IDRC/SRI LANKA - ROOT AND TUBER CROPS PROJECT
TECHNICAL REPORT (1st JUNE 84 TO 1st JUNE 85)
PHASE 11 - 1st YEAR.

Project IDRC/Sri Lanka Root and Tuber Crops Project Phase 11.

Project Location Central Agricultural Research Institute, Gannoruwa, Peradeniya, Sri Lanka.

Project Period 1st June 84 - 1st June 1985

Preoject Staff

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Financial information removed from this version

Technical Report (Research)

Research highlights - (Yala 84 and Maha 84/85, detail seasonal reports annexed herewith)

1. Cassava. (Agronomic studies)

1.1 Seedling evaluation program. (84 yala)

Seven new accessions were tested for yield against MU 51 at CARI fields. Accession CARI 492 outyielded MU 51, the recommended variety with a tuber yield of 47.32 t/ha and a harvest index of 62.5 against 35.97 t/h and 57.5 harvest index for MU 51.

1.1.1 Seedling evaluation program. (84/85 Maha)

In seedling evaluation programme out of 90 selections 77 selections were already tested under the advance yield trials compared with standard varieties MU-51 and CMC-84.

Resulting from these trials 3 new hybrids namely CARI 492, 526 and 555 were found to have good yield potential, desirable plant type with good culinary qualities and included them as entries for National coordinated varietal trials.

The remaining 13 seedlings were evaluated in a yield trial with check variety MU-51 during Yala 84 - Maha 84/85.

The results indicated that the accession numbers CARI 899, 881 and 642 were superior in yields to the check variety MU-51. However, none of them was good as MU-51 with regards to culinary qualities.

1.2 Cassava vegetable intercropping systems. (84 yala)

A study was conducted to ascertain the economic feasibility of intercropping vegetables with cassava. This experiment consisted of five cassava vegetable combinations. The maximum tuber yield was recorded (33.23 t/ha) in the cassava monoculture treatment, while Cassava-Bushitavo, Cassava-Tomato, Cassava-Winged bean and Cassava-Okra combinations yielded 23.66, 25.64, 31.38, 27.57 and 31.17 tons/ha respectively.

The gross return worked out in respect of these crop combinations (Table 4), the highest income to the farmer has been from Cassava-Tomato intercrop combination giving a recorded income of Rs. 77,185.00 followed by Cassava-Cucumber (Rs. 62,265.00) Cassava-Bushitavo (Rs. 62,220.00) and Cassava-Okra (Rs. 43,717.00). The income from any intercropping combination was superior to the Cassava monoculture.

1.2.1 Cassava vegetable intercropping systems. (84/85 Maha)

A repetition of cassava-legume intercropping study showed that the yield of cassava monoculture was significantly higher than those of all cassava-legume combinations except that of cassava-black gram.

The double row planting pattern of cassava proved to be more favourable producing higher tuber yield as well as legume yield since it has less competitive ~~effective~~ effects on legume and tuber yield itself.

Black gram significantly out yielded cowpea and lanka kadala showing the more favourable combination with cassava as compared to the other two intercrops.

A repetition of cassava-vegetable intercropping study was conducted at CARI to find out the possibility of growing vegetables with cassava in Mid country wet zone.

The results indicated that the tuber yield of cassava in cassava-tomato combination recorded the maximum yield (45.61 t/ha). The yield variation between monoculture (38.4 t/ha) and cassava-tomato combination might be attributed to adding organic matter to tomato crop which substantially effect to increase the tuber yield of cassava-tomato combination.

The monetary returns worked out in respect of cassava-vegetable combinations indicated that the highest gross return was obtained

when tomato intercrop with cassava (Rs. 89657.00/ha), followed by cassava-bushitavo (Rs. 64782.00/ha), cassava-cucumber (Rs. 63665.00/ha), cassava-okra (Rs. 42262.00/ha) and cassava-winged bean (Rs. 3954.00/ha). These values were significantly superior to monoculture of cassava (Rs. 28807.00/ha).

1.3 Maturity studies on cassava.

The existence of early maturing (4-6 months) cassava varieties has been often misleading. An experiment was conducted to ascertain the yield potential of this so-called early varieties and yield was evaluated at different stages of crop maturity. Tuber yields, harvest index and starch contents of the tubers were determined.

From the results it was evident that with the increase in maturity stage, Wagolla, Kegalle and Batticoloa selections recorded higher yields. The starch content in tubers increased with the age of the crop but there was no remarkable difference in the starch content among the tested cultivars. (Table 11).

1.4 Weed control studies.

A field study was conducted at CARI to determine the effect of weed competition on cassava yields at different stages of crop growth. The treatments consisted of nine mannual weed control practices. Weeding was done monthly so that the effect of weed competition could be evaluated from planting up to harvest. Highest tuber yield was recorded where complete weed control was done (yield 39.35 t/ha) while no weed control plot gave a yield of 17.23 t/ha (Table 13). Results indicated that the degree of yield suppression was least in the treatments where weeding was done before the main bulking phase of tubers.

1.5 Co-ordinated varietal evaluation program (Regional adaptability)

This program carried out with the participation of the Regional Agricultural Research Stations and some farmers was carried out in nine locations representing the major agro-climatic regions of Sri Lanka. Eleven cassava entries which included four new lines from CARI were tested. Yala 84 season was a very wet season and

ill-drained conditions prevailed in most of the locations. However, Monaragala an intermediate zone location gave good yields (Table 14). This program is being continued.

2. Sweet Potato.

2.1 Crop improvement.

Under the Swet potato breeding program, 25 selected hybrid lines were further tested. Tuber yield was determined at 4 month age and tuber qualities were evaluated. New CARI lines 242, 248, 311, 223, 266 and 315 have given significantly superior yields over presently cultivated varieties. The line CARI 242 was very promissing in yield and its tuber quality with acceptable shape and red skin and yellow flesh. This variety seem to be acceptable to many farmers. This variety is being further tested and multiplied for recommendation to the National seed release committee during this year. (Table 15).

