



Visit of Mr. Christian DIDIER in INDIA

January 2002

Visit of Mr. Christian Didier to the State of Uttranchal from 24/01/2002 to 27/01/2002

SPOT - ANALYSIS

- **Visited 5 orchards in Dehradun Area**

A few orchards are engaged under contract therefore, these orchards are not being properly managed. Other orchards are directly managed by their owners which requires improvement (pruning, good fertilization, irrigation practices etc.). The lychee trees are very old therefore, the pre-harvest management has to be done more methodically. In orchards we found cold damage in the new panicle due to lack of potassium. The potassium sulfate is applied only after harvesting and the availability of the potassium in the soil is not enough. One of the problems noticed in some orchards that irrigation has started and there is risk of vegetative flush start and which will reduce panicle flush.

- **Visited 6 orchards in Kaladungi Area**

In Kaladungi the majority of orchards are managed directly by their owners. It was found that there was same problem as mentioned above were noticed.

Two orchards are planted in high density i.e. in 6x9 meter. These orchards are not properly managed and it requires special management because of high density.

Some of the orchards are more than 50 years old and now no proper care is being taken for these orchards which are resulting into poor quality of the produce. It is preferable to remove the old lychee plants and replant afresh.

- **Visited 6 orchards in Ramnagar Area**

In Ramnagar the orchards are managed slightly better managed in comparison to the orchards in Dehradun and Kaladungi. The problems which exists in this area are: lack of pruning, lack of fertilization and poor irrigation system. The potassium sulfate is applied only after harvesting and the availability of the potassium in the soil is not enough. One of the problems noticed in some orchards that irrigation has started and there is risk of vegetative flush start and which will reduce panicle flush.

For all the above orchards there was Entomological problem (leaf curl mite, leaf miner etc.)

Visit to Pantnagar University:

Interactive session with the scientists of Pantnagar University.

Recommendations for all the orchards in Uttranchal:

- Irrigation system should be improved by flood irrigation.
- The end of June and after the fruit sitting should apply fertilization.
- Pruning should be done just after harvesting is done.
- The treatment for the pest management should be applied as and when the pests are noticed (Integrated Pest Management program to be applied)

Other Recommendations:

- Nursery management for new plants should be improved because at this moment the plants from the nursery are not of international quality as a result the produce will not be export worthy. A new project should be implemented for nursery.
- It is recommended to have mobile facility for extension services.
- It is also recommended to have mobile pack houses.

COMPARISON OF BIHAR STATE & UTTRANCHAL STATE

BIHAR	UTTRANCHAL
<ul style="list-style-type: none">• Majority small farmers• New orchards• Management improved since 4 years• Limited Research support• Market defined• For improvement to create Agri Export Zone	<ul style="list-style-type: none">• Majority big farmers (adoption of practice is easy)• Old orchards (rejuvenation, nursery etc.)• Management yet to commence (New)• R&D more active and commitment for field orientation.• Market to be identified & accepted.• Exporter yet to establish.• It is a part of AEZ success rate is high• State Govt. active.
Logistics Roads to be improved Two pack houses established Exports by Sea established	Logistics Pack house yet to establish, Export by Air possible Export by Sea yet to establish.

UTTRANCHAL Region Orchards Situation

Request	Done	To Do	Observations
1- Pre harvest			
Irrigation system	Bad practices	Improve	Flood irrigation must be applied
Fertilization	Once an a year	Twice or third on a year	This fertilization must be follow by foliar analysis and soil analysis
Pruning	No for the majority	Should be done after harvesting	Need training for to improve
Pest management	Treatment but not in the good time	Knowledge to the biology and the name of the different pest to applied the best pesticide at the good time	Training for the farmers to recognize the pest for give a treatment at a good time Choice the best chemical and Following the residues
2- Harvesting			Difficult to known in this season
3- Post harvest Facilities	Packing house not so effective	Mobile packing house can be implement	

BIHAR REGION orchards situation

Request	Done	To Do	Observations
1- Pre harvest			
Irrigation system	New practices done for the majority of orchards	Just some improvement	Date of irrigation should be followed
Fertilization	Once an a year	Twice or third on a year	This fertilization must be follow by foliar analysis and soil analysis
Pruning	Start done properly	Continuous the training program started six months ago	Need training for to improve
Pest management	Treatment but not in the good time	Knowledge to the biology and the name of the different pest to applied the best pesticide at the good time	Training for the farmers to recognize the pest for give a treatment at a good time following the residues
2- Harvesting	Done properly	To reduce the time between harvesting and packaging	Some training can be done
3- Post harvest Facilities	Packing house effective in Muzzafarpur and under construction in Patna	Some improvement to be making good progress	

NURSERY

Lychee Propagation

Lychee seedlings take a long time to come to bearing stage (after 1 to 5 and as much as 10 years) and do not produce fruits similar to those of the parent tree because of the free pollination of flowers.

