

## ANNUAL PROGRESS REPORT of THE REGIONAL ARECANUT RESEARCH STATION,

## KAHIKUCHI, ASSAM

For the period from 1-7-1962 to 30-6-1963.

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INDIAN CENTRAL ARECANUT COMMITTEE CALICUT, KERALA STATE.

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## Annual Report of the Regional Arecanut Research Station, Kahikuchi (Assam).

This is the Fourth Annual Report of the Regional Arecanut Research Station, Kahikuchi, Assam, and covers the period from 1 7-1962 to 30-6-1963.

### A. Introduction

This Station is one of the five Regional Arecanut Research Stations of the Indian Central Arecanut Committee and is situated near the Gauhati Air Port (Bhorjar), at a distance of 22 km. (14 miles) from Gauhati Railway Station. The altitude of the Station is 48 m. (160 feet) above mean sea level. It lies on 26° 11" N latitude and 91° 47" E longitude.

The soil in the Station is new alluvium with lower strata of laterite. The soil is acidic, the pH being 4.4 to 4.8.

The Research Station which started functioning on 10-1-1959 was established with a view to find solutions to the agronomic and pathological problems of the arecanut crop in the Assam State and to supply quality seedlings to the growers in the region.

The total area of the Station is 12.14 ha. (30 acres) and the same has been allotted to the following experimental and miscellaneous plantings.

1.	Experimental and bulk garden	6.48 1	ha.
2.	Nurseries	1.21 1	ha.
3.	Miscellaneous crops	0.40 1	ha.
4.	Roads, buildings, meteorological observatory etc.	1.21	ha,
5.	Land to be utilised	2.84 1	na.
	Total	12.14 1	ha,

### B. Summary of work done

A brief summary of work done during the year is given below.

#### 1. Agronomy:

In the study of the relative merits of seednuts collected from young, middle-aged and old palms, the treatment differences were found to be not significant in respect of germination. Seedlings raised from nuts gathered

from middle-aged and old trees were however found to have significantly larger girth than seedlings from young palms. In the study taken up to find out the influence of position and depth of sowing seednuts on germination and vigour of seedlings, it was observed that sowing nuts in horizontal position gave significantly higher germination than the other treatments. Regarding depth of sowing, the treatment effects were not significant. Sowing seednuts horizontally and vertically at 0" and 1" depth produced seediings with better girth and height. From an experiment to study the relative merits of sowing the seednuts directly and transplanting sprouts in the nursery under different spacings, it was found that sowing unsprouted seeds gives significantly higher germination and produces seedlings of significantly higher girth and height. In the trial with different media for sowing seednuts, it was observed that the treatments do not have significant effect either on germination or on the morphological characters of the seedlings. An experiment laid out for determining the optimum intensity of shade to be provided to the arecanut nurseries showed that there is no significant difference between the treatments on germination of seednuts. As regards vigour, seedlings raised in open recorded significantly lesser girth and height than the rest. In a study to find out the influence of certain pre-sowing treatments on the germination of seednuts, it was seen that the treatments do not have significantly varying effect on germination. A comparative study of seednuts collected from different tracts, namely; Palasbari, Chaygaon, Muktapur and Bamundi did not show any significant difference either in germination or in the morphological characters of the resulting seedlings. Different methods of packing arecanut seedlings in relation to long distance transport and the period for which seedlings so packed can be retained without their capacity to establish in the mainfield being impaired were studied, and it was observed that seedlings packed in water hyacinth roots recorded significantly lower mortality than the other treatments. Field experiments for finding out the effect on performance of (i) different depths of transplanting seedlings and different intervals of irrigation (ii) growing inter and associate crops, (iii) planting of arecanut and coconut together and (iv) single, double and treble transplanting of seedlings of different ages, were laid out in the mainfield. A manurial experiment for determining the optimum requirement of N. P. K. in the mainfield was also laid out. Observations on the spacing trial laid out in the previous year were continued. Simple Manurial Trial and Package Plan plots were also laid out in private gardens,

#### 2. Botany:

Three exotic and Two indigenous types were introduced, bringing the number of exotics so far assembled to four, and indigenous types to seven. Nine distinct cultivars from Lower Assam were being studied for germination. The study of the relative performance of different in ligenous types namely, Vittal, Tumkur, Peechi, K. & J. Hills, Cachar and Lower Assam was continued in the mainfield. In floral biology of areca the range of variation in flowering, rate, duration and time of male and female phases were studied. It was seen that the last fortnight of May and the first fortnight of June were the peak periods of emergence of inflorescences. The monthwise variation in the production of male and female flowers showed that more number of male and female flowers were produced during the month of June. The male phase was shortest in young palms. One thousand three hundred and forty eight female flowers were cross pollinated between palms possessing desirable characters for production of progeny which would combine desirable characters. Studies on fruit-setting and shedding were initiated in private gardens,

#### 3. Pests and Diseases:

For want of staff no trials on control measures were laid out during the year.

#### 4. Farm

Out of the total area of 12.14 ha. (30 acres), 6.47 ha. (16 acres) were under arecanut crop covering various mainfield experiments, 1.62 ha. (4 acres) were under arecanut nurseries and miscellaneous crops, and 1.21 ha. (3.0 acres) were under buildings etc. An area of 2.02 ha. (5 acres) has been set apart for raising a bulk gardenn for super-imposing various agronomic and pathological experiments. An area of 0.81 ha. (2 acres) was under green-manures. The gardens were given the usual cultural, manurial and plant protection treatments as per shedule. During the year, a total of 2,192 quality areca seedlings were distributed to growers. Different green manure and green leaf manure crops were raised to meet the requirement of organic manure of the Station.

Permanent improvements like construction of main irrigation-cumdrainage channel to a length of about 2,500 ft., secondary and tertiary drains and channels inside the mainfield experiments, electrical service connections (internal and external) to the Office-cum-Laboratory and residential quarters were completed during the year.

## C. Technical Programme for the Regional Arecanut Research Station, Kahikuchi, Assam for the year 1962-'63.

Item No. in the Technical Programme	Name of the experiment	Year of commencement	Year of conclusion	Remarks
(1)	(2)	(3)	(4)	(5)
	AGRONOMY			
Α.	Standardisation of nursery practices:			
1.	Criteria for seednut selection:			
a)	Study of the effect of age of trees, order of bunches and position of seednuts in the bunch on seednut performance.	1962-'63	1965-`66	
b)	To determine the frequency of occurrence of nuts possessing different floating habits factors influencing such habits and their relative merits as seednuts.	1962-'63	1965-`66	
c)	Studies on the performance of the nuts gathered at different stages of maturity for seed purposes.	1962-'63	1965-'66	
2.	Sowing Experiments:			
a)	Study of different position of seednuts cum-depth of sowing.	1960-'61	1963-'64	

A.