2.2 Plant density.

Present recommendation of spacing in Sweet potato does not take into consideration the vine characters namely, Bush, semi-vine and vine type. Field experiment was conducted at CARI to evaluate the interaction between plant type and density on tuber yield. C-26 (bushy) Wariyapola (semi-vine) and B-1 (viny) were planted at densities of 46296 (S_1), 55555 (S_2), 69444 (S_3) and 92592 (S_4) plants/ha. The highest tuber yield for bush type (C-26) (21.5 t/ha) was recorded at highest plant density of 92592 plts/ha, while the lowest plant population showed maximum yield by viny type (B-1) (30.55 t/ha). The present Departmental recommendation of 69444 pts/ha was suitable for semi-vine type of varieties.

2.3 Major pest problem in sweet potato cultivation is the weevil. Vine characters and some morphological and physiochemical properties of tubers are known to possess a correlation with susceptibility

to weevil infestation. Length of the neck, skin thickness, Sugar content, latex cc tent of the vine and tubers are some of these characters.

The data from this experiment revealed that the average number of weevil, larvae and maggot per plant has a significant effect on tuber damage due to weevil and positive correlation was observed between mean number of weevil, larvae and maggot per damaged plant and the sugar content of the tubers. Negative corretalion was observed in the relationship between skin thickness and the number of weevils in the infested tubers. It was observed that the degree of weevil damage indicated some possible correlation to the latex content and the colour of the tuber flesh. This is being further investigated as these characters could be used as a selection criterian in breeding for weevil resistance. In this experiment variety CARI 265 was found to be highly resistant to weevil damage.

2.3 Co-ordinated varietal evaluation program.

Two new hybrid lines CARI 9 and 99 were tested against recommended and cultivated varieties in 8 regional locations. Rainfall during Yala 84 season was heavy and consequently yield obtained from all locations except the two dry zone locations in the Mahaweli area namely Girandurukotte and Aralaganwila were not very satisfactory. However, it was found that the two CARI lines showed much promise for future.

3. Germplasm Collection, conservation and Utilization.

3.1 Cassava.

During yala 84 (June 1st to Dec. 84) season the wet zone districts namely Kalutara and Galle were fully covered in our germplasm collection efforts. Monaragala, Nuwara Eliya and Kegalle districts were partly covered. Consequently during this collection expeditions, 20 new cultivars of cassava have been collected and the present local germplasm collection consists of 140 cultivars.

3.1.1 Introductions from CIAT

For the first time in the history of cassava introductions. 50 hybrid lines were introduced from CIAT as seeds and these are being grown under strict plant quarantine conditions at CARI. Official approval for introduction was facilitated after the visit of CIAT scientists, Dr. James Cock and Dr.K.Kawano, arranged through the project activities. Very poor germplasm base and low genetic variation was recognised as the main constraint for a cassava breeding program. The introductions from CIAT comprize wide genetic variation which could serve as the basis for a future breeding program to be undertaken under the project during next four years.

3.2 Sweet Potato

Germplasm collection in sweet potato two were completed mainly in the two wet zone districts Kalutara and Galle. During yala 84 season, 23 new cultivars were added to the collection bringing the total collection to 94 cultivars with 10 introductions from Taiwan. Sweet potato germplasm base is strong enough to generate adequate genetic variability in a breeding program.

3.3 Dioscorea

Twelve new cultivars were added to the collection bringing the total collection to 40 cultivars. Since, Diascorea germplasm collection is possible mainly during the Maha harvesting season, once a year germplasm collection in Dioscorea will be continued during coming years. Of the 12 cultivars collected, 6 wild species of significant botanical importance have been identified.

3.4 Aroids.

Four new additions during yala 84 raised the total to 41 cultivars.

3.5 Innala (coleus)

One new addition to this collection has brought the total to 20 cultivars.

3.6 Other tubers

Two ginger cultivars and 3 canna species raised the total to 8 other minor root crops of economic importance.

4. Research on Tissue culture.

Newly established Biotechnology Division and Tissue culture unit of the Botany Division has generated a valuable tissue culture program on Root Crops. Techniques are being perfected to develop technical capabilities to conserve germplasm through tissue culture and also use this techniques in crop improvement. Progress is reported here.

4.1 Tissue culture studies.

Tissue culture studies were initiated at the beginning of this year especially to develop and perfect the technology for root and tuber crops with several aspects. Mainly, attention was made on meristem culture and tissue culture including anther culture. Meristem culture technics were applied to several cassava varieties and obtained good results. We hope to perfect this technology to introduce an efficient means to free the plants from systemic pathogens and also to develop a Gene Bank using the meristem cultures. This will also helps to provide an efficient and more reliable method for international exchange of cassava germplasm. Application of this technology for sweet potato and dioscorea is also under investigation with the little facilities we have.

Tissue culture including anther culture work was initiated especially to utilise this technology as a tool in crop improvement. Callus cultures from stem tissues of cassava and sweet potato and from tuber tissues of Dioscorea species were formed. Calli from immature anthers of cassava were also established. Root formation in cassava callus cultures derived from both stem tissues and anthers was also observed. We hope to carry out detail studies

on the latter phenomenon to see whether this roots originated from pollen grains (wich are haploid). This work will also includes preparation of tissues for microscopic examinations (microtomy) (for wich the facilities are not available at CARI).

