years old, planted 7.6m apart under the square system and attained a height of over 10m. Pepper was trailed on the coconut trunk and allowed to develop its canopy to a height of 8m. The number of cacao/cinnamon plants planted were 350 or 600, depending on whether single hedge or double hedge planting was adopted. About 3500 pineapple suckers were planted in the alleys not occupied by cacao/cinnamon.

The entire block was given irrigation during the dry months with perfo-spray.

Pepper was fertilised at 15g N, 10g P₂O₅ and 10g K₂O/vine/year. Pineapple received 50 kg N, 20 kg P₂O₅, and 60 kg K₂O/ha/year. Cacao and coconut were fertilised as in the mixed cropping experiment.

In this four crop architecture, the feasibility and success depends on the top floor crop, unlike a masonry building where the shape and size of the super-structure is determined by the ground floor. The crown habit of coconut, as stated earlier, is ideally suited for this, when the palms are over 20 years old. The pepper vine having its canopy from 2-8m on the coconut trunk, forms the second floor crop. The spread of the above ground parts of cacao and cinnamon, which are pruned periodically, are confined to heights less than 3.5m from ground level. This constitutes the first floor. Pineapple forms the ground floor in this system. The solar energy incident on the area is intercepted at vertical intervals and utilised to a high efficiency level by the foliage of these crops (Nelliati et al., 1974).

A study of the distribution of the roots of these crops showed that they were mutually exclusive and did not overlap to any appreciable extent (Figures 3 and 4). The rooting habits of cacao and cinnamon were such that their roots had relatively less lateral spread. A three and half year old cacao plant had most of its roots within a radius of 80-100 cm and the maximum concentration was between 20-60 cm laterally (Anonymous, 1974). The fibrous roots of

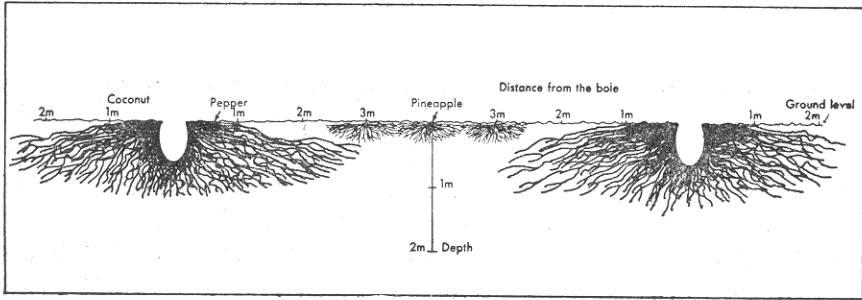
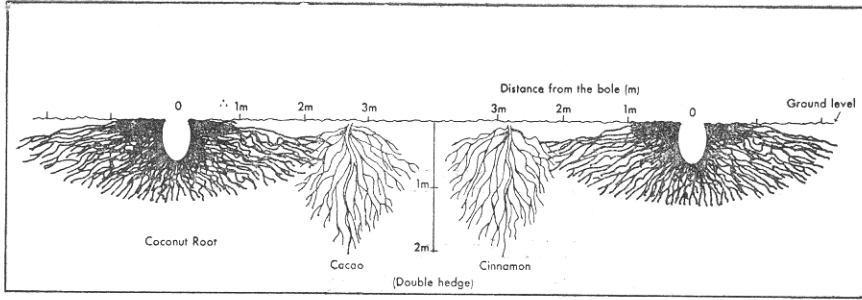


Figure 3. Schematic representation of pattern of vertical root distribution of the multi-storeyed crop combination (Nelliath *et al.*, 1974)