Soil Mixtures

Soil mixtures play an important role, especially in the drainage of containers. Too much clay soil tends to clog the holes in plastic containers. A light soil mixture not only improves drainage but also stimulates root development.

A good mixture consists of one part loam, one part sand and two parts compost (preferably no animal waste, but well-rotted plant material). The mixture should have a pH of 6 to 7. If necessary, phosphate fertilizers and agricultural lime can be pre-mixed with the soil.

The soil mixture in the container ultimately determines the general condition of the tree. The soil mixture should be fumigated at least 15 days before it is placed in the containers. Fumigation destroys nematodes, fungi and weed seeds.

Propagation Methods

Air-Layering (or marcotting)

Lychee is propagated by air layering. Air layers are easy to produce, they fruit earlier (after the third year), and the fruits are identical in size, shape, color and quality to those of the parent tree. The only disadvantage of air layering is that the plant does not have a tap root and is therefore vulnerable to strong wind. Hence, it is important to provide suitable wind breaks when planting air-layered plants.

Air layering is a form of asexual reproduction by which a branch on a tree is made to root while still attached to the parent tree. After it has rooted, the branch is removed and planted. In INDIA, layering can be carried out during the growth period (the rainy season June to July) because in other seasons, the temperatures are very high and the hygrometry is too low and rooting is faster if it is carried out during summer.

The general principle is the following:

Select mother plants with high yield and good quality fruits.

1. Choose a healthy leafy shoot from the mother tree at the edge of the canopy that is 10 to 15 mm in diameter. Do not choose a shoot, which has recently flushed.

2. Girdle the shoot where we want the roots to form around 45 cm from the shoot tip.
3. Remove a ring of bark 25-mm broad.
4. Scrape the cambium from the girdled area. (The cambium is a single layer of cells under the bark that forms new tissues.
5. Apply rooting hormone where roots will be formed (indolebutyric acid, IBA; commercial name, Seradix 2), **but this is not essential**
6. Insert the shoot in a transparent polythene sleeve 15-20 cm long and 9-10 cm in diameter by pressing the leaves against the stem and pulling the sleeve.
7. Tie one end of the polythene tube to the stem, about 2-cm below the girdled bark.
8. Wrap the girdled area with a moist (not saturated), light mixture (1:1) of soil and well rotted farmyard manure.
9. Press the mixture gently against the girdled area to improve contact.
10. Twist the polythene and tie securely to make sure that it is watertight.
11. After 1-2 months, white roots will be seen through the plastic.
12. When the roots have turned light brown (2 to 3 more weeks), cut the branch just below the plastic wrapping with pruning shears. The layer should be removed when it is not growing actively (i.e. no vegetative flush is visible).
13. Remove the plastic wrapping, reduce the leaves by half (in order to reduce evapotranspiration) and plant the branch in a plastic bag containing a soil mixture as above. The plastic bag should be 800 gauge black plastic, 175 x 150 x 350 mm. If the tree is to remain in the bag for a longer period it should be 175 x 150 x 400 mm.
14. Protect the newly potted plant from direct sunlight by keeping in the shade and water every day over 4 weeks. For commercial production, layers are watered, placed under a 50% shade structure and covered with a polythene sheet in order to maintain heat and humidity.
15. When a new flush has formed, remove the polythene sheet and allow the new flush to harden off under shade (4 to 6 weeks).
16. Gradually place in the open (under direct sunlight). Water every day until a new flush has formed.
17. The young plant is then ready for transplanting.

Labeling

Nurseries are not compelled to label trees but labeling is still the easiest way to distinguish between cultivars. Although the cultivar choice is still limited in lychees, the situation may change in future and may become necessary to distinguish between cultivars.