5. Seminars and Workshops.

5.1 Seminar.

IDRC Root and Tuber crop project in Sri Lanka jointly with Sri Lanka Association for the Advancement of Science (SLAAS) sponsored a seminar on "Potential of Root and Tuber Crops in Sri Lanka". This seminar was held on June 29th at Gannoruwa. Speakers at this one day seminar represented the Root Crop Project, Faculty of Agriculture, Coconut Research Institute, Food TEchnology Division of CARI and Private sector Industries. Project is taking action to publish the proceedings of this seminar with support from the IDRC project funds.

5.2 Visitors to IDRC Root Crop Project and guest speakers.

Dr. James Cock, CIAT Physiologist and Dr. Kazuo Kawano Regional Cassava Breeder, CIAT in Thailand visited Sri Lanka during 24th October, 1984 to 30th October 1984 period under CIAT sponsorship. During their stay, Root Crop Project sponsored a seminar where guest speakers from CIAT made the following speaches.

1. Tropical Crop Breeding achievements and challanges: Dr. K.Kawano.
2. Physiology of Cassava. Dr. James Cock.

CIAT scientists during their meetings with the Deputy Director Research and Director of Agriculture stressed the importance of introducing cassava germplasm to provide a sound genetic variability for a breeding program. Department of Agriculture officially at this meeting granted permission to introduce cassava germplasm from CIAT. Dr. Kazuo Kawano CIAT Plant Breeder in Thailand will be helping us in our efforts to utilize this germplasm.

5.3 Visit of IDRC Vice President (Research Programs).

Root Crop Project in Sri Lanka was privileged to have Dr. Joseph Hulse as a visitor, who took time off from his other official duties with the Government of Sri Lanka and visited CARI on 6th May 1985 to see the progress of our project activities.

5.4 Diane M. Barrett.

A Consultant on cassava utilization attached to the Resources Management International, Inc. visited Sri Lanka and gave a lecture on cassava utilization in Indonesia at PGIA. Peradeniya, under the sponsorship of Root Crop Project and SLAAS. This consultant visited all our project sites and some cassava starch factories in the intermediate zone and made valuable suggestion to promote cassava utilization in Sri Lanka.

6. Training, study tours attended etc.

6.1 Training

During 1st year of Phase II Mrs. P.S.A.D.Prematilake,E.O. has gained admission to PGIA to complete a M.Phil. course in Sri Lanka with research studies in VISCA, Philippines.

IDRC office in New Delhi is processing papers for the proposed training program of Mr. S.Ekanayake - Post graduate training in food technology in India and short term training for technical assistants at CTCRI - Trivandrum.

6.2 Study tours.

Project Coordinator and the Principal investigator toured Philippines, Thailand and India on a study tour and visited VISCA, AVRDC in Thailand and CTCRI India. During this tour, valuable information has been gathered, training possibilities discussed. Valuable trip report has been submitted.

7. Technical papers presented and training courses conducted by project staff.

7.1 THE PRODUCTION AND UTILIZATION OF CASSAVA IN THE CONTEXT OF THE AGRICULTURAL ECONOMY. PROJECTIONS AND PROBLEMS IN THE FURTHER DEVELOPMENT OF CASSAVA IN SRI LANKA. By S.D.G. Jayawardene Project Co-ordinator. Paper presented at the workshop on the future Potential of Cassava in Asia and the Research Development needs 5-8 June, 1984. Bangkok, Thailand.

7.2 The following papers were presented by project staff at the IDRC/SLAAS sponsored seminar on Root and Tuber Crop Potential in Sri Lanka. June 29th 84, Gannoruwa.

1. PROBLEMS AND POTENTIALS OF ROOT AND TUBER CROPS IN SRI LANKA. By S.D.G.Jayawardene, Project Coordinator.

11. PRESENT STATUS OF ROOT CROP RESEARCH IN SRI LANKA. By K.P.U. de Silva, Principal Investigator, Root Crop Project.

7.3 The following papers were presented by project staff based on project investigations, at the 14th Annual session of Sri Lanka Association for the Advancement of Science, 1984. Dec.

1. EFFECT OF TIME OF HARVESTING AND GROWING SEASONS ON WEEVIL INFESTATION IN SWEET POTATO. By P.S.A.D.Prematilake and K.P.U. de Silva.

11. EVALUATION OF DIOSCOREA CULTIVARS. By S.Ekanayake, K.P.U. de Silva and C.K.Ranawana.

111. MIXED CROPPING OF SWEET POTATO (IPOMEA BATATAS L) WITH GRAIN LEGUMES. By P.S.A.D.Prematilake and K.P.U.de Silva.

1V. DETERMINATION OF MATURITY PARAMETERS AT DIFFERENT GROWTH STAGES IN SELECTED CASSAVA. (MANIHOT ESCULENTA CRANTZ) CULTIVARS. By K.P.U.de Silva, P.S.A.D.Prematilake and J.C.K.Basnayake.

V. POTENTIALITY OF GROWING VEGETABLES WITH CASSAVA IN MID COUNTRY. By S.D.G.Jayawardene, K.P.U.de Silva and J.C.K.Basnayake.

7.4 Training conducted by project staff.

Under Root crop project sponsorship a training program was carried out by the Principal Investigator, Mr.K.P.U.de Silva at Regional Training Centres at Kalutara and Bindunuwewa. About 80 participants consisting of subject matter Specialists, Agricultural Extension Officials attended this one day training program. Training was on cultivation and production of Root and Tuber Crops.

8. Administrative activities.

Allmost all the equipment projected for importation during Phase 11, 1st year have been obtained with the help from IDRC office in Singapore. Equipments and other items projected for procument under the Department administered funds too have been purchased. However, funds allocated under fuel for vehicles and per diems have not been fully utilized due to curtailments imposed on travelling due to the conditions prevailing in some parts of the country. New proposals are submitted separately to utilize these funds during the coming years.

