RESEARCH ADVANCES AND DEVELOPMENT IN PLANTATION CROPS WITH SPECIAL REFERENCE TO EXPORT-ORIENTATED ITEMS

K.V.A. BAVAPPA
Director, Central Plantation Crops Research Institute, Kasaragod

Plantation crops occupy about 2 per cent of the cultivated area in India and account for an annual earning of about Rs 250 crores. The production of crops such as tea, coffee, cashew, pepper and cardamom is highly export-orientated, but that of coconut, arecanut, rubber, cacao and oil-palm are orientated towards import substitution. India meets about 80 per cent of the world's demand of cashew kernel and produces and exports almost all known spices in sizeable quantities. In pepper, the most important spice in world trade, India accounts for about 30 to 40 per cent of the world production. In world production India accounts for more than 60 per cent in cardamom, 80 per cent in turmeric, 50 per cent in ginger and 60 per cent in chillies. Coriander, cumin fennel, fenugreek, Indian cassia (*tejpat*), mace celery and garlic are the other important spices produced and exported from India. The area, production and import-export of the important plantation crops are given below:

Area and production of plantation crops (1970-71)

Crop	Area (1,000 ha)	Production (1,000 metric tons)	Import (Rs million)	Export (Rs million)
Tea	354.3	432.7		1402.4
Cashewnut	246.6	211.7	294.1	520.3
Coffee	136.4	110.3		259.1
Pepper	119.9	26.2		152.4
Coconut	1,045.6	6,078.0 million nuts	36.5	145.3
Cardamom	75.4	3.1		112.2
Turmeric	75.3	144.2		38.5
Ginger	21.6	28.4		28.7
Cacao	1.2			1.8
Arecanut	167.3	141.0		2.4

In spite of the importance of the plantation crops in the national economy, research and development efforts on these crops have been fragmentary, isolated, and in many cases inadequate. In order to mitigate the situation, the Indian Council of Agricultural Research, set up the Central Plantation Crops Research Institute during 1970 and sanctioned two all-India co-ordinated research schemes, one on coconut and arecanut

...the other on spices and cashewnut. Research programmes, on these crops have ... re-oriented and the limited number of scientists working on these crops have ...ieved considerable progress. Some of the achievements are briefly discussed below, ...ifying the existing gaps.

...earch on arecanut commenced in 1956 and the production increased from 74,750 ... in 1956-57 to 1,39,100 tonnes in 1968-69. Intensive research has resulted in the ... of a high-yielding precocious, semi-tall 'Mangala', having nuts of good market ... and good tolerance to pests and diseases. It has recorded 71 per cent more ... than the local over a period of 6 years. Research is underway on the diversi-... of the uses of arecanut and reduction in cost of production through efficient ... techniques.

...k done on coconut resulted in some superior varieties whose performance is given ...:

Relative performance of a few coconut varieties and hybrids

...ar/hybrid	Yield of nuts/palm	Copra content/ nut (g)	Out-turn of copra/ palm (kg)
...t Coast Tall'	80.15	134.32	10.65
...adive Ordinary'	140.77	159.75	22.39
...adive Micro'	204.75	113.27	21.80
...ippines Ordinary'	106.85	213.50	22.79
...'Dwarf Orange'	101.79	177.86	18.76
...'Tall'	130.17	209.76	26.98
...'Gangabondam'	89.50	193.46	17.76

...hybrids are not only high-yielders, but also early-bearers which is an important ...acteristic since coconut has a long pre-bearing age of 6 to 8 years. Reducing the ...-bearing age is important in stabilizing the economy of coconut cultivators. Res-... has shown that in 'West Coast Tall' the inflorescence is initiated in the 11th leaf ..., which means that its pre-bearing age can be brought down by about two years.

...imizing **production in unit area, time and inputs**

...tation crops as a whole afford considerable scope for improving the production ... unit area, time and input. 'Multi-storeyed' cropping is being developed to have ... efficiency in 'soil harvesting' and in use of solar energy and air space. Studies ... shown that in a plantation of 7.5m×7.5m, only 23 per cent of the soil area is ...ively utilized by the coconut roots. On depth basis, 80 per cent of the roots are ...ned to 31-120 cm of the soil layer. On canopy basis, light utilization comes to

only about 50 per cent. These indicate that the soil and the space above are in a position to support a number of other crops, provided their feeding habit and nutritional, moisture and light requirements are different and the crops are compatible to form a wholesome and efficient mixed-cropping combination. A few of the crop combinations under trial have given the following indications.

Crop	Dry matter per hectare in tonnes (moisture- free basis)
Pure crop of coconut	12.67
Coconut, cacao, pineapple and pepper	19.3
Coconut 'Hybrid Napier' and legume *(Stylosanthes gracillis)*	26.26

Studies have been intensified to choose the correct crop combinations.

Disease tolerance

The root-wilt disease of coconut, which has spread over an area of about 2.5 lakh hectares in central and south Kerala, causing an annual estimated loss of Rs 150 million, has been reckoned as a national problem. The disease is of complex nature and a rod-shaped virus, a bacterium and some fungi have been found to be associated with it. A preliminary study taken up on the disease tolerance of coconut hybrids has given the following results.

