UNIT 18 CULTURAL PRACTICES AND NUTRIENT MANAGEMENT OF CASHEW

Structure

18.0 OBJECTIVES

After studying this unit, you should be able to:

- identify the agro-climatically suitable areas for cashew growing;
- describe varieties suited for cultivation and propagation technique of cashew;
- suggest nutrient management schedule for cashew; and
- organize organic nutrition and integrated nutrient management system in cashew.

18.1 INTRODUCTION

Do you know that the present day high value cashew widely grown in all South Indian [illegible] originally was a crop introduced into India for just conserving soil from erosion? Brazil in South America is the home of cashew (*Anacardium occidentale L*), from where it has been introduced by the Portuguese travelers in Goa during the 16th century. "Though this crop was introduced mainly for soil conservation, it is now grown for its nuts from which highly nutritious and tasty kernels are extracted. Cashew is an important plantation crop of India having a very significant role in India's economy. It earns annually about Rs. 2500 crore in foreign exchange. The major cashew growing states of India are Kerala, Karnataka, Goa and Maharashtra, Tamil Nadu, Andhra Pradesh and Orissa. In these states, cashew was used to be grown in poor soils and there is a false notion that cashew did not require application of nutrients for optimum growth and yield. However, several studies have indicated that manuring and good management can appreciably improve the growth and productivity of cashew. This is all the more true with graft progenies of elite genotypes.

In this unit, we will discuss the soil and climatic requirements, production of quality planting materials, planting and field management, cultural practices, nutrient management technology etc., of cashew in detail.

18. 2 SOIL AND CLIMATIC CONDITIONS

Cashew though not given the status of a major plantation crop initially, has acquired prominence due to its adaptability to a wide range of environmental and management conditions as well as to its export earning potential. Earlier, cashew was grown without adequate care and management although it responds well to better soil and climatic conditions.

18.2.1 Cashew soils

Cashew grows in a wide variety of soils ranging from littoral sand to laterite, productivity varying among different soil types. The best soil for cashew is deep, friable, well drained sandy loam soil without a hard pan. On coastal sands also cashew trees grow, even near to the seashore, suggesting its tolerance to soil salinity. Heavy clay soils, poor drainage conditions, water stagnation, alkaline soils of pH above 8 and acidic soils of pH below 5 are unsuitable for the crop. The false notion that cashew is very modest in its soil requirements and can adapt to varying soil conditions without impairing productivity, had given a setback to this crop. This led people to grow cashew in poor soils where no other crop

could be economically raised. Even high yielding varieties were considered to be suitable for degraded wastelands resulting in very poor yields. On the contrary, when good varieties are grown in fertile soils, they perform to their maximum potential.

Cashew comes up well up to 700 m from sea level. However, the lower temperatures at higher altitudes have adverse effects on the crop. Cashew shows a tendency of late flowering and fruiting at higher altitudes. It is best adapted to warm humid tropical conditions and can tolerate seasonal and daily changes in temperature within the range of 20-30^{0}C. An average rainfall of 1300 to 2000 mm is good for cashew. It needs a climate with at least 4-5 months well defined dry season which coincides with flowering and fruiting of the crop, to obtain best results. Cashew is a sun loving crop and bears more fruits on the branches which receive full sunlight. So it is not advisable to plant the trees in excessively shaded areas.

18.2.2 Root distribution pattern

Cashew has a deep and spreading root system. Root distribution pattern of cashew depends on factors such as age of the tree, type of planting material, soil environment in which it is grown, level of nutrition and irrigation. Majority of the feeding roots are present in the surface layer of the soil. The lateral root spread of adult cashew tree was traced up to 4 m and to a depth of 60 cm. Nutrient absorption was mostly from the 0 to 15 cm soil layer than from the deeper zone suggesting that cashew is a surface feeder.

18.3 VARIETIES OF CASHEW

Successful cashew cultivation depends on selection of highly promising varieties suited for any particular agroclimatic regime and adoption of appropriate cultural practices. Thus different breeding methods are utilized to evolve appropriate selections suited to each area/region.

A total of thirty seven (37) high yielding varieties have been released in the country. The list of released varieties recommended for different southern states is given in Table 18.1 below.