9. Projections 1st June 85 to 1st June 86.
(Yala 85 and 85/86 Maha seasons)

9.1 Research

1. Crop improvement.

During the 2nd year under Phase 11, research emphasis will be shifted from heavy agronomic studies program to a breeding program both in cassava and sweet potato. It is understood that a major breakthrough in yield in both cassava and sweet potato has not been achieved in Sri Lanka yet, mainly due to the lack of crop improvement program. Phase 1 of the Root crop project has placed emphasis mainly on Agronomic studies and adequate information is now available to reap higher yields from existing cultivars. With

the introduction of cassava germplasm and the establishtemt of a polyculture nursery for sweet potato breeding a strong breeding program is now established. Consequent to this intensive varietal selection and evaluation program will be undertaken in different agro climatic regions.

11. Varietal evaluation program

Varietal requirement of cassava and Sweet potato in the wet and Intermediate dry zone areas where inter cropping program under coconut will be evaluated. This program has already been started in collaboration with the Coconut Research Institute at Lunuwila. Main varietal requirements both for cassava and Sweet potato would be high yielding ability under low light intensity and drought tolerance.

111. Coordinated yield evaluation.

This program will be continued in 6 Regional Research Stations both for cassava and sweet potato. In addition to these locations two or more farmers fields in the intermediate wet zone will be used for varietal evaluation for yield and other characters.

1V. Breeding and Agronomy.

Cassava.

a. Seedling evaluation programme.

b. The effect of different grain legumes on cassava yield under varying fertilizer management practices.

c. Evaluation of selected cassava accessions at farmers fields.

d. Study of the varietal performance of cassava under micro climatic and hydrological conditions prevailing under coconut plantations in the intermediate zone.

e. Effect of defoliation and varying plant densities on yield losses (brown leaf spot) and pests (scale insects and mites) incidence of cassava.

f. Collection, maintanance, evaluation and characterization of germplasm. (Local and introduced)

g. Coordinated trials on selected cassava accessions.

Sweet Potato.

a. Breeding through polycross method in polyculture nursery at C.A.R.I. with promissing introductions and local entries.

b. Selection and evaluation programme of hybrid sweet potato lines obtained from polyculture nursery.

c. Evaluation of the varietal adaptability of different hybrid sweet potato lines under partial shade and hydrological conditions prevailing in coconut plantations in the wet zone.

d. Weevil (Cylas formicarious Fab.) control of sweet potato: 1

1. Effect of different green manures.

11. Screening for relative resistance of hybrids and cultivars under field conditions.

e. Studies on the different plant types under varying densities.

f. Collection, maintenance, evaluation and characterization of germplasm.

g. Coordinated trials on selected varieties.

Cocoyams, Dioscoreas, Innala and Other Root Crops:

a. Collection, maintenance evaluation and characterization of germplasm.

b. Induction of somatic mutation by using ionizing radiation and chemical mutagens.

V. Tissue culture studies.

1. Application of meritem culture technology for cassava, sweet potato and Dioscorea to establish the germplasm conservation facility at CARI.

11. Development of suitable nutritional media for the invitro growth of tissues of cassava, sweet potato, Dioscorea and Allocasia.

111. Effect of physical factors (Temp, Light and P^H) on the initiation and growth of tissue of cassava sweet potato Dioscorea and Allocasia.

1V. Study the Morphogenetic potential of the tissues grown on different media.

V1. Food Technology.

Cassava.

1. Screening of cassava lines on the basis of HCN content, starch content and cooking quality for human consumption, Industrial uses and animal feed.

2. Amylose and Amylopectine content and their correlation with Organoleptic characteristics of cassava varieties.

3. Determination of Carbohydrate constituents of different cassava varieties grown in different ecological zones in Sri Lanka.

Sweet Potato.

1. Study of Processing, Screening and storage of Sweet Potato.

2. Analysis of Poly Phenol compounds in Sweet Potato in relation to weevil infestation.

C. Other Root & Tuber Crops.

1. Study on Bio-Chemical changes during storage of Dioscorea.

2. Determination of Starch and Innala content in various Innala cultivars.

HALF YEARLY REPORT (1984-1985)

IDRC - SRI LANKA ROOT & TUBER CROPS PROJECT - PHASE 11.

Officers involved:
Dr. S.D.G.Jayawardene (Project Leader)
K.P.U.de Silva (R.O)
P.S.A.D.Prematilake (E.O.)
J.C.K.Basnayake (R.A.)
L.Dissanayake (A.I.)

S.Ekanayake (E.O. Food Technology)

Research Report on Root and Tuber Crops.
Yala 1984.

A. Cassava.

A.1. Cassava seedling evaluation programme.

Evaluation of cassava seedlings were continued during this period and it was able to test seven accessions under replicated yield trial against the standard variety mu.51. The experiment was laid out at CARI similar to previous years and the recommended cultural practices were observed throughout the study. The crop was harvested at 9 months maturity and observations were made on tuber yield, harvest index, physical and quality characteristics of tubers. (Table-1).

The cassava accession number CARI 492 has been outyielding others (47.32t/ha) including the check variety mu-51. This particular cassava line showed medium size in plant stature with moderate and late branching habit. The high value of its harvest index (62.5%) accompanied with these characters. The cooking quality of its tubers obtained a high level of acceptibility but the off white in colour inner tuber skin caused poor maketing value as compared with mu-51.

Table 1. Tuber yield (t/ha); harvest index (%) and cooking quality of tubers of 7 cassava seedling and the check variety mu-51.

Accussion Number.	Tuber yield	Harvest index	cooking quality.
CARI. 492	47.32a	62.5	excellent.
MU-51 (check)	35.97b	57.5	excellent
CARI. 305	33.43b	52.4	good
CARI. 355	27.78c	48.5	good
CARI. 376	23.15d	42.5	good
CARI. 454	21.60de	41.8	good
CARI. 361	20.66e	39.4	poor
CARI. 464	20.66e	38.5	good
C.V. (%)	22.66		

Values with the common letters are not significantly different at 5% probability level according to D.M.R.T.

