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Some observations on the pre-nursery system for raising coconut seedlings

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ABSTRACT

A pre-nursery system for raising coconut seedlings was compared with the conventional nursery. The two major refinements introduced in the pre-nursery system are the slicing of seed nuts and transplanting of sprouted seed nuts from pre-nursery beds to nurserv beds, soon after sprouting.

The rate of sprouting in the Pre-nursery system was significantly superior. At the end of 20 weeks 76% of the seednuts in the pre-nursery had sprouted as compared to 67% in the conventional nursery. However, the number of plantable seedlings produced was not signifivantly different. The cost of production of seedlings in the pre-nursery system was over 50% more than that of the conventional nursery.

It appears that slicing the seednut facilitates sprouting but transplanting sprouted seednuts from the pre-nursery caused a setback to the development of the seedlings.

INTRODUCTION

The use of a pre-nursery system in the production of coconut seedlings is a recent introduction to Sri Lanka (Liyanage 1982). Traditionally seed coconuts are sown directly in nursery beds and remain there until seedlings are selected and removed for planting in the field. The pre-nursery system in which the production of seedlings is a two-stage process, has become very popular in certain coconut growing countries such as Indonesia, Malaysia, Philippines, Ivory Coast and West Indies. In this system sprouted seednuts are transplanted from a compactly sown seed bed (pre-nursery) into polybags or normal nursery beds. The use of polybags, although common in countries mentioned above, (Wuidart 1981) have not been introduced into commercial nurseries in Sri Lanka. Our commercial nurseries are centrally located and cater mostly to small holders. The high cost of polybags and transport makes it unattractive for the small holder. However large estates which raise their own seedlings have taken to the use of polybags. This report deals with the refinements introduced with the pre-nursery system and how they compared with the conventional nursery in this country.

Some observations on the pre-nursery system

The main differences between the pre-nursery system and the conventional nursery (control) are listed in Table 1.

Table 1: *Main differences between a pre-nursery system and the conventional nursery*

	Pre-Nursery system	*Conventional Nursery (control)*
1.	Seednuts sliced on the ridge, opposite the broadest surface of the seednut, in the area where the sprout normally emerges	No slicing
2.	Seed bed (pre-nursery) about 1.5 m wide, and of convenient variable length. Seednuts spaced about 5 cm apart in the row; and about 20 cm apart between rows containing approximately 16 seednuts per m^2	Beds of similar width with 5 rows of seednuts. Nuts placed about 15 cm apart in the row; containing approximately 10 seednuts per m^2
3.	Pre-nursery trenches are shallower with seednuts only partly buried.	Trenches 15 to 20 cm deep with nuts buried so that top of nut is barely visible.
4.	Transplanting into conventional nursery beds begins when sprouting is observed.	No transplanting
5.	Weekly transplanting of sprouted seednuts until 80% of seednuts have been transplanted.	Weekly counts taken of total numbers of nuts sprouted.
6.	Pre-nursery beds cleared when 80% sprouting is reached and unsprouted nuts removed.	Failures (unsprouted) removed from seed beds.

The operations common to both methods are summarised as follows:

(a) Seedbeds mulched with unwoven cadjan.

(b) Drains are opened around seed beds to facilitate drainage.

(c) Weekly inspection of beds are carried out for weed and pest control.

(d) If there is a continuous dry period of 6 or more days beds are watered every third day, beginning from the 7th day after the last rainy day.

(e) At 24 weeks from laying the seedlings are fertilized with a mixture containing 3 parts of amonium sulphate, 1 part concentrated super phosphate, 2 parts of muriate of potash and 1 part kieserite at the rate of 70 gm per seedling.

(f) Around 6 weeks after the application of fertilizer, unthrifty and poor quality seedlings are eliminated from beds and the good seedlings allowed to grow until they are ready for field planting.

MATERIAL AND METHOD

Tall x Tall seednuts from the Isolated Seed Garden, Ambakelle were used this experiment conducted at six locations.

At each location the amout of seednuts used were grouped into two equal sets (pairs) and the pre-nursery and conventional beds laid side by side on identical soil types. There was a total of 9 pairs for comparison.

The number of seednuts sprouting was recorded weekly. Utilisation of labour for maintenance was also recorded for comparison. Initial sprouting was observed around 12 to 13 weeks from laying. Sprouted seednuts in the pre-nursery were transplanted at weekly intervals until 80% of the seednuts were transplanted. The pre-nursery beds were then cleared and the failures from control beds also removed at the same time. All beds were maintained as described above and a final selection of seedlings suitable for planting in the field was done when the seedlings were approximately 10 months old.

Removal of failures and initail application of fertilizer on seedbeds in many coconut producing countries in this region are carried out at approximately 20 weeks from laying. It is also claimed that with optimum levels of management it is possible to obtain over 80% sprouting during this period (Harries 1983). Therefore the percentage sprouting at 20 weeks from laying was used to compare the performance of the nurseries. A paired 't' test was employed for this comparision.

RESULTS AND DISCUSSION

(a) Rate of Sprouting

The percentage sprouting in the different locations at 20 weeks from laying is summarised in Table 2. A paired 't' test indicated a significantly higher percentage germination ($t = 3.08^*$, $P = 0.05$) in the pre-nursery system. The average difference over the control was 9.0% and the 95% confidence limits between 2.3% and 15.7%.

The rate of sprouting is not the most important criterion of success of a nursery. It is the number (or proportion) of good quality seedlings, selected as being suitable for planting (plantable seedlings) and their cost of production that will determine the acceptance of the system.