(1)	(2)	(3)	(4)	(5)
Ъ	) Effect of different spacing-cum-effici- ency of sowing unsprouted and sprouted seeds on seedling per- formance	1960-'61	1963-'64	
c	Standardisation of the media and methods for sprouting seednuts.	1960-*61	1963-'64	
ď	Effect of shade, no shade and partial shade on the seednut germination	1960-'61	1963-'64	
	and growth of seedlings with parti- cular reference to sun-scorch & pest (mite) attack			
(B)	Influence of pre-sowing treatment and period of sowing on seednut performance	1960-'61	1963-*64	
ť)	Comparison of seedlings raised from seeds collected from young, middle- aged and old palms.	1960-'61	1963-'64	
g)	Study of seednuts from different arecanut growing tracts for their viability, earliness in germination and vigour of seedlings.	1962-'63	1965-'66	
h)	Storage trial of seednuts and viabi- lity studies.	1962-'63	1965-'66	
i)	Standardisation of method of pack- ing seedlings.	1962-'63	1965-'66	

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(1)	1. 	(2)	(3)	(4)	(5)
	j)	Effect of different intensities of shade in seed-bed and in secondary nursery on growth performance of seedlings.	1962-*63	1965-'66	
2. B		Cultural Experiments-Mainfield			
	a)	Determination of optimum spacing.	1961-'62	To be continued for a number of years.	
	b)	Effect of depth of transplanting seedlings-cum-intervals of irrigation on growth and yield.	1962-'63	do	
	c)	Relative performance in the field, of plants of different ages at the time of field planting and of single, double and treble transplants of above ages.	1962-'63	do	
	d)	Study of intercrops and associate crops in arecanut garden.	1962-'63	do	
	e)	Mixed garden of arecanut and coconut.	1962-'63	do	
	f)	Bulk garden for conducting agrono- mic and other trials.	1962-'63	do	
С		Manurial Experiments:			
	a)	Determination of optimum N. P. K. requirements.	1962-'63	do	

(1)		(2)	(3)	(4)	(5)
	•	Miscellaneous:			
	a)	Simple Manurial Trials on arecanut in ryots' gardens.	1962-°63	do	
	b)	Package plan treatment trials.	1962-'63	do	
	c)	Comparative study of different green manure and cover crops for areca- nut garden.	1962-'63	do	
		BOTANY:			
A		Crop improvement:			
	1)	Introduction and maintenance of indigenous and exotic species and types of Areca for selection.	1962-'63	do	
	2)	Survey of arecanut gardens to select superior types.	1962-*63	đo	To be taken up after the sampling techniqe is worked out.
	3)	Relative performance of different indigenous types.	1961-'62	do	
	4)	Floral Biology of Areca:			
	a)	Study of range of variation in flo- wering from tree to tree in the same garden.	1962-*63	1964-'65	

(2)	(3)	(4)	(5)
Study of month-wise variation in flowering in regard to rate, duration and time of male and female phases, number of female flowers and the above studies in the development of fruit.	1962-'63	1964–'65	How these vary with the age of the palm is also to be studied.
Studies on variation of nut size in the bunch and between bunches in the same tree.	1962-'63	1964-*65	
Hybridization and Selection:			
Production of inbred lines in distinct types.	1962-'63	To be continued for a number of years.	For purification of the line.
Physiological studies:			
Studies on fruit setting and shedding.	1962-`63	1964-'65	
PESTS AND DISEASES:			
Relative efficacy of different fungi- cides in the control of 'Koleroga' or 'Mahali' (Fruit-rot).	1962-'63	1964–'65	
	<ul> <li>(2)</li> <li>Study of month-wise variation in flowering in regard to rate. duration and time of male and female phases, number of female flowers and the above studies in the development of fruit.</li> <li>Studies on variation of nut size in the bunch and between bunches in the same tree.</li> <li>Hybridization and Selection:</li> <li>Production of inbred lines in distinct types.</li> <li>Studies on fruit setting and shedding.</li> <li>PESTS AND DISEASES:</li> <li>Relative efficacy of different fungicides in the control of 'Koleroga' or 'Mahali' (Fruit-rot).</li> </ul>	(2)(3)Study of month-wise variation in flowering in regard to rate, duration and time of male and female phases, number of female flowers and the above studies in the development of fruit.1962-'63Studies on variation of nut size in the bunch and between bunches in the same tree.1962-'63Hybridization and Selection: Production of inbred lines in distinct types.1962-'63Physiological studies: Studies on fruit setting and shedding.1962-'63PESTS AND DISEASES: Relative efficacy of different fungi- cides in the control of 'Koleroga' or 'Mahali' (Fruit-rot).1962-'63	(2)(3)(4)Study of month-wise variation in flowering in regard to rate, duration and time of male and female phases, number of female flowers and the above studies in the development of fruit.1962-'631964-'65Studies on variation of nut size in the bunch and between bunches in the same tree.1962-'631964-'65Hybridization and Selection: Production of inbred lines in distinct types.1962-'63To be continued for a number of years.Physiological studies: Studies on fruit setting and shedding.1962-'631964-'65PESTS AND DISEASES: Relative efficacy of different fungi- cides in the control of 'Koleroga' or 'Mahali' (Fruit-rot).1962-'631964-'65

## D. Seasonal conditions:

The period under report recorded a total rainfall of 1302.26 mm. as against a rainfall of 1547.7 mm. recorded during the corresponding period of last year. The rainfall during July 1962 was particularly heavy and a portion of the farm in the low-lying areas was inundated for three days. The rains failed for a period of six months from November to April, resulting in severe drought conditions which proved adverse to growth of the seedlings inspite of regular irrigation given. The month-wise rainfall, maximum and minimum temperature and humidity percentages are given in Appendix I.

#### **E.** Results

#### **AGRONOMY:**

#### A. Standardisation of nursery practices:

#### 1) Criteria for seednut selection:

a) Study of effect of age of trees, order of bunches and position of seednuts in the bunch on seednut performance:

The study is intended to find out the effect of age of trees namely, young, middle, and old, order of bunches, namely, first, second and third and position of seednuts in the bunch viz., top, middle and bottom on germination and vigour of seedlings.

The land required for the purpose was got ready during the year.

b) To determine the frequency of occurrence of nuts possessing different floating habits, factors influencing such habits and their relative merits on seednuts.

A trial with nuts of different floating habits namely, vertical, slanting and horizontal was laid out in order to determine the relation between the floating habit of nuts and germination, vigour of seedlings in the nursery and subsequent performance of these seedlings in the mainfield. The experiment was laid out on a 3x8 randomised block design during the year under report.

c) Studies on the performance of the nuts gathered at different stages of maturity for seed purpose:

The above experiment was initiated during the year with a view to determine the optimum stage of maturity for collection of seednuts for raising nursery stock, in relation to germination and vigour of seedlings. The experiment has been laid out on a 4x8 randomised block design with the following treatments.

#### Maturity of nuts:

- 1) Nine months,
- 2) Ninc-and-a half months,
- 3) Ten months and
- 4) Ten-and-a half months.

Germination data are being gathered.

#### 2) Sowing Experiments:

#### a) Study of different positions-cum-depths of sowing seednuts:

The study is intended to find out the influence of position and depth of sowing seednuts as well as their interaction on germination.

The study was initiated in 1960-'61 and was taken up again during the year 1962-'63.

A 16x4 randomised block design has been adopted for the trials with the following treatments.

Positions: Vertical, slanting, horizontal and topsyturvy.

Depths: 0", 1", 2" and 3".

The germination and morphological data of the seedlings were collected and analysed. The data are presented in Tables I (a) and I (b).

From the germination data, it can be seen that the main effect of position of sowing nuts alone is significant, whereas the main effect of depth of sowing as well as the interactions are not significant. Seednut sown horizontally recorded the highest percentage of germination. Sowing nuts vertically is significantly inferior to all other treatments.

From the mean morphological data, it can be seen that main effects of 'position of nuts' and 'depth of sowing' are significant in respect of girth and height of seedlings produced Sowing seednuts horizontally and vertically at 0" and 1" produced seedlings with better girth and height.

