Introduction to a new trial:

Can strategic N applications after harvest increase starch reserves and yield potential of litchi?

Litchi is a terminal flowering species and its flower buds are formed on the terminal end of shoots formed after harvest. Therefore the post-harvest flush growth cycle is a period to foster bearing shoots for the next season. High quality bearing shoots are the basis for a productive tree (Fig. 1). These shoots are characterised by three features. Firstly, they are strong with thick stems and plenty of healthy leaves; secondly, they have plenty of starch reserves before flowering; and thirdly, they mature at the right time.

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During flowering and fruiting, the leaves of the last flush are the major feeders. Therefore, it is crucial to ensure a healthy growth of the last desired post-harvest flush before winter. Soil application of fertilisers is generally done immediately after harvest. In China, fertilisers are given prior to growth of each flush after harvest. However, this practice has not been tested in South Africa. For this reason a new trial has been started in November 2013 to study the effect of strategic N applications after harvest to foster strong bearing branches.

The trial is conducted in both early (Malalane) and mid-season (Nelspruit) production areas on 'Mauritius' trees. In the early area, N applications were applied as follows:

a) single application during last part of harvest;
b) single application after harvest;
c) split application during the last part of harvest and at hardening of first post-harvest flush to strengthen the second flush;
d) no post-harvest application, all N applied before flowering (Control 1); and
e) farm's practice (Control 2).

Treatments for the mid-season area were the same, except that the split application (c) was applied during harvest and after harvest as there is only one proper post-harvest flush. Table 1 shows the percentage of the total N applied at various times in the different treatments. Soil and leaf nutrient analyses were used to determine the necessary N amount. All other nutrients are applied in relation to the N amount. During the trial period, leaf and starch samples will be taken at regular intervals to determine the effect of timing and amount of N on leaf nutrients and starch reserves.

Preliminary results show that time of N application affects time of flush emergence, hardening-off time and chlorophyll content of the leaves. Especially in the Malalane region clear patterns of flush growth are visible (Fig. 2). The general farm practice of applying fertiliser after harvest (After Harvest and Farm Control treatments) does not advance flush growth compared to No Fertiliser application at all after harvest. However, application of N fertiliser before the end of harvest (Before Harvest and Split treatments) advanced flush emergence and caused earlier flush

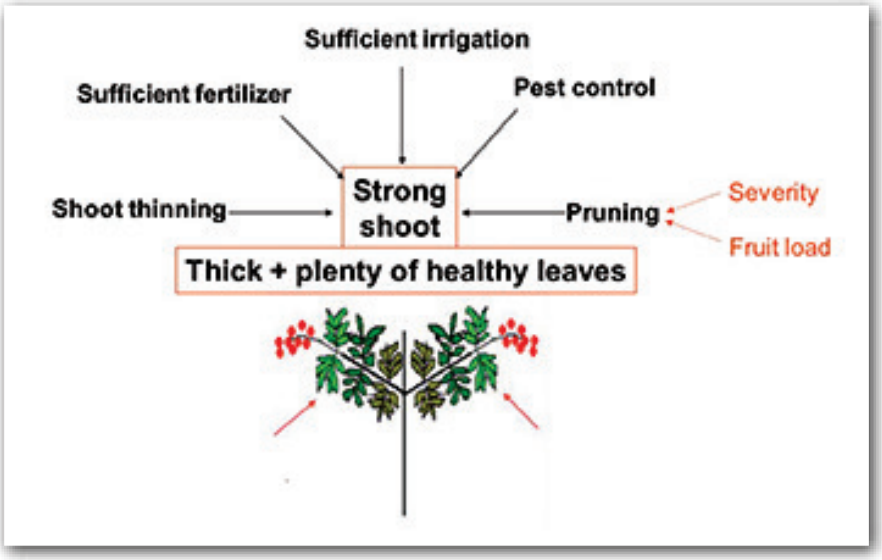

Figure 1. Factors influencing strong, healthy bearing shoots. The outer mature leaves on the latest flushes are most functional and are the major feeder for fruit (red arrows). Source: X.M. Huang, keynote presentation at the 4th International Litchi and Longan Symposium, December 2012; adapted

hardening for both the first and second post-harvest flush.

This has consequences regarding further orchard management for the flower induction and flowering period. Flower induction requires a dormancy period during autumn and winter. Therefore, by determining the correct applications times of N fertilisers, the growth and maturation of the flush can be manipulated in such a way that the trees are dormant by the latest beginning of April. Dormancy can then be enforced by water stress or full cover Ethapon application to the dormant trees, a new practice that is being under investigation and has shown high success so far.

Although climate still plays a major role in tree reaction and can hamper certain orchard management practices, strategic and well understood practices can increase the consistency of litchi flowering and production.

Table 1. Percentage of total nitrogen for various treatments.

Treatment	% of total N		
	Before/After harvest	Before flowering	At fruit set
Before end of harvest	50	30	20
After harvest	50	30	20
Split	30+20	30	20
No N after harvest		80	20
Farm practice	30	50	20

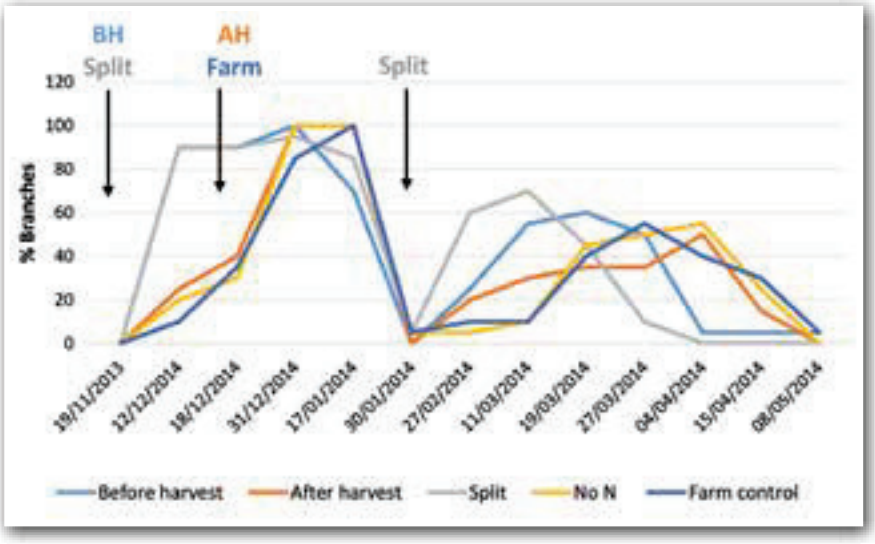

Figure 2. 'Mauritius' post-harvest flush growth after various N application times in the Malalane area between November 2013 and May 2014. Arrows indicate fertiliser application times of various treatment (BH = before end of harvest; AH = after harvest).