A.2 *Cassava - Vegetable intercropping systems.

A study was conducted to find out the possibility of growing vegetables during the early stages of cassava growth and its porentiality in improving farmers income when vegetables are intercropped with cassava. The experiment was conducted by adopting relicated randomized completed block design during Oct. 1983 - June 1984 at CARI using the cassava var.cmc-84. The study was carried out under rainfed condition.

The treatments consisted of five viz. cassava-okra, cassava-bushitavo, cassava-tomato; cassava-winged bean; cassava-cucumber, and one cassava control.

Plant density of cassava was maintained at 12345 plants/ha. The vegetable seeds were dibbled simultaneously with cassava planting. Okra, tomato, winged-bean and cucumber were planted in the centre of every four cassava plants while two rows spaced at 30 cm between 2 cassava rows were maintained in respect of bushitavo. Three weeks after planting, seedlings of vegetable were thinned out leaving 2 plants per hill and stakes were provided for winged-bean as supporting material. Recommended cultural and fertilizer management practices were followed throughout the study.

All aspects of harvesting of bushitavo, cucumber, tomato, okra and winged bean were completed 70, 80, 90, 100, and 150 days after planting respectively. Ten plants of cassava from the harvestable area were reported to determine the final tuber yield at 9 months age. Data on labour units for manual weeding were recorded for each cassava-vegetable combination. Crop yield income was calculated at current market price with a view to evaluating the best cassava-vegetable combination with the highest gross return per unit area of land.

The maximum tuber yield (33.23t/ha) was recorded in monoculture of cassava which was no par with yields obtained from cassava-tomato and cassava-okra combinations (31.38, 31.7 t/ha respectively). However the key differences in yield between

the monoculture of cassava and the combination of cassava with winged bean, bushitavo and cucumber were found (Table-2).

Among vegetables cucumber showed the most dramatic effect in the reduction of yield compared to others. As intercrops, okra and tomato were non-competitive and more favourable to cassava since ~~the no~~ remarkable yield differences were recorded as compared with sole crop of cassava (Table-2 & 3).

Of the different vagetables tried with cassava, cucumber, tomato and bushitavo have given good results in terms of their pod yields (Table 2). The performence of winged bean was poor probably due to the poor light interuption since it is a long duration crop.

Table.2 Tuber fresh weight of cassava and pod fresh weight of vegetables in cassava-vegetable intercrop systems (t/ha).

Crop pattern	Tuber yield	pod yield
cassava (sole)	33.23a	-
cassava-cucumber	23.66c	44.52a
cassava-bushitavo	26.64b	10.56c
cassava-Tomato	31.38a	21.46b
cassava-winged bean	27.57b	2.25d
cassava-okra	31.17a	6.78c
CV (%)	4.38	10.44

Values with a common letter are not significantly different at 5% probability level according to D.M.R.T.

Table 3. Interspecific competition in cassava as affected by vegetable intercrops.

Crop pattern.	yield reduction of cassava (t/ha)	%yd reduction of cassava as affected by vegetables.
cassava (sole)	none	none
cassava-cucumber	33.23-23.66	29.60
cassava-bushitavo	33.23-26.64	19.83
cassava-tomato	33.23-31.38	5.56
Cassava-winged bean	33.23-27.57	17.03
cassava-okra	33.23-31.17	6.22

The gross return worked out in respect of cassava-vegetable combinations (Table 4) indicated that the highest gross return was obtained when tomato intercropped with cassava (Rs.77,185.00), followed by cassava-cucumber(Rs. 62,265.00), cassava-bushitavo (Rs. 62,220.00) and cassava-okra(Rs. 43,717.00). These values were significantly superior to monoculture of cassava(Rs.24,922.00).

Table 4. Gross return of cassava-vegetable intercrop system (Rs/ha)

Crop pattern	Cassava[a]	Vegetable[b]	Total
cassava(sole)	24,922.00	-	24,922.00
Cassava+cucumber	17,745.00	44,520.00	62,265.00
Cassava+bushitavo	19,980.00	42,240.00	62,220.00
Cassava+tomato	23,535.00	53,650.00	77,185.00
Cassava+Winged bean	20,677.00	9000.00	29,677.00
Cassava+Okra	23,377.00	20,340.00	43,717.00

a. Price of cassava = Rs. 750.00/t.

b. Price of vegetables.

1.	cucumber	= Rs.	1.00/kg.
11.	bushitavo	= Rs.	4.00/kg.
111.	tomato	= Rs.	2.50/kg.
1v.	winged bean	= Rs.	4.00/kg.
v.	okra	= Rs.	3.00/kg.

Introducing different kinds of vegetables between the cassava rows resulted in remarkably varied labour inputs and cost for weed control (Table 5). The highest labour input for weed control was recorded in monoculture. Considering the effects of different vegetables on weed control of cassava, it was observed that other than cucumber all vegetables did compete well with weeds,hence lower labour input required. The vigorous growth of cucumber cover the ground more rapidly, hence suppression of weeds as well as cassava growth was very distinct. The poorly developed cassava canopy which was not enough to cover the ground after the senscence of the cucumber.

This could explain the increasing labour units for weed control in this particular combination.

Table 5. Labour input and Labour cost for weed control in cassava-vegetable intercrop systems.

Crop pattern	Weed control	
	Labour units/ha	Cost Rs/ha.
Cassava(sole)	56	1960
Cassava-cucumber	44	1540
Cassava-bushitavo	36	1260
Cassavo-Tomato	36	1260
Cassava-Winged bean	32	1120
Cassava-Okra	36	1260

*This study was presented at the 40th annual session of SLAAS(Dece.1984) with the title of "Potentiality of growing vegetables with cassava in Mid country."