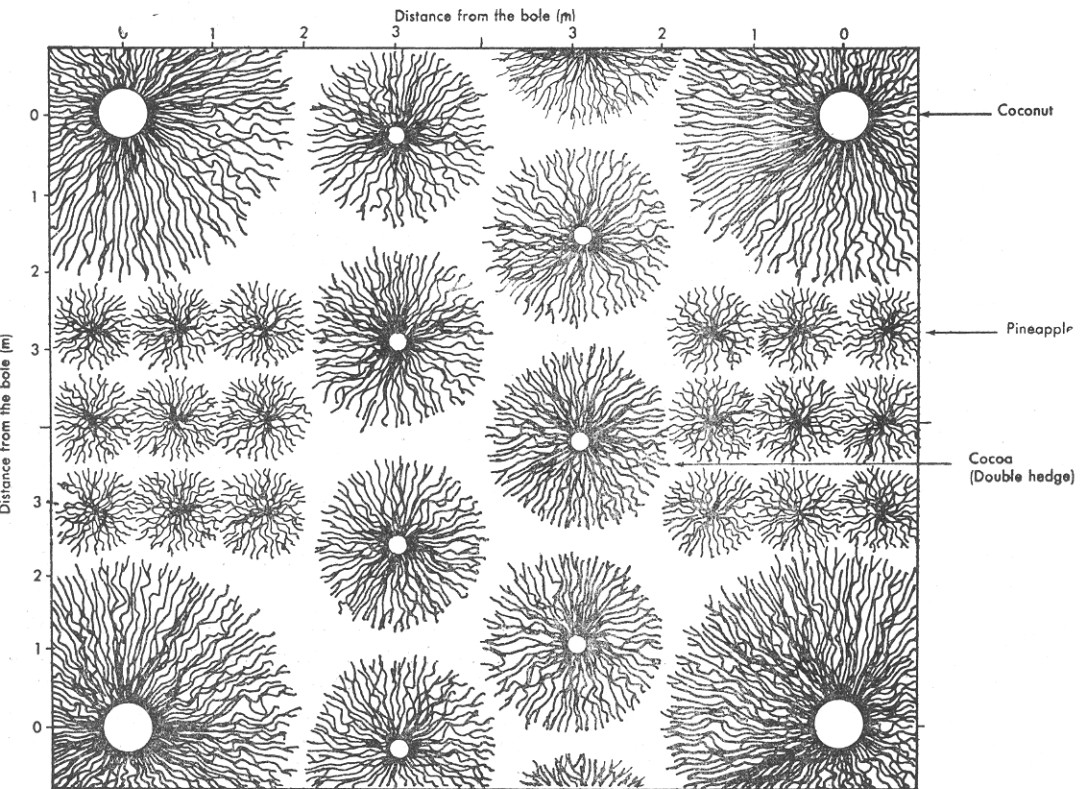
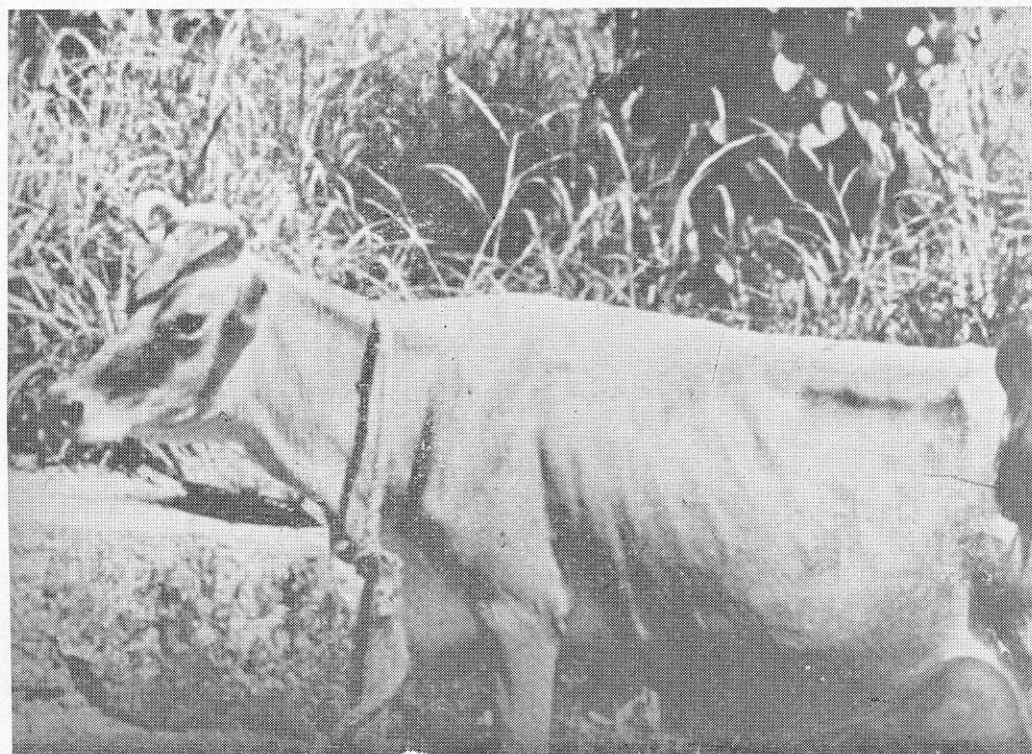


Figure 4. Schematic representation of pattern of horizontal root distribution of the multi-storeyed crop combination (Nelliath *et al.*, 1974)



Multistoreyed cropping of coconut, cacao, pepper, and pineapple



Mixed farming in coconut garden

Table 26. Mean yield of coconut in the multistoreyed cropping experiment—1978

S.No.	Treatment	Pre-treatment yield (nuts/palm)	Yield during 1978	Percentage increase over pretreatment yield	
				1978	Mean for 1975-78
1.	Cacao single hedge + pepper + pineapple	45.3	107.8	138	141
2.	Cacao double hedge + pepper + pineapple	48.1	94.0	96	90
3.	Cinnamon single hedge + pepper + pineapple	41.5	73.6	77	147
4.	Cinnamon double hedge + pepper + pineapple	40.1	87.8	119	94
5.	Cinnamon double hedge	40.8	89.4	119	114

pineapple rarely extended beyond 50 cm laterally or vertically.

Yield

In the feasibility trial, initiated in 1970, the mean yield of coconut increased by 33% (80 nuts/palm) in 1978 over the pre-treatment mean yield of 60 nuts/palm (Anonymous, 1979). The mean yield of coconut in the experiment, started in 1972, is presented in Table 26.

The cinnamon plants gave a maximum yield of 77g quills and 40g quillings per plant in 1977. Yield during 1978 was slightly higher.

The per plant yield of cacao was higher in single hedge and the yield continued to improve with age. During 1978, the mean yield of pods per plant was 14 and 9, respectively, in single and double hedge systems of planting.

Pepper variety Panniyur-1 was found to be shy in flowering and berry setting under excessive shade. A mean yield of 269g and 335g dried berries per standard was obtained in 1976 and 1977, respectively.

Pineapple was replanted every three years. The fruiting was good and the mean weight of fruit was 1.24 kg.

Thus, the output from the four crop multistoreyed cropping would be 17,000 coconuts, 300 kg cacao (dried beans), 60 kg dried pepper, and 4000 kg pineapple/ha/year. The cultivation expenses were around Rs 7,200 and at the prevailing market rates the net annual income would be over Rs 20,000/ha.

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