Tree Quality

A good air layer tree has a single erect stem with first scaffold branches that branch horizontally at about 20 cm. Any acute forks that branch lower than 20 cm should be avoided. The ideal tree must therefore have an erect single stem so that the producer can do the necessary pruning in the orchard once the tree has been established. **Trees must be free of all insects and diseases.**

SCHEDULE

Seasonal guide for lychee production in adult's orchards

	Jan	Feb	Mar	Apri	May	June	July	Aug	Sept	Oct	Nov	Dec
Soil sampling						X	X	X				
Leaf analysis						X	X	X				
Plough the orchard				X			X		X	X		
Cover crop												
Irrigation			X	X	X	X						
Fertilization			X			X	X					
control of pests	X	X	X	X	X	X	X	X	X	X	X	X
Manuring						X						
Pruning						X						
Weed control				X			X		X	X		
Harvesting					X	X						

January

- **Do not fertilize and irrigate the adult's orchards**
- Irrigate the young plants and protect them against cold
- Control the leaf curl mite (*Aceria lychee* erinose) :
 Prune and burn the affected twigs infested or treatment with
 i wettable sulphur (microlux) : 500g in 100 l water
 ii Kelthane (dicofol) 480 g/ha = 120 ml/100Water
- Control the leaf miner (*Acrocercops heirocosma*):
 Spray 0.05% endosulfan 2.0 ml/1 l water
- Control of shoot borer, the treatment against leaf miner can reduce the population of shoot borer.

February

- Remove thatches around and above the younger plants and irrigate them

March

- Control of mites and shoot borer (see above) very important
- Transplant the new plants in orchard in to already prepared pits and irrigate them immediately.

April

- Control of fruit borer: lychee moth (*Cryptophlebia peltastica*) The following treatments are recommended:
One month before harvest:
 - fenthion (Lebaycid 170 cc/100 l water),
 - deltamethrin (Decis 80 ml/ 100 l water);
- Control of mites and shoot borer (see above) very important
- After the fruits set start irrigation in adult's orchards.
- Apply nitrogen (ammonium sulfate or urea) and potassium sulfate after the fruit setting in the rate following the leaf analysis result.

- If boron deficiency spraying of 1% borax solution on trees by month-end.

May

- Control of mites and shoot borer(sea above) very important
- Controls of fruit borer (*Cryptophlebia peltastica*) see above
- Irrigate the orchard at approximately every 10 days to maintain > 75 80 % Relative humidity in the orchard
- Lay out ,digging and filling quickly of pits for new orchard plantation in June or July.
- Start harvesting when the fruit TSS reach at 17 18%. Careful handling of fruit is necessary. Avoid skin desiccation during all operations
- Start to prune the harvested trees, and apply the nitrogen, potash, phosphorous and manure.

June

- Control of mites and shoot borer(sea above) very important
- Harvesting like see above
- Irrigate the orchard to maintain 75 to 80 % relative humidity
- Prepare the air layering
- Lay out, digging and filling quickly of pits for new orchard plantation in June or July.
- Control Shoot and bark borers by putting "endosulfan" or petrol in the holes and plug them with mud.
- Prune the trees, and apply nitrogen, potash, phosphorous and manure.
- Prepare air layering.
- Irrigate young plants
- Subsurface tillage (maximum 15 cm deep) the orchard for to bury green manure (weeds).

July

- Control of mites
- Make air layering throughout the month as when the weather permits.
- Irrigate the young plants if rainfall is not efficient.

August

- Control of mites
- Separate the air layering from the mother plants and transfer to the nursery.

September

- Control of mites
- Irrigate newly planted orchards, if necessary.
- Transplant one-year-old plants of nursery in the pits and irrigate them.
- Separate the rooted air layers (of July) from the mother plants and transfer to the nursery.

October

- Control mites
- Leaf analysis and look at the deficiency
- Subsurface tillage (maximum 15 cm deep) the orchard for to bury green manure (weeds).

November

- Control mites.
- Irrigate the young plants.
- Prepare thatches to cover the young plants in the orchards as well in nursery for protection against frost (Uttanchal).

December

- Water young plants as and when needed to keep the soil wet and protect the plants from frost.

Pruning

The lychee tree grows relatively quickly and soon becomes very big, tree size must be controlled. The trees should grow until all available space in an orchard is occupied, with just enough room to move between the rows.

Although lychee trees have brittle wood and the branches tear or break easily, the following are also causes of broken branches:

- too many branches that branch at the same place,
- scaffold branches that branch just above the ground,
- scaffold branches that branch from the main stem at an angle that is too acute (less than 45°),
- trees that grow too densely. Too many branches and leaves causes such a tremendous weight on the fork of the tree that point because air flow is restricted,
- main stems that branch with a sharp "V" easily tear in half, damaging the root system.

These factors can be corrected by correct pruning and so crop losses resulting from broken branches can be drastically reduced.

Various types of pruning should be used:

- shaping is applied to achieve a proper framework in young trees,
- selective bearer pruning can be applied to control the size of trees that are already producing fruit,
- rejuvenation pruning can be applied to large mature trees,
- corrective pruning.

Most air-layered lychee trees have a tendency to form weak crotches and to develop numerous branches near the ground level. It is important to train lychee trees properly from 12 months onwards.