Table 18.1 : Cashew Varieties Recommended for South Indian States

State	Recommended Varieties
Karnataka	NRCC Sel-2, Bhaskara, Ullal-1, Ullal-3, Ullal-4, UN-50, Vengurla-1 (Uttara Kannada), Vengurla-4 (Uttara Kannada), Vengurla- 7 (Uttara Kannada)
Karnataka (maidan part)	Chintamani-1, Dhana
Kerala	Madakkathara-1, Madakkathara-2, K-22-1, Kanaka, Dhana, Priyanka, Amrutha, VRI-3, Dharasree, Anakkayam-1, Anagha, Akshaya, Damodar, Raghav, Poornima
Maharashtra	Vengurla-1, Vengurla-4, Vengurla-6, Vengurla-7
Tamil Nadu	VRI-3
Andhra Pradesh	BPP-4, BPP-6, BPP-8

Fifteen varieties have been developed for cultivation in Kerala from the Madakkathara and Anakkayam, Cashew Research Stations. Among them, five are selections and nine are hybrids. Table (18.2) below shows the salient features of a few of the high yielding varieties released for cultivation in Kerala.

Table 18.2: Promising Cashew Varieties of Kerala and their Economic Features

Name of Variety	Breeding Method	Yield (kg/tree/ annum)	Nut wt. (g)	Kernel wt. (g)	Shelling Percentage	Export Grade	Flowering Habit
Anakkayam-1	Selection	12.00	5.95	1.67	27.99	W280	Early
Madakkathara-1	Selection	13.80	6.20	1.64	26.80	W280	Early
Madakkathara-2	Selection	17.00	7.25	1.88	26.20	W210	Late
Kanaka	Hybrid	12.80	6.80	2.08	30.58	W280	Mid
Dhana	Hybrid	10.66	8.20	2.44	29.80	W210	Mid
Priyanka	Hybrid	17.03	10.80	2.87	26.57	W180	Mid
Dharasree	Hybrid	15.02	7.80	2.40	30.50	W240	Mid
Sulabha	Selection	21.90	9.80	2.88	29.40	W210	Late
Amrutha	Hybrid	18.35	7.18	2.24	31.58	W210	Mid
Raghav	Hybrid	14.65	9.20	2.27	26.60	W210	Mid

18.4 PLANTING MATERIALS: IMPORTANCE AND TECHNIQUE OF SOFTWOOD GRAFTING

Cashew is propagated either through seedlings produced from selected seeds or by vegetatively multiplied materials, mainly soft wood grafts. In earlier times when cashew cultivation was not scientifically managed, all plantations were just unselected seedling populations in relatively poor soils and only nominal returns were obtained. Seedling populations from selected trees were later used for increased yields. With the development of vegetatively propagated planting materials particularly grafts, cashew cultivation attained new dimensions in the recent past.

Propagation through Seedlings

Selection of mother trees: Mother trees having the following characteristics are selected for collection of seed nuts and production of seedlings:

i) 15-25 years old, healthy vigorous and intensively branching with panicles having high percentage of hermaphrodite flowers; and

ii) bearing 7-8 nuts/panicle, of medium size and weight (5-8 g/nut) with an average yield of 15 kg nuts/annum.

The trees are selected in February and good mature seed nuts which sink in water are collected in March-April. They are sun dried for two to three days. Selected seeds are soaked in water for 18-24 hrs to speed up germination. These nuts are

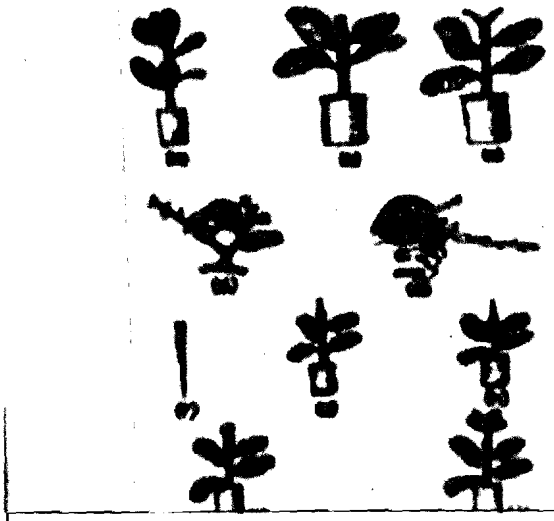
shown in 300 gauge polybags of size 20×15 cm with 15-20 holes and filled with potting mixture (red soil, river sand and compost in 1:1:1 ratio) mixed with rock phosphate @ 5 gm/2kg of potting mixture. While sowing, the nuts are placed 2-3 cm deep with the stalk end up and watered daily. Seeds germinate in 7-10 days.