The above study will be continued during the year 1963-'64 for confirmation,

The previous year's data brought out that the main effect of depth of sowing was significant on the girth of the plant. Main effect of both depth and position of sowing and the interaction were found to be significant on the height of plants and spread of roots.

## b) Effect of different spacing-cum-efficiency of sowing unsprouted and sprouted seeds on seedling performance:

This experiment is intended to find out the relative merits of sowing the seednuts *in situ* and planting pre germinated seeds in the secondary nursery, as is the usual practice, and also to find out the optimum spacing to be given in each case in the nursery.

The study was initiated in 1960-'61, and was repeated on the same lines in 1962-'63. An 8 x 4 randomised block design was adopted with the following treatments: --

Nature of seednuts: Unsprouted and sprouted. (In the former case the nuts were sown in the nursery beds directly at the spacing indicated, and in the latter case, the seednuts sprouted separately in a seed bed were transplanted at the appropriate spacings. In either case, the date of sowing was the same).

Spacing:

9"	X	9"	
12"	x	12"	
15"	x	15"	and
18"	x	18"	

The germination and morphological data were statistically analysed and the results of analysis are given in Tables II (a) and II (b).

From the germination data it can be seen that the main effect of 'nature of nuts' sown alone is significant. Sowing nuts in a primary nursery gives significantly higher percentage of germination.

From the results of analysis of morphological data, it can be seen that the treatment differences are significant in respect of the method of sowing only. Sowing nuts *in situ* produces seedlings with significantly more girth and height.

The experiment is being continued in 1963-'64 for confirmation.

The previous year's data brought out that plants resulting from nuts sown in situ recorded significantly greater height-growth, and spacings of 15" x 15" and 18" x 18" recorded significantly greater height-growth than the other two spacings.

(c) Standardisation of media and methods for sprouting seednuts:

This trial laid out on a 5 x 6 randomised replicated design is intended to determine a suitable medium or method of sprouting seednuts, and was initiated in 1960-'61. The experiment was repeated in 1962-'63.

The following were the treatments:

- 1) Sowing in soil medium.
  - 2) Sowing in sand medium.
  - 3) Arranging seednuts in country baskets with a layer of straw as cover. 4) Tying seednuts in straw bundles.

  - 5) Heaping seednuts under shade.

The germination and morphological data of the seedlings relating to the sowings made in 1962-'63 were statistically analysed and the results are presented in Tables III (a) and III (b).

It can be seen that there was no significant difference between treatments either in regard to germination or morphological characters.

The previous year's data brought out that soil and sand media produced seedlings with significantly larger girth and number of leaves.

The experiment will be repeated during the ensuing year.

d) Effect of shade, no shade and partial shade on the seednut germination and growth of seedlings with particular reference to sun-scorch and pest (mite) attack: matters of malls and

This trial is intended to determine the optimum intensity of shade to be given to the arecant nurseries, and was initiated during 1960-'61 and was being repeated during the year 1962-'63.

A 3 x 8 randomised block design has been adopted for the trial with the following treatments: - "pical Bau dista

- 1) No shade.
- 2) Partial shade.
- 3) Complete shade.

The trials taken up earlier had shown that the treatments had significant effect on height, spread and number of roots.

The germination and morphological data of the seedlings relating to the sowings made in 1962-'63 were collected and statistically analysed. The results are presented in Tables IV (a) and IV (b).

From the Tables it can be seen that the treatments do not have significantly varying effect on the germination percentage. The morphological data show that the treatments have significantly varying effect on girth and height. Seedlings raised in open were significantly inferior to those under the other two treatments.

The above study is being continued.

e) Influence of pre-sowing treatments and period of sowing on seednue performance:

This experiment is intended to find out the influence of certain presowing treatments on the germination of seed arecanuts and the vigour of the resulting seedlings.

The experiment was first carried out in 1960-'61 and was continued during the year under report on the same lines.

A  $12 \times 4$  randomised block design was adopted for the trial. The following are the treatments.

- 1. Harvesting and immediate sowing.
- 2. Treating with cowdung slurry and immediate sowing.
- 3. Treating with cowdung slurry, air-drying for three days and sowing.
- 4. Treating with cowdung slurry, air-drying for six days and sowing.
- 5. Treating with cowdung slurry, air-drying for nine days and sowing.
- 6. Sun-drying for two days and sowing.
- 7. Sun-drying for four days and sowing.
- 8. Sun-drying for six days and sowing.
  - 9. Air-drying for three days and sowing.
  - 10. Air-drying for six days and sowing.
  - 11. Air-drying for nine days and sowing.

12. Soaking in water for three days and sowing,

The results obtained in the previous year had shown that seednuts sown immediately after harvest without any pre-treatment, those treated with cowdung slurry and then sown immediately, and those soaked in water for three days before sowing produced seedlings with significantly greater height-growth and girth.

The germination and morphological data of the seedlings collected during the year were statistically analysed. The results are presented in Tables V (a) and V (b).

The analysis of the germination data did not reveal any significant difference between the different treatments. Harvesting and immediate sowing has however recorded the highest percentage of germination.

From the morphological data, it can be seen that the treatment differences are significant only in respect of the height of seedlings. The treatments treating with cowdung slurry, air-drying for six days and sowing, sun-drying for two days and four days and sowing and air drying for nine days and sowing were found to be significantly inferior to the rest of the treatments.

The experiment will be repeated during 1963-64 on the same lines.

(f) Comparison of seedlings raised from seednuts collected from young. middle-aged and old palms:

This trial was initiated in 1960—'61 and was repeated during the year under review. It is intended to find out the performance of the seednuts collected from trees of the above age-groups with reference to germination and relative vigour of seedlings.

A 3 x 8 randomised block design was adopted, the variants being seednuts collected from (1) young, (2) middle-aged and (3) old palms.

The germination and morphological data of the seedlings were statistically analysed and the results are given in Table VI (a) and VI (b).

From the Table it can be seen that the treatments do not differ significantly with reference to germination percentage. However, seednuts collected from middle-aged palms recorded the highest percentage of germination.

The analysis of the morphological data showed that the treatment effects are significantly different in respect of girth of the seedlings only.

Seedlings raised out of seednuts collected from young palms had significantly lesser girth than the rest.

The previous year's data revealed that seedlings obtained from seednuts collected from middle-aged palms recorded significantly greater girth, height and number of leaves.

The above experiment is being repeated during 1963-'64.

g) Study of seednuts from the different arecanut growing tracts for their viability, earliness in germination and vigour of seedlings:

The trial was initiated during the year under report, and was laid out with seednuts collected from the following tracts in the Kamrup District.

- 1) Palasbari.
- Chaygaon.
   Muktapur.
- 4) Bamundi.

The treatments were replicated six times in a randomised block design, The germination and morphological data of the seedlings were gathered and statistically analised. The results are presented in tables VII (a) and VII (b).

The treatments were found not to differ significantly with reference to germination percentage. However, it can be seen that the seednuts collected from Chaygaon recorded the highest germination.

The results of analysis of the morphological data also did not reveal any significant difference between the variants,

Storage trial of seednuts and viability studies: h)

This trial was initiated during the period under review to study the period of viability of seeds and if the period can be prolonged by subjecting the seeds to different treatments. A 7 x 4 randomised block design was adopted with the following treatments.