Branches that come out from the main trunk with sharp V shaped angles should be removed as they will split easily in later years.

Skirt trees by removing all branches and shoots to a height of 50 to 60 cm leaving a clean single trunk. Skirting helps to minimize the twisting, effect of high winds and prevents fruits and leaves from touching the ground.

This allows orchard activities such as herbicide and fertilizer application to be carried out efficiently without damage to trees. Loss of fruit to insects and rots is avoided. Control of ants and scale insects is easier.

Tip prune long branches or dominant leader branches by approximately 15 cm. This increases the number of growing points which means more flowers and fruit. The risk of major limb breakage is also reduced.

If the canopy is too dense, thin out a few branches so that broken sunlight is seen on the ground under the tree after the pruning. This practice allows wind to pass through the canopy.

The final result of pruning should be a dome-shaped canopy, 50-60 cm above the ground with all terminals exposed to sunlight.

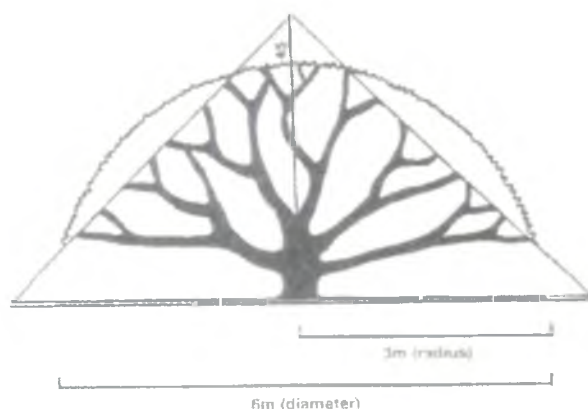
Selective bearer pruning

This type of pruning is used to control the size of trees that are already bearing in order to increase the bearing area of the tree. When the tree flowers, twigs form at the base of the flower stem. These develop after harvesting and put a great burden on the branch, with adverse effects. Bearer pruning removes this unnecessary mass from the branch.

Selective bearer pruning can be successfully applied to control tree size, but this practice and the use of plant growth regulators are still under investigation.

Method:

Immediately after harvesting every branch that has borne fruit is pruned back about half an arm's length from the tip. The next season all alternate fruit-bearing branches are pruned. This means that windows are pruned in the tree. This not only increases the bearing area, but also effectively controls tree size.



Scheme of the tree after pruning.

Fertilization application period

Nitrogen (N)

- 1st year
Divide the nitrogen fertilizer into eight equal monthly applications of 25 g each and apply during the summer.
- 2nd to 5th year
Divide the nitrogen fertilizer into five equal applications and apply during the summer
- 6th year and older
Half of the nitrogen fertilizer is applied immediately after harvesting and the rest after the fruit setting.

Phosphate (P)

All the phosphate is applied just after harvesting.

Potassium (K)

Half of the potassium fertilizer is applied after harvesting and the rest after the fruits setting.

Zinc (Zn) and Boron (B) sprays

Since most soils naturally contain little zinc or the zinc is not available, this element must be applied at least four times a year. The following substances and concentrations are recommended for 100 l of water.

Zinc oxide at 200 g or Nitro-Zn at 150 mg or Agri-zinc at 50 mg.

Many orchards also display low boron values and from the outset the trees should be sprayed with 100 g borax or 75 g Solubor/100 l water every 2 years.

The quantity of these element depend to the results of soil or leaf analysis, usually in Muzzafarpur area these following amount are applied per tree:

For trees after 10 years old

Compost:	75 kg	
Caster cake:	5 kg	
Neem Cake:	3 kg	
Single super phosphate:	5 kg	
Muriate of potash:	1.5 kg	
Calcium ammonium nitrate:	2 kg	
Zinc sulfate:	100-200 gm}	Zinc sulfate and borax should be applied
Borax	50-70 gm}	every third year.

These amounts must be controlled by the soils and leafs analysis.

Fertilizer practices for N, P and K in lychee orchards.

Amounts presented are for well-grown 10 year old trees (100kg crop)

Country	Amounts of nutrients(g per tree per year)			Timing of fertilizer application
	N	P	K	
Florida	435-653	588-882	460-690	March, may, July
Hawaii	763	327	633	December
Taiwan	450	218	548	January, April, June
China	365-730	0	182-360	March, July
	800	640	320	January, March, June
	434-730	209-409	100-200	March, June
	1650	225	320	July
	1610	180	800	March, June
	1820	980	1400	February, April, July
South Africa	700	54	250	February, July (South hemisphere)