Propagation through Grafting

Different methods of grafting *viz.*, epicotyl grafting softwood grafting, veneer grafting, side grafting etc., have been tried in cashew with varying degrees of success. Among these, softwood grafting which gives a high rate of success is found to be the best method for commercial multiplication.

Softwood Grafting

In a graft, *rootstock or stock* is the lower portion of the graft which forms the root system of the grafted plant and *Scion* is the short piece of detached shoot from a desirable tree containing several dormant buds which when united with the root stock, produces the upper portion of the graft plant. Fig.18.1 shows how softwood graft is produced.



(a) Root stock, (b) Retaining 2 pairs of lower leaves, (c) Making a ceft, (d) Precured scion, (e) Seperating scion from mother plant, (f) Wedge shaped scion, (g) Inserting scion into rootstock (h) Tying with polythene tape, (i) Convering using Polythene cap, and (j) Sprouted grafts.

Fig 18.1: Technique of softwood grafting in cashew

The technique of softwood grafting involves three major steps such as: .

- Rootstock production
- Scion production
- Grafting

We will discuss these steps in detail in sections 18.4.1, 18.4.2 and 18.4.3 hereunder:

18.4.1 Rootstock production

For cashew softwood grafts, seedlings serve as the rootstock. Good seed nuts are collected in February-March. The standards described above for seedlings

production can be adopted. For continuous supply of rootstocks, nuts should be sown at weekly intervals. During summer, provide partial shade to the seedlings till they change their bronze colour to green and then keep them in the open. Prevent damage to germinating nuts from squirrels, birds, rodents etc. Adequate plant protection measures should be taken against pests and diseases. Side shoots which many arise from leaf axils may be removed to get vigorous seedlings.

Selection of rootstock: Select 30-40 days old healthy seedlings having single main stem grown in the centre of the polythene bag, as rootstock.

18.4.2 Scion material

For producing grafts of any high yielding variety, scion should be collected from mother plants of that particular variety. For large scale production of grafts, scion banks of promising varieties can be established in advance. Scion bank is a group of mother plants, specially grown for collecting scion sticks. It is an important prerequisite for cashew nursery. An ideal location where sunlight, irrigation, good soil etc, are available can be selected for the scion bank. Each variety should be separately planted and a closer spacing of 4 m × 4 m may be adopted. In addition to the normal management practices, the following should also be above:

- the flower panicles of the scion trees should be removed in order to get more scions,
- maintain the plants by de-topping at a height of 1.5 – 2 m.
- remove the dried branches if necessary, and
- keep plants healthy through proper management practices.

Selection of scions: Select 3-5 month old non-flowering lateral shoots of current season's growth of 10-12 cm length, straight, uniformly round and pencil thick with brown colour having a plump dormant terminal bud. The top 4-5 leaves should be dark green indicating proper maturity of the scion.

The scion materials need pre-curing in order to facilitate better graft-union. This is a process of partial removal of leaf lamina from the selected scion branches while they are on the plant. Clip off three fourth portions of the leaf blades of the selected scions. By 7-10 days, all the leaf petioles will shed from the branch. This indicates that the shoots are cured and ready for grafting.

Collection of scions: On the day of grafting, cut and separate the pre-cured scions from the mother plants early in the morning. The scions should be collected before the terminal buds sprout. Wrap the scion sticks in moist cloth to avoid desiccation and placed in polythene covers as soon as they are cut from the mother tree and taken to the nursery for grafting. If necessary, they can be stored for 3-4 days and used for grafting. The collected scions should be properly labeled.

18.4.3 Grafting

The stock plants are selected and made ready. For grafting each stock plant is cut back retaining two pairs of the bottom leaves using a sharp knife by giving a transverse cut on the main stem, 15 cm above ground level. Make a cleft 4-5 cm deep in the middle of the decapitated stem of the seedling by a longitudinal cut.

Immediately select a matching scion stick (same thickness as that of the rootstock). Shape the cut end of the scion to a wedge of 4-5 cm length by chopping the bark and wood from opposite sides. Insert the wedge of the scion into the cleft of the rootstock. Ensure that the cambium layers of stock and scion are in perfect contact with each other. Secure the graft joint firmly by a polythene tape 1.5 cm wide and 30 cm long and 100 gauge thick. Do the grafting under shade in the grafting shed.

