CHAPTER 7

CARE OF THE YOUNG ORCHARD

The first few years in the life of a litchi tree are very important. One should make every effort to get the young trees established quickly and to have them make good growth. For this reason, it is wise to follow a system of intense care for first 4-5 years of planting. Litchi saplings planted in June-July take full advantage of monsoon season for their establishment and initial growth. Up to October, plant grows well except the attack of some pests and put forth one or two new extension flush. Litchi plants are supposed to bear fruits after 5-6 years of planting. By this time, plants attain a definite framework and become physiologically ready to bear fruits. Therefore, tree management system of developing plants should be followed until the management system is switched over to that for bearing trees. In the first two years, plants need some special care for better growth and establishment. Young orchards in particular, suffer readily from poor management and hence delay in bearing of commercial crops. Old trees, though more tolerant, because of their greater reserve of food materials, will nevertheless, respond positively to cultural management. Moreover, it is not necessary and often not desirable to follow a single system to manage the orchard throughout its life. An orchard is handled in one way when the trees are young and in different way when the trees become mature. Following care is taken initially in establishing litchi orchard to avoid future problems.

The most common faults observed in establishing the newly planted tree are improper irrigation and lack of weed control. These two faults cause more stunting and loss of trees than any others during the first two years. Irrigation during the first year should be applied often (at least every 2 to 3 weeks), but each irrigation should be of short duration. While the root system is still very small, it may deplete the moisture immediately surrounding each root, and even though good moisture is found at the surface close to the tree, the soil around the roots may be dry. Thus, frequent irrigations at *short duration* will replenish the dry areas around the roots without water logging the soil. Inexperienced growers often apply too much water at one time and drown the roots (that is, the excess water creates an oxygen deficiency), or they let them become too dry or they commit both errors.

Weed growth around a young tree robs it of soil moisture, nutrients, and sunlight, all of which are needed by the tree for the rapid growth so essential to early flowering and cropping. Weeds can be kept out by tillage or by surface mulches of sawdust, bark chips, or black plastic. In the second and succeeding years, chemical herbicides can be applied to prevent weed growth. It is usually hazardous to use chemical weed control in the first season because of possible injury to un-established trees.

Pruning for Training

The term "training" is defined as the cutting away of portions of a tree to obtain the desired shape and frame-work. At planting time, the tree is cut back to 0.70 to 0.80 meter if it is an unbranched tall sapling. If it is a branched tree, it is reduced to three or four wide-angled branches, each of which is cut back to one-third its length or to a desired length to give it a proper balanced shape. It is important that the newly planted sapling be pruned back enough so that the top is in good balance with the root system, which was pruned during the digging operation in the nursery. In general, the permanent conventionally spaced orchard tree is developed so that three or four wide-angled side branches form the framework of the tree, with the uppermost branch becoming the modified leader (Fig. 7.1). However, trees to be spaced closely in a hedgerow or those that are temporary fillers need a different sort of initial training. Hedgerow trees should be pruned and trained to restrict their growth within the specified spacing.

New Evidence on Growth

New evidence indicates that not all buds or branches of a litchi tree respond in the same way to imposed or natural inhibitory or stimulatory mechanisms. Some buds remain inactive while some grow into vigorous shoots. The growth potential of a bud (seen in its stored nutrients, water supply, mineral nutrients, and growth hormones) interacts with various inhibitory conditions to produce a net growth that reflects the balance of opposing forces. There are several growth patterns that are incompletely understood, but they are believed to be directed by the interplay of hormones, gravity, light, and initial plant vigor.

The influence on branch angle is independent of orientation with respect to gravity. As the bud begins to grow, the crotch angle between the young branch and the main axis enlarges rapidly while the branch tissue is not yet lignified. Later, this process of angle enlargement ceases, indicating the relative rigidity of the system after secondary cell walls are formed. Morphactins present in the plant tissues tend to alter a plant's normal responses to gravity and light. Normally, plant roots grow downward toward the earth's center of gravity (positive geotropism), and shoots grow upward away from it (negative geotropism) as well as toward a source of light (positive phototropism). Branch angles are influenced by the mechanical pressure exerted on the branch base by tissues growing in the crotch area.