Field tolerance of hybrids to root (wilt) disease

Name of variety	Total palms studies	Mean disease incidence (per cent)	Average yield of nuts per palm	
			Healthy	Diseased
'Dwarf'×'Tall' (NCD)	241	4.6	111.6	93
'Tall'×'Dwarf'	263	8.4	59.8	241
'Dwarf Orange'	771	18.9	44.6	243
'Dwarf Green'	150	7.3	38.4	115
'West Coast Tall'	2964	48.5	26.2	91

The data indicate that 'Dwarf'×'Tall' and 'Tall'×'Dwarf' hybrids are tolerant to the disease, the incidence ranging from 4.6 to 8.4 per cent, when compared with 48.5 per cent in 'West Coast Tall'. Intensive work is in progress to locate total resistance to the disease.

In cashew, work done so far has resulted in about 20 promising selections and hybrids, now under multilocation trials. The detailed agro-techniques and plant-protection requirements of this crop are being worked out.

In pepper, 'Panniyur 1', evolved at the Pepper Research Station, Panniyur, has out-yielded the local by almost 300 per cent. The chief characteristics of this hybrid as well as those of the popular 'Kalluvally' are given below.

Characteristics	'Panniyur 1'	'Kalluvally' (local popular variety)
Mean yield for the past five years	7.331 kg (green)	1.751 kg (green)
Mean length of the spike	16.2 cm	10.8 cm
Mean number of berries per spike	98	65
percentage of bi-sexual flowers	87.7	53.4
Weight of 100 green berries	16.8 g	12.4 g
Volume of 100 green berries	17.0 cc	12.0 cc
Percentage of dryage	32.8	31.4

Though pepper is indigenous to India, the germplasm bank does not have a sizeable assemblage of the genetic variability. An expedition for the collection of pepper germplasm is being organized. Extensive crossing and selection programmes have also been planned.

In ginger, work done so far has given the following promising varieties, some of which are already under commercial cultivation.

Variety	Yield (kg per ha)	Fibre content (%)	Dry matter (%)
'Rio-de-Janeiro'	29,350	5.19	16.25
'Maran'	23,225	10.04	22.00
'China'	25,150	3.43	15.00
'Thingpuri'	24,475	7.09	20.00
'Nadia'	23,900	8.13	20.40

High recovery of dry ginger, low fibre and high oleoresin content are the important characteristics receiving attention. As ginger is a vegetatively propagated rhizomatous crop, autotetraploids are likely to prove useful. Induction and study of such polyploids are under way.

Cashew and spices are meant mostly for the quality-conscious foreign markets, where there is keen competition. Improvement of these crops for high oleoresin content,

volatile gases, protein and other active principles will have to be given immediate attention. In addition, in the processing technology a very high hygienic standard is to be maintained. These call for not only immediate adherence to quality standards, but also an understanding of the future demand of the foreign buyers. A broad view of these problems and anticipatory action based on world trends will have to be taken.

Another important line of investigation on which very little efforts have been made so far is the pharmacological uses to which the products of plantation crops could be put to. Coconut water if reported to be not only a substitute for saline but even better. Curcumin of turmeric has beneficial effects in the management of diabetics and ginger and pepper are used treatment of various ailments. Detailed investigation on the active principles contained in these products and the pharmacological uses to which they can be put require priority.

Development efforts

The following Table indicates the targets of production and estimated requirements of some of the plantation crops.

Production and requirement targets of certain plantation crops

Crop	Expected production Fourth by Plan end*		Targetted production for Fifth Plan end*		Estimated requirement of the country in 1980**	
Coconut	6,600	million nuts	7,700	million nuts	9,180	million nuts
Arecanut	1,50,000	tonnes	1,60,000	tonnes	1,62,000	tonnes
Cashew	2,10,000	,,	4,36,000	,,	4,36,000	,,
Pepper	30,000	,.	38,000	,,	40,000	,,
Cardamom	3,100	,,	4,200	,,		,,
Ginger	28,000	,,	35,000	,,		,,
Turmeric	1,45,000	,,	1,50,000	,,		,,
Cacao	Negligible				2,400	,,
Oil palm	Nil				1,53,000	tonnes of oil

*Directorate of Coconut, Arecanut and Spices Development.

**Working paper of National Commission.

There is a huge gap between the present production and the requirements. In coconut, cashew, pepper, cardamom and ginger, substantial increase in the production has to

be achieved. In cacao and oil-palm, in which the existing production is almost nil, the situation is more difficult. Barriers in achieving the targets of production and special problems that limit the production are to be identified and research and developmental efforts planned accordingly. These call for considerable efforts on developing a new know-how in the farming technology. There is a delay in the transmission of available research results to the farming community. The cultivators, the state departments of agriculture, the development councils for the different crops, agricultural universities and research institutes are to be linked through a strong and effective training programme, and agricultural polytechnics are to be organized for transmitting results of research and activating the links in the chain of production.