18.4.4 Management of grafts in nursery

Cover the scion of the graft with a wet polythene cap (15 × 12.5 cm and 100 gauge thick) and tie at the bottom to maintain humidity inside and to protect the apical bud from drying. The polythene cap should not touch the terminal bud. Keep the grafted plants under shade for 10-15 days after covering with cap. Or they can be kept directly inside of the polyhouse. This enables sprouting of the terminal buds. Successful grafts show signs of growth within 3-4 weeks after grafting. If signs of growth are seen, remove the polythene cap and shift the grafts to open place. Water the grafts regularly. Remove new sprouts emerging from rootstock at frequent intervals. Shift the grafts frequently from one place to another to prevent them from striking roots into the ground. Ensure adequate plant protection measures in the nursery. The success in softwood grafting is more during the period from March to September under Kerala conditions. The grafts will be ready for planting 5-6 months after grafting.

18.4.5 Graft production under polyhouse

For graft production during the monsoon season, polyhouse is necessary to give protection to the seedlings and grafts during heavy rains and to reduce mortality. Low cost structures of convenient dimensions can be prepared using casuarina/ bamboo poles/GI pipes and covered with high density polythene sheet. The height of the polyhouse should be 2.5 m in the middle and 1.0 m on both sides. Raising of rootstock seedlings and maintenance of grafts can be done inside polyhouses.

The plants may be watered using hose. Misting units can also be fitted at appropriate points which can be switched on for about 5-10 minutes at an interval of two hours from 10 a.m. to 6 p.m. during summer season. This reduces the temperature build up inside the polyhouse.

18. 5 FIELD PLANTING

Seeding progenies from highly promising selections can be scientifically planted and managed for raising cashew plantations. Generally, trees from seedlings grow tall and occupy more space. Hence, a wider spacing is necessary for better performance and yield. Seedlings of 5-6 months age can be planted at recommended spacing of 10 × 10m. However, for convenience in management and all field operations etc., besides early bearing, planting and establishment using graft progenies is given preference in the past few decades.

Softwood grafts will be ready for planting in 5-6 months after grafting. The suitable season for planting in the different cashew growing states in South India is given below.

Kerala	:	June-July or September- October
Maharashtra	:	July-August
Andhra Pradesh		
North coastal district	:	June-July
Godavari, Krishna	:	July
Guntur, Prakasam and Nellore	:	September-October
Karnataka	:	May-June
Tamil Nadu	:	June-July or September-October

Planting is done in pits of 50 cm^3 and filled with topsoil and 5-10 kg of compost or dried cow dung per pit. Before planting, carefully remove the polythene bag and polythene tape. While planting, the soil around is pressed well ensuring that graft union is 2.5 cm above the ground level. Staking should be done immediately after planting to protect the grafts from damage. Mulch the basin with leafy materials.

18.5.1 Planting systems and planting density

Clear the wild growth, particularly forest tree growth from the selected site. Roots of the weeds and bushes should be completely removed.

Spacing

The normal spacing recommended for cashew in different cashew growing states ranges from 7 × 7 m to 10 × 10 m depending on soil fertility as given in Table 18.3.

There are two systems of planting; the square system and the triangular system. In the first, the inter-row and intra-row spacing will be the same while in the second, the inter and intrarow spacing remains the same. Here plants in the adjacent rows come in triangular formation. Plant population in unit area will be more in triangular system compared to the square system.

Table 18.3: Cashew Planting Details Recommended for the Southern States of India

States	Planting Details	
	Normal Spacing	Pit Size
Maharashtra	7 m × 7 m 8 m × 8 m	60 cm^3
Tamil Nadu	7 m × 7 m	45 cm^3
Andhra Pradesh	8 m × 8 m 9 m × 9 m	1 m^3 (red soil) 60 cm^3 (red sandy/sandy)
Karnataka	7.5 m × 7.5 m	60 cm^3 – 90 cm^3
Kerala	8 m × 8 m	60 cm^3

18.5.2 High density planting for increased productivity

High density planting is a planting technique recommended for enhancing the productivity per unit area of cashew plantations. The method involves planting more number of grafts per unit area and thinning them at later stages. Instead of the normal planting density, grafts are planted initially at a closer spacing of 4 × 4 m, 5 × 5 m or 8 × 4 m so that there will be 625, 400 or 312 plants respectively per hectare (Table 18.4).