A.3 Cassava-Legume Intercropping systems:

Under different fertilizer management a field study was carried out in order to find out the effect of different grain legume intercrops on yield potential of cassava. The experiment was conducted with replicated block design during Maha 83/84 to Yala 84 at CARI by using cassava variety CMC-84. The soil on experimental site was clay loam having 0.145% total Nitrogen and the crop was maintened under rainfed condition.

Treatments consisted of 4 levels of fertilizer applications (Fo-No fertilizer, F_1 - Basal only; F_2 - Basal+TD-1 and F_3 - Basal+TD-1+TD-2) and 3 legume intercrops (LO-Non-legume; L_1 - Cowpea and L_2 - Black gram).

Fertilizer recommendation for cassava (Kg/ha).

	Basal	TD-1	TD-2
Urea	84	84	84
Conc super phosphate	120	-	-
Muriate of potash	120	60	-

Recommended plant density of 12345 per hectare was maintained for cassava and in which 2 rows of legume spaced at 30 cm were planted between 2 rows of cassav simultaneously with cassava planting. Other than the fertilizer management recommended cultural practices were observed for all treatments throughout the study.

All aspects of legume harvesting were completed in 3½ months and retained the intercrops stubble in the same plots. At 4½ months cassava growth and at harvest soil Nitrogen was analysed according to the treatments. At 9½ months age 8 plants of cassava from the harvestable area were uprooted to determine final root tuber yield, harvest index, tuber number per plant and mean tuber weight.

The data presented in Table 7 indicated that varying levels of fertilizer management and combination effects of fertilizer levels and the different legume intercrops had a significant effect on the yield potential of cassava. The yield of cassava under the monoculture(non-legume treatments) showed a high response to the different fertilizer levels, giving a steady increase of tuber yield with the increasing levels of fertilizer combinations. The non-legume treatment of cassava with basal and all top dressing applications has recorded the maximum tuber yield (35.97t/ha) which was significantly on par with other treatments.

Table 6: Tuber fresh weight of cassava (t/ha) as affected by different grain legume intercrops and varying levels of fertilizer management.

Level of fertilizer management	Tuber fresh weight. non-legume(LO)	Cowpea(L_1)	Black gram(L_2)	mean
No-fertilizer(F_0)	15.63d	25.19bc	23.56c	21.46c
Basal only(F_1)	24.03c	25.75bc	24.46c	24.46c
Basal+TD-1(F_2)	29.12b	24.70c	25.32bc	26.38ab
Basal+TD-1+TD-2	35.97a	26.54bc	26.65bc	29.97a
mean	26.19a	25.54a	24.99a	
C.V. (%)		7.66		

Values with the common letter are not significantly different at 5% probability level recording to D.M.R.T.

However, irrespective of the increasing fertilizer levels, cassava recorded more stable tuber yield with different grain legume under the intercropped condition. Data showed that the tuber yield variation in these treatment combinations laid on from 23.56-26.65t/ha, but which were not significantly different. (Table 6).

Further, results showed that the low fertilizer levels (no-fertilizer and basal only) growing of cassava with grain legume intercrops are more beneficial and economic. The non-legume cassava with no fertilizer treatment recorded the lowest yield (15.63t/ha) while at the same fertilizer level cassava-grain legume combinations obtained notably high yields(25.19 and 23.56t/ha for cassava-cowpea and cassava-black gram respectively).

A.4** Maturity studies on cassava:

The harvesting of cassava usually is done from the ninth month onwards. However, farmers generally believe that certain cassava cultivars mature early and could be harvested from 3-4 months on wards. In order to test this concept, a field study was carried out to determine the maturity parameters of some selected cassava cultivars, which are believed to be early maturing against the check variety mu-51 at different stages of growth.

The experiment was conducted with RCB design during Maha 83/84 to yala 84 at CARI. Thirteen cassava cultivars VIZ. cmc-84, mu-51, Embilipitiya selection, CARI-866, CARI-143, CARI-999, Wagolla selection, Batticoloa selection 1,2,3,4,5 and Kegalle selection-1 were studied in this experiment. The plant density was established at 12345 plants/ha with 90 x 90 spacing the crop was maintained under rainfed condition giving all recommended cultural practices throughout the growing periods

Sampling was started in the 5th month after planting and continued up to the 9th month, at monthly intervals. During each sampling 4 plants from each cultivar were uprooted and observations were made on following maturity parameters.

i. Tuber yield(t/ha)
ii. Mean tuber weight.
iii. Tuber number per plant.
iv. Harvest index.
v. Starch content.

The pattern of change in all the maturity parameters other than the tuber number per plant showed a particular trend along with crop growth.

Data on tuber yield (Table 7) indicated that with the increase in age of the crop the tuber yield increased steadily in all cultivars tested. At every stage Wagolla selection, Kegalle selection-1 and Batticolea selection-5 recorded higher yields which were not significantly different from the yield of check variety mu-51.

Similar to tuber yield, the increasing pattern of harvest index was observed withthe crop growth. Further, as far as harvest index was concerned, results clearly indicate significant difference among the cassava cultivars. (Table 8).

The tuber number did not show any difference while mean tuber weight was increased with age of the crop (Table 9 &10) At all growth stages maximum mean tuber weight was obtained with mu-51. Tuber number per plant varied with the variety and maximum tuber number was seen in Kegalle selection-1, CARI 143, CARI 866, Wagolla selection, Batticaloa selection 2 and 5 (Table 9).

The starch content in tubers increased with the age of the crop but there was no remarkable difference in the starch content among the tested cultivars (Table 11). The check variety gave maximum starch at every stage of growth.