- 1. Untreated seednuts packed in untreated gunny bags, and sown,
- 2. Seednuts treated with 1% Bordeaux mixture and packed in gunny bags, also treated with 1% Bordeaux mixture, and sown.
- 3. Wax coated nuts packed in gunny bags treated with 1% Bordeaux mixture and sown.

- 4. Wax coated nuts packed in baskets with cushioning material and sown.
- 5. Seednuts treated with 1% Bordeaux mixture, stored in baskets with cushioning material, and sown.
- 6. Untreated nuts packed in baskets with cushioning material, and sown.
- 7. Air-drying the seednuts under shade for three days and packing in gunny bags treated with 1% Bordeaux mixture, and sown.

In all the cases the seeds were sown 15 days after treatment. The germination data were being collected

i) Standardisation of method of packing seedlings:

This experiment is intended to determine the best method of packing arecanut seedlings for long distance transport, and the maximum period for which seedlings so packed can be retained without planting without their capacity to establish being impaired. The experiment is laid out on a  $9 \times 4$  randomised block design with the following treatments.

#### Treatments:

1 to 3. Roots packed in dry grass and seedlings planted out in the mainfield after one, two and three weeks of removal from the beds.

4 to 6. Roots packed in alkathene sheet and seedlings planted out in the mainfield after one, two and three weeks of removal from the beds.

7 to 9. Roots packed in water hyacinth roots and seedlings planted out in the mainfield after one, two and three weeks of removal from the beds.

In all cases the seedlings were removed with the ball of earth intact and with minimum damage to the roots. The leaf surface was also reduced by 25% to keep down transpiration by cutting 25% of the length of the leaflets.

Forty seedlings of uniform age were utilised for each of the treatments.

The percentage of mortality after transplanting the seedlings in the field under different treatments was recorded and the data statistically analysed. The results are given in Table VIII.

From the table, it can be seen that the main effects of method of packing and interval between removal and planting and their interactions are significant. The mortality was significantly less in seedlings packed in water hyacinth. Mortality significantly increased with the interval between removal and planting the seedlings.

j) Effect of different intensities of shade in seed-bed and in secondary nursery on growth performance of seedlings:

During the current year, the experiment on different intensities of shade reported under (d) above was modified, with the same treatments as before in the primary nursery followed by the following nine treatments to be given in the secondary nursery.

1. No shade in the primary nursery with no shade in the secondary nursery.

2. No shade in the primary nursery with partial shade in the secondary nursery.

3. No shade in the primary nursery with complete shade in the secondary nursery.

4 Partial shade in the primary nursery with no shade in the secondary nursery.

5. Partial shade in the primary nursery with partial shade in the secondary nursery.

6. Partial shade in the primary nursery with complete shade in the secondary nursery.

7. Complete shade in the primary nursery with no shade in the secondary nursery.

 Complete shade in the primary nursery with partial shade in the secondary nursery.

9. Complete shade in the primary nursery with complete shade in the secondary nursery.

A 9 x 4 randomised block design was adopted for the trials.

The morphological characters of the seedlings were collected while transplanting to the secondary nursery. These are under examination.

Other studies:--

i) Investigations on different types of areacanut under rain fed and irrigated conditions:

The trial is intended to find out if any of the types of areacanut which are known to perform well under low moisture conditions can be grown successfully as purely rainfed crop or with limited irrigations.

For this purpose, two types of arecanuts, one growing under purely rainfed conditions and another, in situations along-side the river where waterlogged conditions prevail for about six months in a year (Palasbari) had been collected and sown in the nurseries during 1961-'62. It had been proposed to utilise the material for detailed field trials, but it has now been decided to treat the trial as an observational one and plant out the seedlings in the observation plot.

#### B. Cultural Experiments-Mainfield:

#### a) Determination of optimum spacing:

This experiment is intended to determine the optimum spacing that is to be given to the arecanut palm in the mainfield, and is laid out on a  $6 \times 6$  randomised block design. The following are the spacings under study.

6' x 6'
 6' x 9'
 6' x 12'
 9' x 9'
 9' x 12' and
 12' x 12'

The planting was done during 1961-'62. The morphological data of the seedlings were collected after one year of planting and the growth made since taking pre-treatment measurements worked out. The data are given in Table IX.

It can be seen that the treatments do not have significantly varying effect on the morphological features of the seedlings.

# b) Effect of depth of transplanting seedlings-cum-intervals of irrigations on growth and yield:

With a view to find out the effect of depth of transplanting and intervals of irrigation on palm productivity, an experiment was laid out on a  $4 \times 3 \times 5$  split plot design with the following main and sub-plot treatments.

#### i) Main-plot treatments:

- 1. No Irrigation.
- 2. Irrigation once a week.
- 3. Irrigation once in two weeks.
- 4. Irrigation once in three weeks.

#### ii) Sub-plot treatments:

- 1. Planting at 6" depth,
- 2. Planting at 12" depth, and
- 3. Planting at 18" depth.

The spacing adopted is  $9' \times 9'$ . Each sub-plot has twenty experimental palms with borders all round.

Planting was completed during the year under report. The treatments will be given after one year of planting.

## c) Relative performance in the field, of plants of different ages at the time of field planting and of single, double and triple transplants of above ages:

The trial is intended to find out the relative performance in the Mainfield of seedlings of varied ages transplanted either once only or more than once in the nurseries, and is intended to be an observational trial.

The treatments are as follows:

- 1. Planting in the field 18-month-old seedlings (Current practice).
- 2. Planting in the field 30-month-old seedlings.

3. Planting in the field 42-month-old seedlings (All the above seedlings had been transplanted in the secondary nursery when 6-months-old).

4. Planting in the mainfield 18-month-old seedlings trasplanted twice, once after six months and second time after another six months.

5. Planting in the field 30-month-old seedlings trasplanted thrice, once after six months, second time after another six months and third time six months after the second.

6. Planting in the field 42-month-old seedlings transplanted thrice at the same ages as above (Treatment 5).

(The transplanting is done up to the 18 month only as it is the common observation that seedlings do not establish well in the nurseries if they are older, and further, lifting and transplanting are difficult). The study was initiated towards the close of the year.

d) Study of inter crops and associate crops in arecanus garden:

This experiment is intended to determine the effect of planting inter crops in areacanut garden on palm performance.

The following intercrops which are grown commonly in this tract have been considered for the trial.

1. Banana, 2. Pineapple, 3. Ginger, 4. Citrus (Mandarine orange) 5. Betel-vine and 6. Control (no intercrop). The six treatments are replicated four times in a randomised block design.

The morphological characters of the seedlings were collected at the time of planting, and after one year Malbhog variety of banana, pincapple (Kew), Khasi Mandarine orange which is commonly grown as an intercrop in K. & J. Hills, and ginger were planted in the alleys.

The morphological characters of the seedlings were recorded and statistically analysed. The results are given in Table X.

From the data it can be seen that the treatments have significantly varying effect on the girth of the plants. Planting banana in the arccanut garden as an intercrop seems to have the effect of reducing the girth of the plants significantly.

e) Mixed garden of a recanut and coconut:

It is a common practice among the arecanut growers in some tracts to interplant arecanut and coconut. In order to determine the effect of such interplanting on the permormance of arecanut palms, an observational trial on mixed planting of coconut and arecanut was laid out during the year. The lay out is as follows:

1.	Treatments:	a) Arecanuts and coconuts interplanted.
		b) Pure Arecanut crop.
2.	Type of coconut:	Local type-Tall.
3.	Spacings:	For coconut 30' x 30' square.
		For arecanut 10' x 10' square.
		Between coconut and arecanut 10'
4.	Border rows:	Two rows all round, the rows between two plots or replications being common.
5.	No. of replications:	Two.