Table 18.4: Initial Spacing and Plant Population Under High Density Planting

Spacing	Plant Population (Trees/ha)	
	Square System	Triangular System
4 m × 4 m	625	700
5 m × 5 m	400	460
8 m × 4 m	312	360

The initial plant population is to be decided carefully depending upon the fertility status of the soil. The entire population can be retained for a period of seven to ten years depending upon the canopy growth rate. Later the alternate plants may be removed in a phased manner and finally when the plants attain full growth, the spacing between the plants will be 8 × 8 m or 10 × 10 m etc., according to the extent of thinning. Fig.18. 2 illustrates the method of high density planting.

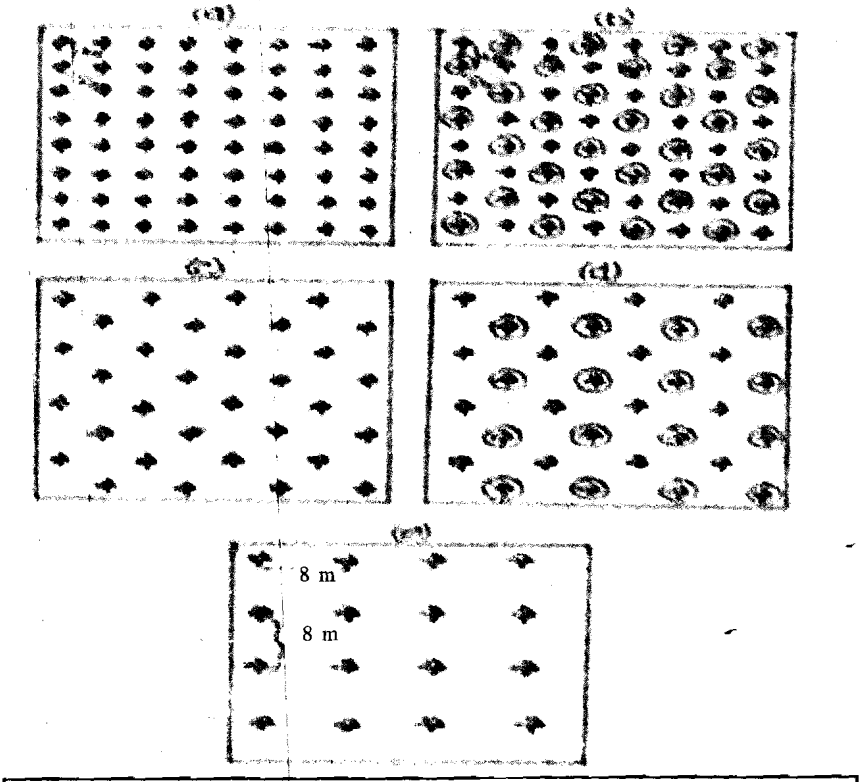


Fig 18.2 : High Density Planting Technique in Cashew

Advantages of high density planting: During early years, per hectare yield will be more from high density plantations (due to higher plant population) compared to the normal density plantations. During later years, when the plant population is equalized to that of normal density plantation, the productivity of both the plantations would be more or less the same. The higher yield obtained during the early years would be substantial in high-density plantations.

In addition to obtaining higher yields, good quantities of firewood can be obtained by thinning, which will fetch additional revenue to the farmer. The weed growth in the inter spaces will be less.

18.6 CULTURAL PRACTICES

From first year of planting onwards, cashew requires regular cultural operations like initial training and shape pruning, weeding, plant protection, manuring, pruning, irrigation etc.

18.6.1 Shape pruning

Initial training and pruning of young cashew plants during the first 3-4 years is essential for providing proper tree shape. The plants should be allowed to grow by maintaining a single stem up to 0.75-1.00 m from ground level. This can be achieved by removing the side shoots or side branches gradually as the plants start growing from the second year of planting. Weak and criss-cross branches may also be removed.

Initial pruning and shaping of the trees facilitate cultural operations such as terrace making, weeding, fertilizer application, nut collection and plant protection. Pruning should be done during May/June in Kerala. In older cashew plantations, a general pruning to remove dried or dead wood, criss-cross branches, water shoots etc., is to attended to at least once in 2-3 years.

18.6.2 Intercropping and cover cropping

The wider inter space available in between cashew trees offers opportunities for raising other crops as a source of additional income. During first year, about 90 per cent of the area is available for intercropping whereas during second and third year 80 and 70 per cent respectively, of the plantation area is available for intercropping. Short duration crops like tuber crops, vegetables etc., and medium duration crops like pineapple are the suitable intercrops. Of these, pineapple is the most profitable intercrop in the early stages of growth. These can be planted between two rows of cashew in trenches opened across the slope. Paired row of pineapple suckers can be planted in trenches 60 cm between rows and 40 cm between suckers within the row. These trenches can be opened at 1 m distance between two rows of cashew.