Among the thirteen cultivats tested, the check variety recorded higher maturity parameters (except the tuber number plant) as compared to other cultivars. The potential yield of mu-51 at 9 month is about 35t/ha and in this study it was found that the yield of check variety at 5,6,7 and 8 months after planting is 34.8%, 44.5%, 60.8% and 22.2% respectively (Table 12).

** Paper presented at 40th annual session of SLAAS (Dece.1984) with the title of "Determination of maturity parameters at different growth stages in selected cassava (Manihot esculenta Crantz) cultivars.

Table 7: Tuber fresh weight of cassava cultivars at different stages of growth, (t/ha).

Cassava Cultivar	Months after Planting 5	6	7	8	9
CMC-84	7.28	10.64	19.13	24.69	29.31
MU-51	12.22	15.58	21.28	29.00	34.87
Embilipitiya Sel.	10.24	12.81	20.83	23.14	27.15
CARI-866	9.63	13.12	17.28	17.90	21.60
CARI-143	11.73	14.19	19.13	25.61	32.40
CARI-999	3.95	9.01	12.04	14.19	19.97
Wagolla sel.	13.33	16.51	23.76	29.01	33.94
Batticaloa sel-1	9.64	14.81	18.51	24.01	28.39
Baticaloa sel-2	8.51	11.42	16.54	19.13	23.14
Batticaloa sel-3	6.79	12.58	16.05	20.06	24.07
Batticaloa sel-4	4.94	12.80	20.37	21.91	26.23
Batticaloa sel-5	13.33	15.58	22.68	30.86	35.18
Kegalle sel-1	13.54	16.66	24.22	28.82	33.33
C V (%)	11.03	19.29	8.43	7.31	8.37
LSD(0.05)	2.24	3.52	3.54	2.74	5.14

Table 8: Harvest index of cassava cultivars at different stages of growth.

Cassava cultivar	Months After Planting. 5	6	7	8	9
CMC-84	26.24	30.64	34.15	39.71	48.71
MU-51	31.05	34.56	39.47	48.86	50.67
Embilipitiya sel.	32.39	35.11	40.64	44.03	45.76
CARI.866	27.19	27.61	28.4	31.93	35.00
CARI-143	28.45	30.57	33.11	36.87	40.75
CARI-999	15.06	26.44	27.59	30.10	31.42
Wagolla sel.	30.82	34.72	40.88	48.62	51.16
Batticaloa sel-1	32.38	34.72	36.75	43.40	46.70
Batticaloa sel-2	28.82	29.67	32.45	37.58	44.11
Batticaloa sel-3	25.64	32.82	36.13	41.43	47.85
Batticaloa sel-4	19.63	31.96	33.07	35.80	41.06
Batticaloa sel-5	32.21	31.37	37.80	49.7	51.35
Kegalle sel-1	30.12	33.12	39.60	51.3	54.54
CV (%)	6.04	5.16	4.86	3.24	6.13
LSD (0.05)	2.91	3.58	3.79	3.94	2.58

Table 9: Tuber number per plant of cassava at different stages of growth.

Cassava cultivar	Months After Planting 5	6	7	8	9
CMC-84	9	7	8	8	8
MU-51	8	9	8	8	9
Embilipitiya Sel.	8	7	8	9	9
CARI.866	10	10	11	11	10
CARI.143	12	11	12	10	12
CARI.999	5	4	6	6	5
Wagolla sel.	11	10	12	11	10
Batticaloa sel.1	8	10	10	9	8
Batticaloa sel.2	11	11	10	11	10
Batticaloa sel.3	7	10	8	9	9
Batticaloa sel.4	8	10	9	9	9
Batticaloa sel.5	10	11	12	11	10
Kegalle sel.1	11	12	12	12	11
CV (%)	28.51	22.40	30.55	18.49	25.64
LSD(0.05)	4.52	3.59	4.02	4.68	5.04

Table 10: Mean tuber weight of cassava at different stages of growth, (g/tuber).

Cassava cultivar	Months After Planting 5	6	7	8	9
CMC-84	65	123	194	250	296
MU-51	123	140	215	293	313
Embilipitiya sel.	103	148	210	208	212
CARI-866	77.5	101	127	131	145
CARI-143	79	105	129	207	210
CARI-999	62.5	143	162	191	229
Wagolla sel.	98	133	160	213	275
Batticaloa sel-1	87.5	107	160	216	287
Batticaloa sel-2	62.5	84	134	140	187
Batticaloa sel-3	78	104	162	180	216
Batticaloa sel-4	50	111	183	197	236
Batticaloa sel-5	102	117	150	227	285
Kegalle sel-1	86	104	163	194	245
CV (%)	7.15	10.81	9.03	5.93	7.19
LSD(0.05)	20.82	30.42	32.49	26.38	19.6

Table 11. Starch content of cassava tubers at different stages of growth (dry wt basis).

Cassava cultivar	Months After Planting			
	6	7	8	9
CMC-84	67.97	69.14	72.49	76.82
MU-51	69.14	72.49	77.60	79.42
Embilipitiya sel.	63.47	65.49	70.42	74.95
CARI-866	67.60	68.49	72.49	72.90
CARI-143	60.14	67.45	70.60	72.47
CARI-999	60.08	64.49	71.49	73.42
Wagolla sel.	60.08	67.49	73.95	75.92
Batticaloa sel.1	66.76	70.42	74.42	76.31
Batticaloa sel.2	62.49	66.95	73.47	76.20
Batticaloa sel.3	62.49	69.49	72.95	75.27
Batticaloa sel.4	67.6	70.42	76.47	78.50
Batticaloa sel-5	67.97	69.60	74.76	75.42
Ketalle sel.1	64.95	67.60	74.6	76.8

Table 12. The Percentage of tuber yield of standard var. MU-51 at different stages of growth.