The morphological data of the palms were collected at the time of planting.

#### f) Bulk garden for conducting agronomic and other trials:

With a view to superimpose certain studies relating to Agronomic and Pathological aspects, it has been programmed to raise a garden of about 5 acres in extent. The area intended for the above garden was cleared of wild growth and levelled at certain points during the year under review.

A garden covering an area of 0.41 ha. and planted with 444 seedlings at 12' quincunx was raised during November 1961 for conducting miscellaneous observations.

#### C. Manurial experiments:

#### a) Determination of optimum N. P. K. requirements in the mainfield:

This trial intended to determine the optimum N. P. K. requirements of the arecanut palm in the mainfield, was laid out on a  $3^4$  confounded factorial design as a single replication with the following treatments.

	Levels:	
 0,	50 and 100	1
 0,	40 and 80	Pounds
 0,	75 and 150	> per 500
 0,	7500 & 15000	parms.
··· ·· ··	0, 0, 0, 0,	Levels: 0, 50 and 100 0, 40 and 80 0, 75 and 150 0, 7500 & 15000

Each treatment plot has 20 experimental palms spaced 9' x 9'.

The planting was completed during the year under report.

The morphological features of the seedlings were recorded before planting,

Soil samples were collected just before the first application of manures at three depths namely,  $0-6^{\prime\prime}$ ,  $6-18^{\prime\prime}$  and  $18-36^{\prime\prime}$  at nine points in each treatment plot, one composite sample being then made up for each depth in a plot. The samples are awaiting analysis.

#### Miscellancous:

#### a) Simple Manurial Trials:

Simple manurial trials on arecanuts were initiated in four private gardens near the Station in collaboration with the Agricultural Officer of the Indian Central Arecanut Committee. Pre-treatment data of yield and morphological characters were gathered in the plots.

c) Comparative study of different green manure and cover crops for arecanut garden:

An observation plot with the following ten green manure crops was maintained and a study of growth behaviour was made.

#### Indigenous:

- 1. Centrosema pubescens.
- 2. Crotalaria striata.
- 3. Pueraria phaseoloides.
- 4. Crotalaria anagyroides.
- 5. Sesbania speciosa.
- 6. Tephrosia candida (Boga meduloa)

#### Exotics (U. S. A.)

- 7. Crotalaria brownee.
- 8. Crotalaria usura.
- 9. Crotalaria sericea.
- 10. Sesbania speciosa.

#### **BOTANY:**

- A. Crop improvement.
- (1) Introduction and maintenance of indigenous and exotic species and types of Areca for selection.

The following types were introduced during the year.

- i) Andaman.
- ii) Indonesia-1.
- iii) Indonesia-II.
- iv) Vittal and
- v) North Bengal.

The first-mentioned four were introduced from the Central Arecanut Research Station being the seeds collected from the trees grown in the Station, while the fifth was introduced directly from the State. The seeds of the exotics (i to iii) were obtained by selfing under controlled conditions. These introductions bring the total number of exotics under cultivation to four, and indigenous types to seven.

#### (2) Survey of arecanut gardens to select superior types:

Germination data of nine cultivars isolated from Lower Assam and sown in 1961-'62 were collected and are under examination.

#### (3) Relative performance of different indigenous types:

Morphological characters of 144 plants of five distinct indigenous types, namely, Vittal, Tumkur, Peechi, K. & J. Hills, Cachar and Lower Assam transplanted in the mainfield in a randomised replicated design in plots of four trees during the year 1961-'62, were gathered and the data statistically analysed. The results are given in Table X1.

From the Table it can be seen that the treatments differ significantly with reference to all the morphological characters. The seedlings raised out of seednuts collected from Lower Assam were generally superior. Seednuts from Cachar and K. & J. Hills produced seedlings with significantly lesser height, girth and number of leaves than the rest.

#### (4) Floral biology of Areca:

a) Study of the range of variation in flowering from tree to tree in the same garden:

The range of variations in flowering in different trees was studied in five gardens. It was seen that the last fortnight of May and the first fortnight of June were the peak periods of emergence of inflorescences.

b) Study of month-wise variations in flowering in regard to rate, duration and time of male and female phases, number of female flowers and the above studies on the development of fruit:

Floral biology studies were carried out on ten palms during the year under review. The month-wise variations in flowering in the case of male and female phases were as follows:

Month,	Rate of	Dura (Da	tion ys)	No. of flowers (Average)			
	Male.	Female.	Male phase.	Female phase,	Male.	Female.	
May	Maximum flo- wers opened during the first fitteen days of male phase	Maximum flo- wers opened from the se- cond to sixth day of the fe-	21 to 27	9	9968	268	
June	do	male phase —do—	20 to 25	8	16531	331	

Variations in male and female phases were also studied in young, middle-aged and old palms. It was seen that the male phase was the shortest ranging from 21 to 24 days in the case of young palms. Female phase was longest lasting from five to nine days in the case of old palms.

## (c) Studies in the variation of nut size in the bunch and between bunches of the same tree:

Inflorescences which emerged out early in the flowering season, namely, in April and those that emerged late, namely, in July orther eafter, gave very poor fruit set or no set at all. Further observations on nut size in the bunch are underway.

#### (5) Hybridisation and selection:

One thousand three hundred and forty eight female flowers in five inflorescences of different trees were cross-pollinated with palms possessing desirable characters such as high-yield and regularity in bearing. The extent of set is being watched.

#### B. Physiological studies:

#### Studies on fruit-setting and shedding:

The studies were commenced at the close of the year.

#### PESTS AND DISEASES:

#### (1) Study of pests and diseases of arecanut:

Study of pests and diseases could not be taken up due to the nonappointment of the Pathology Assistant.

#### F. GENERAL:

#### 1. Farm management.

During the year under report, all the maintenance works such as irrigation, drainage, weeding, intercultural operations etc. were attended to regularly both in the mainfields and in nurseries. Certain varieties of banana namely, 'Karibale', 'Vatabale' and 'Puttubale' were collected from Mysore and introduced. A few seedlings of *Coffea arabica* collected from Mysore, Guatemala grass (*Tripsacum Laxum*) and Mentha plant (*Mantha arvensis*) collected from Central Arecanut Research Station, Vittal were introduced. *Tephrosia candida* (Boga meduloa) and *Grotalaria anagyroides* were sown along the boundary of the farm and also along the boundary of nurseries.

#### 2. Permanent improvement:

The existing main irrigation-cum-drainage channel was extended by 2500 r.ft. An area of 7 acres of the Block III was cleared of wild growth and levelled to accommodate the manurial and depth-cum-irrigation main-field experiments. Two culverts were constructed at the entrance to the Station.

Electrical service connections (internal and external) to the Officecum-Laboratory and residential buildings were completed.

#### 3. Marking of mother palms:

In addition to 412 mother palms, 100 palms were marked out in Kamrup and Darrang districts.

#### 4. Procurement of seed arecanuts:

Seednuts numbering 21,210 were procured during the year for sowing in the Station and for supplying to the Tripura State.

#### 5. Distribution of seedlings:

Two thousand one hundred and ninety two arecanut seedlings were distributed to the growers and State Government Institutions.