Fig. 7.1: Frame work development in litchi

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After the orchard is established, trees are trained to give them a desired shape. Initially, only minimal corrective pruning should be done. During this period of developing the bearing surface, the least pruning is the best. Severe pruning may lead to adverse effect and potential bearing surface is reduced and the time of first flowering may be delayed.

Temporary filler trees that will remain in the orchard only 6-7 years should not be trained. Early-bearing species/cultivars should be used as fillers, but even so, every practice should be directed toward maximum yield during the years prior to removal.

Do not Neglect Plant Basins

Proper aeration near root zone and good sanitary conditions in the basins of newly planted litchi sapling is a must for keeping the plants healthy and disease free. Proper growth of young plants can be ensured by timely hoeing and weeding of the basin which is considered to be the essential and should always receive first priority. If intercropping is being practiced, the litchi plants should not be kept in neglected condition during pre-bearing stage. After harvest of

every intercrops, the plant basins should be properly cultivated and essential nutrients should be applied. It should also be seen that the pest and diseases of intercrop are not causing damage to litchi plants. Any such neglect of young orchards proves costly as fruiting is delayed and longevity and productivity of the plants are reduced.

Protecting Plants from Cold

Newly planted litchi saplings face first winter from November February under North Indian conditions. For the successful establishment and growth during winter, it is necessary to protect the newly planted sapling from cold. In North India, sometimes, winter becomes more severe leading to occurrence of frost. The frost damages the young leaves and growing tips and finally the plant may die. Therefore, the protection of litchi saplings for at least one winter or in some cases two seasons is very essential. It is advisable to establish litchi orchards in such a manner that the rows run diagonally to the prevailing wind direction to avoid creating a tunnel effect. Before planting of litchi orchard, it is essential to reserve some place for planting of wind breaks at the border sides of orchard from which hot and high winds and frost are expected. To protect the plants from frost, thatching of individual plant is essential. They can be thatched with any type of dried grass or dried stalk of maize or bajra along with paddy straw. The plant is covered from 3 sides leaving a gap towards east to allow entrance of sunlight and air. For protection against frosts, the young litchi plants should be covered properly well in time and the thatching should be removed only when the danger is over. Some growers remove the covers too early, with the first warming up of temperatures after winter; but the trees are likely to suffer if late frosts occur. Basin irrigation, mulching raising border crop and spray of water before anticipated frost date may be helpful in reducing the extent of loss. Occurrence of hailstorms is a natural phenomenon which causes partial or total loss of litchi crop. Likewise, it must be protected in summer to avoid scorching from hot winds (Loo) and intense heat of the summer months.

It is necessary to provide support to the plant by staking in the areas where high winds are more prevalent. The staking is helpful to keep plant stem straight and save the plant from damage. When litchi have grown taller, the stem may be white washed with lime to protect from sunscald.

Water Management

Young litchi plants must be frequently irrigated during the drought spell in rainy season, winter and summer months for at least one year. When the plants are well established in the field, irrigation may be given as per need preferably on the basis of soil moisture status. During vegetative growth period, every effort should be made to maintain sufficient moisture near root zone of the plant. Generally, irrigation at weekly interval during summer and fortnightly interval in winter along with mulching should be done in the first two years of plant establishment. However, the quantity and frequency may be modified depending on

the soil type, climatic condition and method of raising orchard. Lighter soils will have to be irrigated more frequently than the clay soils. Irrigation frequency may be adjusted according to rainfall and evapo-transpiration during each season. During rainy season, water should not be allowed to stagnate around the plant as it will affect the root activity adversely. Drainage may be provided near root zone by making slope at lower side. In marginally water logged area, planting of litchi at raised platform can also be done.