In orchards where intercropping is not done, leguminous cover crops like *Peuraria javanica, Calapagonia muconoids, Centrosema pubescens* etc., can be grown.

18.6.3 Water and weed management

Cashew responds very well to irrigation although it is considered a rainfed crop and withstands drought conditions. Newly planted grafts may be irrigated regularly

during summer months. Drip irrigation has proved itself as the most efficient method. Pitcher irrigation can also be adopted. Irrigation during periods of soil moisture stress can double cashew yields. For adult trees, about 200 litre of water per tree may be applied at an interval of 15 days during summer months. As the crop requires some dry periods for flowering and fruit setting, irrigation should be avoided during post-monsoon period between August to December.

In sloppy lands, pits of 50 cm^3 or trenches of 50 cm width, 50 cm depth and convenient length can be taken in between rows along the contours. This technique not only conserves soil and water, but also enhances growth of cashew.

Weeding in cashew can be done twice in an year, either manually or by using machines like slashers. First weeding is done in August during manurial application and next weeding before nut collection.

18.6.4 Regulation of flowering

The flower panicles emerging from the grafts during the first and second year of planting should be removed. The technique is termed as de-blossoming. This allows the plant to put up good vegetative growth. The plants are allowed to flower and fruit only from the third year onwards. In mid season and late varieties, application of a growth retardant namely Paclobutrazol (Cultar) 1g/litre and potassium nitrate (KNO_3) 1 per cent, towards the end of October can induce early flowering.

18.7 MANAGEMENT OF SENILE PLANTATIONS

You should understand that one of the major causes for decline in productivity of raw nuts is over ageing and senility of existing plantations. By scientific management, such as top working, irrigation, better nutrient supply and plant protection, productivity of such senile gardens, can be increased.

18.7.1 Top working

Top working is a technique evolved to rejuvenate unproductive and senile cashew trees. The unproductive trees are to be beheaded at a height of 0.75 to 1.00 m from ground level without causing stump splitting. The best season for this operation is May - September. Soon after beheading, the stumps and cut portions should be protected to avoid rotting. Large number of sprouts emerge in 30-45 days after beheading. Removal of the extra shoots arising from the stumps should be done to obtain better growth of a limited number. When sprouts are 20-25 days old, they should be grafted with scions of high yielding varieties adopting softwood grafting technique. To ensure at least six or seven successful grafts, 10-15 grafts are to be done on the new shoots of each tree. The best season for grafting is July-November. Removal of sprouts below the graft joint and removal of polythene strip from the graft joint should be done later to permit growth of the grafts.

The top worked trees start yielding right from the second year after top working. The major disadvantage associated with top working is the huge casualty of trees due to stem borer attack, hence intensive care and management toward off stem borer is essential.

Check Your Progress 1

Note: a) Use the space below for writing your answers.
b) Compare your answers with those given at the end of this unit.

1) Which are the major cashew growing states in India?

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2) Which are the two different planting systems in cashew?

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3) What are the advantages of vegetative propagation in cashew?

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4) Define scion bank.

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5) What is high density planting in cashew?

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18.8 NUTRIENT REMOVAL AND RESPONSE TO NUTRIENTS

A 30-year old cashew tree removes 2.85 kg N, 0.75 kg P_2O_5, and 1.27 kg K_2O through vegetative parts including root system, apples and nuts. The nutrient off take through 1 kg of nut and its apple is 64.1 g N, 2.05 g P_2O_5, 24.7 g K_2O, 4.1 g Ca, 1.57 g S, 525.7 mg Fe, 87.8 mg Zn, 63.6 mg Mn and 26.5 mg Cu. Apples remove more nutrients than the kernels and shells. The relative nutrient requirement is in the order of N>K>Ca>P>Mg>S>Fe>Zn>Mn>Cu. Nutrient recycling in cashew is through its "canopy biomass fall out" involving leaves, cashew apples and flowers which contribute 15.5 to 37.7 per cent of the total requirement of macro nutrients of the tree.

Nitrogen (N): Nitrogen is essential for the formation of proteins and it is an integral part of chlorophyll. An adequate supply of nitrogen enhances vegetative growth. When nitrogen becomes deficient, plant growth will be stunted and the leaves turn yellow. The yellowing or chlorosis usually appears first on the lower leaves and spreads to the upper leaves later. Severe nitrogen shortage results in death of leaves. The response of cashew to applied nitrogen is tremendous and the same is observed universally.