#### 6. Plant protection measures in the farm:

Soft collar-rot noticed among the sprouts in the nursery beds during the months of heavy rainfall was effectively brought under control by drenching the plants with copper oxychloride at 1 kg. in 200 litres of water and the nursery beds with mercuric chloride at 1 kg. in 1000 litres. Incidence of scale insects was controlled by spraying Folidol at 0.02% concentration.

#### 7. Books and Periodicals:

In addition to certain important books added to the library, nine periodicals were subscribed for during the period.

#### 8. Laboratory equipment and furniture:

One Research Microscope (Carl Zeiss) with accessories, one insect box, essential glass-wares and chemicals and furniture were purchased.

#### 9. Meteorological observatory:

One rain-gauge, one soil thermometer and one wind-vane were procured for the Meteorological Observatory at the Station.

#### 10. Advisory and Extension work:

Enquiries on all aspects of arecanut cultivation were attended to promptly by the station. The Officer and staff also visited a number of gardens at the request of the owners to give spot advice on improving the gardens or on the control of diseases and pests. During visit to the gardens at Panari, Adalguri, Rawta and Dhekiajuli the growers were told of the benefits of co-operative marketing of arecanut. During the visit to Mazbat Tea Estate, the management was advised to drench the soil with 0.1% Ceresan and spray 0.5% Bordeaux mixture against collar-rot and yellow leaf spot respectively. At the arecanut gardens in the lateritic belt of Khasi and Jaintia Hills, removal and burning of diseased palms, control of yellow leaf spot of seedlings and mites by spraying, and deep-planting and manuring with fertilizers were suggested to the growers.

#### 11. Visitors:

Dr. Ram Subhag Singh, Union minister of State for Agriculture, Government of India. accompanied by Sarvashri M. H. Chaudhury, Minister for Agriculture, Assam, S. Sarma, Minister of Forest and Revenue, Assam and other officials including Dr. S. R. Barooah, Director of Agriculture, Assam, visited the Station on 24-10-1962. They were taken round the Station and the various experiments in progress were explained to them.

A batch of twenty three trainees from the Assam Forest School, trainees from the Grama Sevak Training Centre and students from Pragjyotishpur College, Gauhati were the important among the visitors to the farm.

#### 12. Seminars and Exhibitions:

The Station participated in the 'Coconut Day' celebrated at the Regional Coconut Research Station, Kahikuchi.

#### 13. Farmers' week:

The Station celebrated the Farmers' Week from 20th to 26th March 1963. A large number of officials of the State Government and large number of arecanut growers took part in the celebrations. The farmers were taken round the farm and the exhibition that was arranged in connection with the function. The preparation of Bordeaux mixture, spraying technique, different nursery practices, planting of seedlings etc. were demonstrated to the visitors. Discussions on the various aspects of arecanut cultivation were held and the growers were appraised of the scientific methods of cultivation and advantages of co-operative marketing of arecanut.

#### 14. Museum:

A museum with 30 big photographs, posters, models and specimens depicting all aspects of arecanut cultivation, pests, diseases and by-products was set up at the Station as a permanent feature.

#### 15. Herbarium:

Nuts and plant of *Penanga gracilis* and other specimens collected from neighbouring areas were preserved.

#### 16. Publications:

The following note was written up during the year. Inter cultivation—spade digging, By K. N. Murthy.

> K. NARASIMHA MURTHY Research Officer, Regional Arecanut Research Station Kahikuchi (Assam).

C.	Technical	Programme for	the	Regional Area	canut	Research	Station,
		Kahikuchi,	for	the year 1963-	-'64.		

Item No. in the Technical Programme	Name of the experiment	Year of com- mencement and completion	Work done so far	Work proposed to be done during the year
(1)	(2)	(3)	(4)	(5)
	AGRONOMY			
А.	Standardisation of nursery practices:			
1.	Criteria for seednut selection:			
a)	Study of the effect of age of trees, order of the bunches and position of seednuts in the bunch on seednut performance.	f 1962-'63 t 1965-'66	The experiment was laid out and germina- tion and morphologi- cal data gathered statistically analysed.	The experiment will be repeated for confirmation.
b)	To determine the relative germina- tion performance of seed arecanuts showing different floating habits and the relative growth performance of plants obtained from such nuts. A trial with nuts different floating habits 1965-*66 randomised replicat design.		A trial with nuts of different floating habits was laid out on a 3 x 8 randomised replicated design.	Observations on the cxperiment already laid out will be continued. Experi- ment will also be repeated.
c)	Studies on the performance of the nuts gathered at different stages of maturity for seed purpose.	1962-`63 1965-`66	Nuts of four different stages of maturity were gathered and the trial laid out on a 4 x 8 ran- domised Block design	Observations will be recorded and the experiment re- peated.

(1)	(2)	(3)	(4)	(5)
2. a)	Sowing Experiments: Study of different positions-cum-depth of sowing seednuts.	1960-'61 1963-'64	Trial laid out showed that sowing nuts in horizontal position gives significantly high- er germination than the rest. Seedlings obtained from nuts sown vertically and horizontally at 0" and 1" depth had better girth and height.	Experiment will be repeated.
b)	Effect of different spacing-cum-effici- ency of sowing unsprouted and sprouted seeds on seedling per- formance.	1960-'61 1963-'64	Sowing unsprouted seeds gave significantly higher germination and produced seedling with better vigour.	do
c)	Standardisation of media of sprout- ing seednuts.	1960-'61 1963-'64	The treatment diffe- rences were found to be not significant.	do
d)	Effect of shade, vs. no shade on the seednut germination and growth of seedlings with particular reference to sun-scorch & pest (mite) attack.	1960–'61 1963–'64	As far as germination was concerned the treatment differences were not significant. Seedlings raised under no shade recorded significantly lesser girth and height.	do

(1)	(2)	(3)	(4)	(5)
e	) Influence of post harvest treatments and period of sowing on scednut performance	1960-'61 1963-'64	The trial laid out did not show significant difference between the different pre-sowing treatments.	Experiment will be repeated.
g	) Study of seednuts from different arecanut growing tracts for their viability, earliness in germination and vigour of seedlings.	1962-'63 1965-'66	The study of the seed- nuts collected from four different arecanut growing tracts did not show any significant difference either in germination or vigour of seedlings.	The experiment will be repeated for confirmation.
i	) Standardisation of method of pack- ing seedlings.	1962-'63 1965-'66	Packing seedlings in water hyacinth roots was found to give good establishment on transplanting in the mainfield.	The study will be repeated.
j	) Effect of different intensities of shade in seed-bed and in secondary nursery on growth performance of seedlings.	1962-'63 1965-'66	The experiment has been laid out for the first time.	Observations will be continued and the study will be repeated.
<b>B</b> . a	Cultural Experiments-Mainfield ) Determination of optimum spacing.	1961-'62 To be continued	The experiment was laid out in 1961-62. The morphological characters of the ex- perimental plants were recorded	Observations will be continued.