Table 2 : *Percentage sprouting in pre-nursery (PN) and control (C) at 20 weeks from laying*

Location	*PN*	*C*	*Difference (D) (PN - C)*
1	70.8	56.2	14.6
2	75.5	52.0	23.5
3* (a)	72.4	66.8	5.6
3 (b)	57.2	42.0	15.2
3 (c)	87.2	82.4	4.8
3 (d)	77.6	65.2	12.4
4	89.0	78.4	10.0
5	80.5	81.4	-0.9
6	73.2	78.2	-5.0
Total	683.4	602.6	80.8
Mean	75.9	67.0	9.0

* Four separate pair were laid in site 3

(b) Number of Plantable seedlings

The percentage of plantable seedlings selected and the amount rejected at each location is shown in Table 3. A paired 't' test, comparing the plantable seedlings, as a percentage of seednuts laid indicated no significant difference between the pre-nursery system and the control.

The seedlings rejected as a percentage of sprouted seednuts, was also not significantly different (t = 0.15).

(c) Labour Requirement

Table 4 gives a summary of production costs of the two methods averaged over the locations. Only the maintenance costs have been considered in this comparison. On the average there is an increase of over 50 % in the labour required for a pre-nursery system.

The results of this analysis indicate that although there is a faster rate of sprouting in the pre-nursery system, there is no significant difference in the percentage of plantable seedlings finally obtained from the two methods. This may be due to the effect of transplanting, resulting in a set-back to the subsequent growth of seedlings.

Table 3 : *The relative performance of the pre-nursery system & control*

	Location	*1*		*2*		*3**		*4*		*5*		*6*		*Mean*	
		PN	*C*	*PN*	*C*	*Pn*	*C*	*PN*	*C*	*PN*	*C*	*PN*	*C*	*PN*	*C*
1.	Seednuts laid	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	500	5000	916.7	916.7
2.	Seednuts sprouted	812	785	849	592	753	662	890	754	805	814	410	413	753.17	675.0
3.	Seedlings selected	429	473	684	491	618	530	759	614	777	787	383	389	608.3	547.3
4.	Seedlings selected as a % of seednuts laid	42.9	47.3	68.4	49.1	61.8	53.0	75.9	61.4	77.7	78.8	76.6	77.8	67.2	61.2
5.	Rejected seedlings	383	312	165	101	135	132	131	170	28	27	27	24	144.8	127.7
6.	Rejected seedlings as % of sprouted seednuts	442.7	39.7	19.4	17.1	17.9	19.9	14.7	21.7	3.5	3.3	6.6	5.8	18.2	17.9

* The four different pairs a,b,c and d have been considered together in this table.

PN = Pre-Nursery
C = Control

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Table - 4: *Production costs of seedlings*

		Pre-Nursery	*Control*
1.	Total cost of maintenance * (Rs)	11,832.56	7247.25
2.	Total number of seedlings produced	2966.00	2793.00
3.	Cost per seedlings (Rs)	3.98	2.60

* Includes costs of slicing the seednuts, laying, mulching, weeding, watering, fertilizer application, pest control and transplanting.

The results obtained in relation to the rate of sprouting is worthy of further examination. Prior to transplanting, the closer spacing and slicing are the only differences in the pre-nursery system over the conventional nursery. Given adequate irrigation and mulching it is unlikely that better moisture retention or an improvement in the microclimate due to closer spacing would account for this faster rate of sprouting. Slicing of seednuts therefore could be a major factor responsible for the faster rate of sprouting in the pre-nursery. It has also been reported (Harries 1983) that under drier climatic conditions, where hand watering of seed beds is practiced, trimming of husk (slicing) has given rise to better nursery performance.

It was also observed during this study that non-sprouting in some unsliced seednuts was due to the physical impediment caused by the hard epicarp. This could be overcome by slicing.

If transplanting can be carried out with minimum physiological shock, it should be possible to maintain the initial trend of the faster rate of sprouting throughout the development of the seedlings. Work done in Ivory Coast (Wuidart 1981) suggests that the effect of transplanting could be minimized if transplanting is done as soon as the sprout is observed and also recommend pruning of roots prior to transplanting. In this case transplanting has been done in polybags; which also eliminates the competition among transplanted seedlings. It appears that the use of a pre-nursery has become very much a requirement in countries adopting the polybag system. However under local conditions polybags will further increase the cost of production of the seedlings.

The pattern of labour use for maintenance of the pre-nursery system and the control are given in terms of man days in table 5. It gives an indication of the demand for labour in the various maintenance operations. In the pre-nursery system transplanting was the most labour intensive. The labour for slicing of seednuts works out to approximately one man day, per thousand seednuts (5500 seednuts sliced in this experiment). Considering labour wages applicable during the period of this study, this works out to about Rs. 25,00

Table 5 : *Pettern of labour use for maintenance operations expressed man days*

	Operation	*Pre-Nursery*	*Control*
1.	Slicing of husk	5.0	
2.	Laying of seednuts/mulching	28.19	27.38
3.	Transplanting	242.3	
4.	Weeding	31.2	38.2
5.	Watering	215.7	244.4
6.	Pest Control	0.88	1.13
7.	Fertilizer application & forking	12.7	13.3
	Total (man days)	535.97	324.41

per thousand seednuts. With the advantages envisaged by the slicing of seednuts it may be a worth while practice to be introduced into the conventional nursery.

The use of a pre-nursery system cannot be justified mainly due to the higher requirement of labour for transplanting. Further it takes up a large area of land than the conventional system, as land for transplanting has to be reserved in close proximity to the pre-nursery beds at the time of laying. The requirement of labour would increase, with increase of distance between pre-nursery beds and the sit of transplanting.

The results of the overall analysis therefore suggest that under local conditions the conventional nursery managed under optimum environmental conditions perhaps with slicing as a refinement is capable of producing better results.

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