Phosphorous (P): Though Phosphorous is a yield limiting nutrient in deficient soils, cashew is generally shy to show response to phosphatic fertilisers.

Potassium (K): Positive effects of potassium on cashew are observed generally. Application of potassium increases the cashew nut production particularly in the presence of nitrogen.

The response of cashew to the major nutrients is in the order of N, K and P.

Activity 1: Familiarise with cashew varieties, propagation techniques, field establishment and nutrient management etc., by visiting an established cashew plantation in your area/cashew research station.

18.9 FERTILISER SCHEDULING AND APPLICATION

Nutrient recommendation: The nutrient doses recommended for cashew in the seven major cashew growing states is presented in Table 18.5.

Table 18.5: Nutrient Recommendations for Cashew in Different States

State	Fertilizer Dose for Adult Tree (g.)		
	N	P_2O_5	K_2O
Kerala	750	325	750
Maharashtra	1000	250	750
Tamil Nadu	500	250	250
Andhra Pradesh	500	125	125
Karnataka	500	250	250
West Bengal	1100	1000	330
Orissa	500	250	250

Nutrition in relation to age: Cashew requires at least seven years to attain full growth and stabilized yield. It is therefore, necessary to apply fertilizer doses as related to age. As a thump rule, graded doses of 20, 40, 60 and 80 per cent of the full dose from the 1st to 4th year and full dose from 5th year, are recommended.

Time of fertilizer application: It is generally recommended that fertilizers are to be applied to cashew twice a year coinciding with the south west and north east monsoons. Agronomically, for getting maximum efficiency of applied nutrients, fertilizer application is to be timed to coincide with the highest nutrient demand of the tree. Highest root activity and peak absorption of N, P and K was observed in cashew during the "flushing and early flowering phase" which extends from September to December. It is suggested that the onset of this phase is the most appropriate time for fertilizer application in cashew orchards.

Method of application: Fertilizers are to be applied in the tree basins where the feeding roots are concentrated in 2-3 m radius and 60-100 cm deep. For adult trees, fertilizers can be broadcasted and incorporated over the entire tree basin leaving 50 cm from the tree trunk. The tree basins must be made weed free before fertiliser application. The soil in the root zone should be moist to encourage absorption.

18.10 ORGANIC NUTRITION AND INM

Organic manures: Since organic manures availability may vary according to different locations, strategies need to be developed for the application of appropriate organic manures for different agro-ecological zones, both for organic farming and Integrated Nutrient Management (INM) systems. Any of the commonly available organic manures like farmyard manure (FYM), poultry manure, vermicompost, oil cakes and coir pith compost can be used in cashew. Green leaf from Glyricidia , Pongamia etc., grown on the border or inside cashew plantations and cover crops grown inside also serve as sources of organic manures.

Organic recycling: Cashew leaf litter should be allowed to decompose and recycle in the garden in which case organic manure application form outside can be almost dispensed with. But in most of the gardens the leaf and other wastes are taken away for use as fuel or as bed materials in cattle shed. Virtually no application of organic manure is done and this has led to continuous drain of nutrients from cashew gardens resulting in serve shortage of nutrients. Organic recycling of agricultural waste or crop residue including cashew apple and weed growth is a major step to realize high yield in cashew.

Cover cropping:Growing leguminous crops such as *Peuraria javanica, Calapogonium, muconoides* and *Centrosema pubescens* can enrich the soil, add organic matter, prevent soil erosion and conserve soil moisture. The seeds of these cover crops can be sown in the beginning of the rainy season at a seed rate of 12 kg/ha in the interspaces of cashew orchard.

Organic cashew: Brazil is presently the lead producer of organic cashew, accounting for nearly 30 per cent of the global organic cashew production. Although yet in its infancy, India which holds premier position in the world cashew trade, is in an advantageous position in this regard since nearly 90 per cent of the cashew

farming in India is done under natural conditions without using agro-chemicals. In majority of the cashew plantations wherever manuring is done, it is mostly done using cattle manure. Availability of large quantity of organic biomass in cashew plantations also helps improved growth of cashew. India can effectively exploit this situation to its advantage and can initiate organized production of organic cashew without any yield decline that is normally associated with crops where a transition is made from chemical farming to organic farming.