(1)	(2)	(3)	(4)	(5)
b)	Effect of depth of transplanting scedlings-cum-intervals of irrigation on growth and yield.	1962-'63 To be continued	The experiment was laid out in 1962-1963.	Observations on the morphological characters of the seedlings will be recorded.
c)	Relative performance in the field, of plants of different ages at the time of field planting and of single, double and treble transplants of above ages.	1962-'63 To be continued	do	do
d)	Study of inter and associate crops in arecanut gardens.	1961-'62 To be continued	Morphological charac- ters of the seedlings recorded showed that ginger had the least effect on growth of arecanut plants while banana had the effect of reducing the girth.	Observations will be continued.
e) C	Mixed garden of arecanut and coconut. Manurial Experiments:	1962-'63 To be continued	The observation plot of coconut and areca- nut has been laid out.	Observations on the influence of co- conut on arecanut plants will be made.
a)	N. P. K. experiment.	do	The experiment was laid out during 1962– 1963.	Application of ma- nures as per sche- dule will be done. Morphological cha- racters of the seed- lings also will be recorded.

(1)	(2)	(3)	(4)	(5)
	Miscellaneous:			
a)	Simple Manurial Trials on arecanut in ryots' gardens.	1962-'63 To be continued	Four units of Simple Manurial trials were laid out and pre-ex- perimental data recor- ded.	Application of the different manures as well as recording of yield will be done.
b)	Package plan treatment trials,	do	The required palms are being marked out.	Application of diff- erent micro and m a c r o-nutrients will be taken up.
	BOTANY:			
	Crop improvement:			
1)	Introduction and maintenance of indigenous and exotic species and types of <i>Areca</i> for selection.	do	Four exotic and seven indigenous types have been collected so far.	Seedlings in the secondary nursery will be transplan- ted to the mainfield and fresh collect- ions will be made.
2)	Survey of arecanut gardens to select superior types.	do		After the sampling technique is worked out detailed survey will be taken up in the important are- canut growing tracts.

(1)	(2)	(3)	(4)	(5)
3)	Relative performance of different indigenous types.	do	Six ecotypes have been collected and planted in the mainfield.	Observations on these types will be continued. Fresh types will be collec- ted.
	Floral Biology of Areca:			
a)	Study of range of variation in flo- wering from tree to tree in the same garden.	1962-`63 1964-`65	The study showed that the peak period of emergence of inflore- scences is in the last fortnight of May and first fortnight of June.	The observations will be repeated. Tree to tree varia- tions in flower production will also be studied.
b)	Study on the month-wise variations in flowering in regard to rate, duration and time of male and female phases, number of female flowers and the above studies in the development of fruit.	do	Observations made on month-wise variations in fiowering revealed that more number of male and female flo- wers were produced during the month of June. Study was also made of the durations of male and female phases.	The study will be repeated, Varia- tions in palms of d i ff e r e n t age groups will also be studied.
c)	Studies in the variation of nut size in the bunch and between bunches in the same tree.	do	Nut-set in respect of inflorescences produ- ced early and late in the seasons was found to be very poor.	Variations in the size of nut of di- fferent bunches as well as that of the same bunch will be studied.

(1)	(2)	(3)	(4)	(5)
	Hybridization and Selection:			
b)	Production of inbred-line in the local types.	1962-'63 To be continued		Selfing will be ta- ken up in a few palms of the local type for raising in- bred progenies.
	Physiological studies:			
1)	Studies on fruit setting and shedding.	1962-'63 1964-'65	Spray and soil appli- cation of different chemicals have been programmed.	The experiment will be laid out and the influence of different treatments on fruit-setting and shedding studied.
	PESTS AND DISEASES:			
1)	Study of pests and diseases of arecanut:			
a)	Relative efficacy of different fungi- cides in the control of 'Koleroga' or 'Mahali' (Fruit-rot).	1962-'63 To be continued	-	Different fungicides will be tried again- st 'Koleroga'.

#### H. APPENDIX-I.

#### Temperature (°F) Humidity SI. Rainfall Month and Year No. (mm.) % Maximum Minimum 1962 July 1. 91 61 79.45 215.646 70.18 2. August 201.676 82.76 89.45 80.00 3. September 22.860 90.80 29.00 68.18 October 4. 65.278 88.07 73.37 66.42 November 5. Nil 82.30 65.67 57.49 6. December 20.066 77.36 56.70 63.17 1963 7. January Nil 72.55 51.70 54.31 8. February Nil 81.79 58.58 47.14 9. March 64.770 85.59 63.49 47.51 April 10. 166.370 86.133 70.60 60.02 11. May 76.466 292.354 73.51 75.76 12. June 87.87 76.166 253.238 77.34 Total 1302.258 or (1302.26)

#### Data of Rainfall, Temperature and Humidity

### APPENDIX II

#### TABLE I (a)

### Study of different position cum-depth of sowing.

## Treatments:

Position

1) Vertical

- 2) Slanting
- 3) Horizontal
- 4) Topsyturvy

#### Depth

- 1) 0"
- 2) 1"
- 3) 2"
- 4) 3"

#### Germination data

A. Position of		B. Depth of sowing					
sowing nuts	0″	1″	2"	3*	Mean		
Vertical	59.50	54.00	39.83	38.67	48.00		
Slanting	72.17	83.83	77.50	68.50	75.50		
Horizontal	79.33	86.00	88.67	72.67	81.67		
Topsyturvy	81.83	78.17	83.50	73.67	79.29		
Mean	73.21	75.50	72.37	63.37	71.11		
S. E. of means A	, B.	101020	3.30				
S. E. of means A	. B.		6.00				
C. D. to test diffe	erent levels	of $A(P = I)$	0.05) 9.14				
S. E. per plot			14.70				
General mean			71.11				
C. V. (%)			20.67				

## TABLE I (b)

## Morphological data

## Treatment means

## Girth (cm)

A position of nute		B. D	epth of sow	ing	
A, position of nuts	0″	1"	2"	3"	Mean
Vertical	1.45	1.25	1.10	1.05	1.21
Slanting	1.08	1.10	1.03	0.90	1.03
Horizontal	1.43	1.38	1.38	1.38	1 39
Topsyturvy	1.10	1.07	0.97	0.97	1.02
Mean	1.27	1.20	1.08	1.17	-

## Height (cm)

A position of nuts		B. D	B. Depth of sowing			
A. position of nuts	0''	1''	2''	3''	Mean	
Vertical	61.00	59.17	48.67	47.33	54.04	
Slanting	61.00	59.00	54.83	48.83	55.92	
Horizontal	60.17	64.00	61.50	49.50	58.79	
Topsyturvy	47.83	43.33	37.50	32.70	40.33	
Mean	57.50	56.37	50.63	44.58	52.27	

## No. of leaves

A position of puts		B. 1	Depth of sowing	g ·	
A. position of huts	0"	1''	2''	3''	Mean
Vertical	4.00	3.67	3.83	3.83	3.83
Slanting	3.83	4.00	3.67	3.83	3.83
Horizontal	3.83	3.83	4.17	4.00	3.96
Topsyturvy	3.83	3.50	3.50	3.83	3.67
Mean	3.87	3.75	3.79	3.87	3.82
		Girth (cm)	Height (cm.)	No.	of leaves
S. E. of means A.	B	0.04	2.11		0.12
S. E. of means A I	3	0 08	4.22		0.23
C. D. for A $(P = $	0.05)	0.11	5.98		
,, B(P =	0.05)	0.11	5.98		
S. E. per plot		0.19	10.35		0.57
General mean		1.21	52.27		3.82
C. V. (%)		15.70	19.80		14.92

Effect of different spacing-cum-efficiency of sowing unsprouted and sprouted seeds on seedling performance.