Fertilizer Application

The litchi plant needs more nitrogen at young stage to promote plant growth, therefore during the establishment and growth phase, higher proportion of nitrogenous fertilizer should be given than phosphatic and potassic fertilizers. As the plant grows, the requirement of fertilizer increases and therefore, the doses should be increased annually until the plant attains full growth. For efficient use of applied fertilizer, it is always better to split the annual quantity of fertilizers in 2-3 parts and apply in the plant basin. The loss of fertilizer can further be minimized by avoiding its application in the peak rainy season. As a matter of fact, fertilizer in young litchi plants should be applied during October and March whereas the manures should be applied during pre monsoon period (June-July). Fertilizers should be placed in a band spread in circle approximately 30 cm away from the base of the plants and should be incorporated to the soil mechanically without disturbing the roots. The distance of band should increase as the plant grows. Sufficient soil moisture is necessary after application of the fertilizer mixture. Soil incorporation is not necessary if under tree sprinklers are used for irrigation of trees as fertilizers can be effectively incorporated by irrigation water.

Intercropping

Intercropping is growing of two or more crops simultaneously on the same piece of land. Since litchi trees require a considerable long juvenile phase to complete their canopy structure to bear fruits, there is sufficient scope to grow intercrops during initial years of establishment. Usually, the period of juvenility extends from 4 to 6 years but in some cases it may extend even more rendering the orchard unproductive during this period. So growing short duration crops is the only answer to make the orchards productive in early years of establishment (Fig. 7.2). If three or four intercrops are grown in succession, it helps in receiving income from the orchards round the year. Intercropping also helps in proper upkeep of the orchard as the orchard floor is frequently hoed and weeded for raising intercrops.

For those orchards which are near the cities or towns, it is always better to grow vegetables as intercrops as it is more paying. For distant orchards crops which can be stored longer like onion, potato, turmeric and ginger can be grown. Only those crops are selected which are adapted well to the climatic and soil conditions of the area. Legumes are better choice for soils which are poor in nitrogen content. For young orchards, vegetables which require abundant sunlight can be selected. For older orchards, shade-loving crops are preferred. It should be

Fig. 7.2: Intercropping in young litchi orchard with gladiolus and amorphophalus

kept in mind that the intercrop should not affect the management of the main crop or interfere with its cultural practices. It is not desirable ordinarily to grow crops like maize, sunflower or other exhaustive crops like sugarcane, because of the exhaustion of nitrates and moisture. Intercrop should be compatible with the main crop. Trailing vegetables or vine crops are not desired as intercrops in litchi orchards. Growth habit should be such that it does not affect the development of litchi crop directly. Certain pest and disease problems may be enhanced by growing two or more crops together. It is also noted that intercrops appear to favour some pests and pathogens since they may act as alternative hosts. Such crops are not allowed to be grown together.

While the orchard is young and non-bearing, the trees will not need all the ground. A litchi orchard planted at a spacing of 10 m x 10 m in one hectare area provides as much as 0.8 ha open sunny space for intercropping in the first year of establishment. Gradually, the available space decreases with the increase in size of the litchi trees and at the age of 10 years when canopy development is complete, the entire ground surface is shaded. At this stage, it is generally advised to discontinue the practice of intercropping but this is not a rational approach since the space beneath the canopy is not totally dark. So shade loving crops like ginger, turmeric, betel vine and yams can be grown.

There are appreciable changes in the spectral composition of radiation with the nature of the canopy as shading created by trees is extremely variable. As regards spectral composition, leaf canopies preferentially absorb, and therefore, filter out the visible wave lengths used in photosynthesis. Thus, shade light has a lower portion of useful wave lengths and a greater portion of infrared, the later being the wave lengths largely responsible for raising the temperature. Because of the diverse conditions under which litchi trees are grown, they can be interplanted with a large number of other economic species. Field crops like peanut, potato, gram, pea, mung, sweet potato, yam and vegetable crops like cauliflower, cabbage, spinach, okra, beet-root, knol-khol, carrot, chillies, radish, onion, cowpeas, colocasia can be

grown successfully in the orchards. Short duration fruit plants like pineapple, papaya, banana, strawberry, cape-gooseberry, phalsa, lime and lemon can also be grown as intercrops (Fig. 7.2).