Thus, most of the cashew grown in India is organic and can be exported as organic, but it has to be certified so by designated bodies. "Certified organic" refers to agricultural products such as organic cashew, that are grown and processed according to strict uniform standards and are verified by Certifying Bodies. The procedures for this are similar to those for Tea and Coffee given in Unit 7 and Unit 16 of Course 2. The International Federation of Organic Agricultural Movements (IFOAM) acts as a common forum for information exchange and debate on organic farming practices. IFOAM also sets guidelines for permitted practices.

Organic cashew production in developing countries has been gathering more attention over the last decade. The development of organic cashew nut production is being advocated by governments and NGOs. As one of the most valuable processed nuts and tree crops on global commodity markets, organic cashew cultivation and processing is an important and promising sector for many developing countries.

Integrated Nutrient Management (INM)

The concept of INM is the maintenance of soil fertility for sustainable yield through optimizing the use of organic, inorganic and biological sources of plant nutrients that are required for crop growth and production in an integrated manner appropriate to each cropping system and farming situations. The benefits of INM are:

- Enhancement in soil organic carbon content,
- Structural improvement of soil,
- Higher use efficiency of inorganic fertilizers,
- Enhanced soil microbial activity, and
- Better soil fertility build up.

18.11 YIELD

The national average yield of cashew on productive area basis is about 820 kg. raw cashewnuts/ha. Among the major cashew growing states, Maharashtra has the highest productivity of 1500 g cashew nuts/ha and Kerala is second highest with yield of 900 kg/ha. The high yielding varieties which yield 15-20 kg nuts/ plant/year have a per ha yield potential of 2 to 3 tonnes. There is thus, good scope to enhance the cashew production in the country. You will learn more about yield of cashew in Course 3 under harvesting and processing etc.

Check Your Progress 2

Note: a) Use the space below for writing your answers.
b) Compare your answers with those given at the end of this unit.

1) What is the nutrient recommendation for cashew in Kerala?

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2) At what stage of cashew growth are highest root activity and peak absorption of N, P and K observed?

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3) What is the method of application of fertilisers in adult cashew?

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4) What does INM envisage?

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18.12 LET US SUM UP

Cashew, an important plantation crop has moved from the forest confines to commercial production through technological advancement with respect to varietal improvement, propagation and nutrient management. This unit attempts to deal with all aspects of selection of superior varieties, propagation techniques with special emphasis on graft plants production, cultural practices, procedures for regeneration of low yielding mature trees and an effective nutrient management strategy for cashew. The soil characteristics needed for optimum growth and yield of cashew is also described. Since rooting pattern plays a vital role in the nutrient

absorption, this has been explained. Different aspects of nutrient scheduling such as recommended dose, time of application and method of application have also been discussed. Organic manuring including recycling of crop residues, has been described. Need for INM approaches and production of organic cashew also have been emphasized in this unit.

18.13 GLOSSARY

Pre-curing : Process of partial removal of leaf lamina from the selected scion branches leaving the petiole intact, while they are on the mother plant itself.

Polyhouse : Structure fabricated with wooden poles/ GI pipes and polythene sheets, where rootstock production and graft maintenance can be done.

Scion Bank : Group of mother plants specially grown and maintained for collecting scion sticks for grafting.

Softwood Grafting : Commercial propagation method in cashew where a scion is wedged into the softwood portion of the stock and united.

Top Working : Technique done to rejuvenate unproductive and senile cashew trees by detopping the trunk and doing softwood grafting on a few newly developed shoots using scion material from selected varieties.

CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

1) Kerala, Karnataka, Goa, Maharashtra, Tamil Nadu, Andhra Pradesh and Orissa are the major cashew growing States.

2) Square system and Triangular system.

3) i) True to type planting material,

   ii) Early bearing, and

   iii) High yield.

4) Scion bank is a group of mother plants specially grown and maintained for collecting scion sticks.

5) High Density Planting is a planting technique recommended for enhancing productivity by planting more number of grafts per unit area initially and thinning them at later stages.

Check Your Progress 2

1) 750: 325: 750 g/tree of N, P_2O_5 and K_2O

2) Flushing and early flowering phase.

3) In adult cashew garden, fertilisers can be broadcast and incorporated (15 cm deep) over the entire tree basin within a radial distance of 2 to 3 m, leaving half a metre from the tree trunk.

4) Integrated Nutrient Management (INM) envisages conjunctive use of organic manures, crop residues, bio fertilisers, leguminous crops, green leaf manuring and green manuring together with inorganic fertilizers, to meet the nutrient requirement of the crop.

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