## Treatments:

1.	Sowing unsprouted seednuts		9" x 9"
2.	ور	at	12" x 12"
3.	,,	at	15" x 15"
4.	31	at	18" x 18"
5.	Transplanting sprouts	at	9" x 9"
6.	33	at	12" x 12"
7.	33	at	15" x 15"
8.	"	at	18" x 18"

## Germination data

A Cassing		B. Nature	of nuts	Maan
A. Spacing	Unsprouted		Sprouted	Mean
9″ x 9″	85	.00	60.75	72.87
12" x 12"	70	.50	57.75	64.12
15" x 15"	80	.00	53.25	66.62
18" x 18"	84	.50	40.25	62.37
Mean	80	.00	53.00	66.50
S. E. of means	A	6.24		
S. E. of means	В	4.41		
C. D. for B ( $P =$	0.05)	12.98		
S. E. of means	AB	8.82		
S. E. per plot		17.64		
General mean		66.50		
C. V. (%)		26.53		

## TABLE II (b)

## Morphological data

## Two-way tables of treatment means

Girth (cm)

A. Method		_	B. Spa	acing		
of sowing	9" x 9"	12" x 12	" 15" x	x 15"	18" x 18"	mean
Unsprouted	1.52	1.20	1.1	.2	1.42	1.32
Sprouted	1.02	1.05	1.0	)5	1.07	1.05
Mean	1.27	1.12	1.0	9	1.25	1.19
Height (cm)						
A. Method			B. Spa	acing		
of sowing	9" x 9"	12" x 12	' 15''	x 15''	18" x 18'	Mean
Unsprouted	62.50	63.00	62.	.00	61.50	62.25
Sprouted	55.50	54.25	53.	.00	55.25	54.50
Mean	59.00	58.62	57.	.50	58.37	58.37
No. of leaves						
A. Method		1.	B. Sp	acing		
of sowing	9" x 9"	12" x 12	' 15''	x 15''	18'' x 18'	' Mean
Unsprouted	4.00	3.75	4.	.00	3.75	3.87
Sprouted	3.75	4.00	3.	.75	3.50	3.75
Mean	3.87	3.87	3	.87	3.62	3.81
			Girth	Heig	ht No.	of leaves
S. E. of means A			0.05	1.4	0	0.17
S. E. of means B			0.07	1.9	8	0.24
C. D. for means A	(P = 0.0)	5)	0.16	4.1	2	
S. E. per plot			0.21	5.5	9	0.69
General mean			1.19	58.3	7	3.81
C. V. (%)			17.65	9.5	8 1	8.11

### TABLE III (a)

Standardisation of media and methods for sprouting seednuts.

#### **Treatments:**

- 1) Sowing seednuts in soil medium
- 2) ,, in sand medium
- 3) Arranging the seednuts in country baskets with a layer of straw as cover.
- 4) Tying the seednuts in straw bundles.
- 5) Heaping the seednuts in shade.

#### Germination data

#### Treatment means

Treatment No.	Germination %	
1.	67.83	en alle
2.	75.33	
3.	66.83	
4.	86.00	
5.	56.00	
S. E. of treatment mean	6.51	
General mean	70.40	
S, E, per plot	16.09	
C. V. (%)	22.85	

## TABLE III (b)

#### Morphological data

Treatment	Girth (cm)	Height (cm)	No. of leaves
1	1.07	51.17	4.00
2	1.00	49.33	4.00
3	1.02	48.83	4.17
4	1.07	51.33	4.33
5	1.03	54.50	4.50
S. E. of means	0.07	2.55	0.23
S. E. per plot	0.17	6.25	0.56
General mean	1.04	51.03	4.20
C. V. (%)	16.35	12.25	13.33

## TABLE IV (a)

Effect of shade, no shade and partial shade on the seednut germination and growth of seedlings with particular reference to sun-scorch and pest (mite) attack.

#### **Treatments:**

- 1) No shade
- 2) Partial shade
- 3) Complete shade

#### Germination data

Treatment		Germination %
1 No shade		76.25%
2 Partial shade		75.50
3 Complete shade		76.12
S. E. of treatment means	2.12	
S. E. per plot	5.99	
General mean	75.96	
C. V. (%)	7.89	
TABI	LE IV (b)	
Morph	ological data	
Treat	mont moons	

Treatment	Girth (c.m.)	Height (c.m.)	No. of leaves
1 No shade	1.15	43.87	4.00
2 Partial shade	1.25	61.00	3.75
3 Complete shade	1.46	65.00	4.37
S. E. of mean	0.07	3.77	0.20
C. D.	0.22	11.10	
S. E. per plot	0.21	10.65	0.56
General mean	1.29	56.63	4.04
C. V. (%)	16.27	18.81	13.86

## TABLE V (a)

Influence of post-harvest treatments and period of sowing on seednut performance.

## Treatments:

1.	Harvesting and immedia	ate sowing:
2.	Treating with cowdung s	slurry and immediate sowing.
3.	do	air drying for three days and sowing.
4.	do	air drying for six days and sowing.
5.	do	air drying for nine days and sowing.
6.	Sun-drying for two days	and sowing.
7.	do four day	s and sowing.
8.	do six days	and sowing.
9.	Air-drying for three day	ys and sowing.
10.	do six days	and sowing.
11.	do nine day	rs and sowing.
12.	Soaking in water for the	ree days and sowing.

### Germination percentage

Treatment No.	75.96	Germination %
1		79.67
2		74.33
3		66.83
4		79.33
5		74.00
6		72.67
7		72.17
8		67.00
9		68.17
10		63.33
11 00 *		62.33
12		71.50
S. E. of means		5.89
S. E. per plot		14.43
General mean	The second second	70.94
C. V. (%)	14 Bel 6	20.34

## TABLE V (b)

## Morphological data

Treatment	Girth (cm)	Height (cm)	No. of leaves
1.	0.90	54.17	4.00
2.	1.05	54.67	4.00
3.	1.07	59.33	4.00
4.	1.05	41.17	4.17
5.	1.12	53.50	4.00
6.	1.15	48 6.7	3.67
7	1.15	46.17	4.00
8.	1.05	55.00	4.17
9.	1.13	53.50	3.67
10.	1.12	54.00	3.83
11.	1.05	50.83	4.17
12.	1.02	59.17	4.00
S. E. of means	0.07	2.85	0.25
C. D. (P=0.05)		8.10	_
S. E. per plot	0.16	7.02	0.61
General mean	1.07	52.51	3.97
C. V. (%)	14.95	13.37	15.36

## 44 TABLE VI (a)

Comparison of seedlings raised from seednuts collected from young, middle-arged and old palms.

## Treatments:

- 1) Young palms
- 2) Middle-aged palms
- 3) Old palms

### Germination data

#### Treatment means:

Treatment	Germination %		
2 Middle-aged palms 3 Old palms	61.12 80.50 67.25		
S. E. of treatment means	8.18		
S. E. per plot	23.14		
General mean	69.62		
C. V. (%)	33.24		

## TABLE VI (b)

## Morphological data

Treatment	Girth (cm)	Height (cm)	No. of leaves
1 Young palms	1.11	51.25	3.87
2 Middle-aged palms	1.44	63.25	3.75
3 Old palms	1.27	61.12	3.75
S. E. of means	0.06	3.34	0.18
C. D. $(P = 0.05)$	0.19		
S. E. per plot	0.18	9.44	0.50
General means	1.27	58.54	3.79
C. V. (%)	14.17	16.12	13 19