It is generally believed that growing intercrops will adversely affect the long term productivity of the main crop. But published literature show that the crux of the problem is the level of management. When both the main crop and the intercrop are adequately manured and managed well, intercropping is most often a paying exercise. This has been shown in several experiments. On the other hand, if the additional crop is allowed to be a parasite, the yields of both components of the mixture will be adversely affected. It is true that productivity of crop mixtures mainly depends on plant interactions. Intercrop and main crop draw their nourishment from the same environmental resource pool. If selection of crop is not properly done then the extent of competition may be too high and can harm the productivity significantly. If selection is done carefully taking care of aerial growth and root distribution pattern, then considerable additional benefits can be achieved by intercropping. Hence, the intercrops must have synergistic rather antagnostic effect on litchi plants.

Mulching

Mulching the litchi trees is an important and very useful practice. Mulches are effective in conserving soil moisture, maintaining root zone temperature, controlling weed and soil erosion. Most of the organic materials including farm waste and other bi-products can be used as mulching material but hard to decay materials with high C:N ratio are better. Materials like rice straw, rice husk, dried weeds, saw dust etc. can be used for mulching purpose. When mulches are used, care should be taken to inspect trees regularly for any termite activity to take appropriate control measures. Termite activity may be increased with mulch application.

Canopy Architecture

Providing a better frame is the first step to make plant prepared for heavy yields expected under good management. Almost one year after planting, when plants are established, every care should be taken to maximize the plant growth so that the plant can be pruned and trained to provide good framework with well spaced spreading branches and open center canopy. For a proper framework, do not allow branches at the base of the main stem. Such branches should be removed/pinched off in the early stages of growth to leave a standard main trunk without any branch up to a height of 70-80 cm. Between this height, if 3-4 side branches are there, allow them to grow as limb but if branches are not there force the plant to produce by heading back or twisting the main trunk at approximate height and ensure 4 well spaced shoots in each direction. These will develop into limbs. After 60-70 cm, each limb should have 2-3 primary branches. Each of these primary branches should culminate into 2-3 secondary and further into 2-4 tertiary branches. To train branches as spreading limbs, staking of individual branch can be done to avoid breaking. This way, plants can be provided

with better canopy architecture. The pruning and training process must be continued for 2-3 years because all these can not be done in a single operation or two. Therefore, growers must regularly visit the plants and train them as and when necessary. Pruning should be commenced in well established plants before any anticipated major growth flush.

Plant Protection

During dry periods, termites may damage underground parts of the plant. To overcome this problem apply a band of engine oil on the base of the stem up to about 45 cm height. Similarly, the measures to control the pests and diseases should be taken time and time to save the developing litchi plants. Deatiled information on insect pest management has been given separately. In the dry zone, heavy winds blow during May-June. Most cultivated lands are damaged by fire at this time of the year. To protect the litchi plantation by spreading fire, have a 5-10 m wide fire belt around the orchard plough and harrowed to remove dry grass. Also during the dry months of the year, keep an area of about 3 m around the base of trees weed free. This might protect trees even if a fire spreads over the orchard.

Bringing the Orchard into Bearing

Proper care, training and pruning the young plant help getting earlier flower induction and fruiting. Very intense pruning may have adverse effect on early yields as potential bearing surface is reduced and the time of first flowering is delayed. Under many climatic conditions, young litchi trees fail to yield fruit as soon as tree size is sufficient to support a crop. Such trees are slow to initiate flowers, and when blossoming does occur, yield is low because of poor set. Tests indicated that pruning reduced yield and girdling increased it on young trees.

Trunk or branch girdling can be used to induce flowering and heavier cropping in some tree crops. Ringing (making a single cut through the bark completely encircling the trunk) young litchi trees increased yield, altered tree shape, and reduced tree size. The less vigorous, ringed trees responded well to the heavier pruning required to keep the trees confined to the provided spacing.

The following points should be remembered regarding the care of young litchi trees to favor early bearing.

- Don't prune after initial training.
- Ring fillers or other vigorous trees to induce early fruiting.
- Add nitrogen and other fertilizers if trees lack vigour.
- Don't ring a weak tree.
- Ring early (full bloom to petal fall) and use only a single cut (no bark removal).