Months after Planting	Tuber yield t/ha.	% yield potentiality
5	12.22	34.80
6	15.58	44.50
7	21.28	60.80
8	29.00	82.20
9	34.87 =35.00	100.00

A.5. Weed control studies in cassava.

Tuber yields of cassava affected by weeds which are competing for nutrients, light, water and other resources. However, megre attention has been paid on which stage weeds are more critically affecting the yields of cassava. Hence, a field study was conducted at CARI during Maha 83 to Yala 84 to determine the effects of time of weeding on productivity of cassava.

Using variety C.M.C. 84 the experiment was laid out by adopting R C B design. The treatments consisted of nine mannual weed control practices and two controls. All detail regarding treatments are follows:

W_0 - Control without weeding.
W_1 - Weeding upto one month after Planting.
W_2 - Weeding upto two month after planting.
W_3 - Weeding upto three months after planting.
W_4 - Weeding after four months after planting.
W_5 - Weeding from one month after planting.
W_6 - Weeding from two months after planting.
W_7 - Weeding from three month after planting.
W_8 - Weeding from four month after planting.
W_9 - Control with weeding.
W_{10} - Circular weeding.

Other than the controlling weeds all recommended management and cultural practices were followed throughout the study under the rainfed condition. Data gathering was done at harvest (9½ months) and observations were made on tuber yield, harvest index, and mean tuber weight.

Table 13. Tuber yield of cassava as affected by stage of weeding (t/ha).

Weed control system	Tuber yd.
W_0 - Control without weeding	17.23e
W_1 - Weeding upto 1 MAP.	25.46c
W_2 - Weeding upto 2 "	29.32d
W_3 - Weeding upto 3 "	34.72bc
W_4 - Weeding upto 4 "	37.03 ab
W_5 - Weeding from 1 "	32.4 c
W_6 - Weeding from 2 "	32.4 c
W_7 - Weeding from 3 "	29.32d
W_8 - Weeding from 4 "	23.66f
W_9 - Control with weeding	39.35a
W_{10} - Circular weeding	31.12cd
C.V. (%)	8.32

Values with the common letters are not significantly different at 5% probability level according to D.M.R. test.

Good weed control is important because cassava is a poorly competitive species. The same hold true in the present study where highest (39.35 t/ha) and lowest (17.23t/ha) tuber yield recorded in the treatments of control with and without weeding respectively (Table 13). Further, results indicated that the degree of suppression of cassava growth by weeds was least in the treatments where early weeding have been done (W_3 , W_4 & W_5). In these weed control systems cassava did compete well with weeds due to its closed canopies at the latter stages similar to control with weeding throughout the growth cycle of cassava (W_9). Presence of weeds with the early stages of cassava retarded its growth distinctly. Therefore, it resulted poorly developed cassava canopies which were not enough to cover the ground at the latter stages to keep itself weed free (W_1, W_2, W_7, & W_8). This leaded to appear more weeds in the ground to compete with cassava throughout its growth.

However, the weed control system which keep weed free around cassava plants (Circular weeding, W_{10}) showed some beneficial effects giving relatively high tuber yields (31.12t/ha). But this type of weed control practice is much more relevent to backyard cropping system unlike to the large scale of cassava planting.

In general, it can be concluded that cassava yields can be greatly increased by eliminating weed competition during the initial growth periods. Until a complete canopy is formed, attention generally should be paid to control weeds.

A.6. Coordinated varietal evaluation Programme.

Eleven cassava entries which include four present promissing cassava varieties and seven new CARI hybrid lines were tested at 9 different ecological locations as coordinated trials during Maha 83/84 to Yala 84. The experimental details were similar to previous seasons and recommended cultural practices were followed throughout the 10 months growing period under the rainfed condition. Data presented in Table 14 indicate the tuber yields of cassava entries at different locations in 10 months maturity.

Most of the trials located at wet zone were subjected to water logged conditions during their later parts of growth. This caused rottening of tubers especially at CARI Makandura and Bombuwela. Therefore the trial at CARI has to abonded. The trials at Aralaganwila and Girandurukotte were also subjected to water logged condition as they were laid out at poor drainage conditions. These unavoidable cirmumstances did not reveal the real picture of the performances of cassava entries. Highest location mean yield was recorded at Monaragala and lowest recorded at Aralaganwila. (Table 14).

Since the cassava is long term crop and it needs quite a large area of plot size to layout the experiment, it is difficult to maintain a large number of entries in coordinated trials. Hence, it is suggested to reduce the number of entries and this will be practiced during next season.

Table 14: Yields of cassava varieties(t/ha) at different locations during Maha 83/84
Yala 84 (N.C.V.T)

Variety	Locations									
	A'ganvila	B'uwela	G'Kotte	CARI	Monaragala	Makadura	M'Deniya	K'Aru	V'Villu	mean
CARI 866	3.54	3.84	3.21	-	16.12	4.06	-	12.08	9.602	7.49
CARI 103	5.62	4.32	17.36	-	16.87	23.71	7.15	19.54	27.26	15.22
CARI 109	5.04	8.78	24.43	-	24.34	15.02	11.31	14.02	16.11	14.87
CARI 111	1.82	7.06	14.27	-	23.66	11.83	11.08	21.19	23.49	14.33
CARI 112	2.43	6.37	17.59	-	30.10	7.92	10.48	12.98	20.57	13.55
CARI 113	1.66	4.66	10.10	-	18.19	9.98	9.62	14.17	13.03	10.17
CARI 114	2.04	11.48	10.93	-	24.82	14.19	9.31	15.68	14.40	12.93
MU-51	10.65	5.55	18.38	-	33.40	14.09	6.95	17.74	25.37	16.51
CMC-84	4.78	4.08	32.02	-	32.23	16.04	8.74	20.96	21.26	17.52
Philippino	3.79	2.71	14.01	-	27.77	-	10.74	16.40	20.40	13.68
Wagolla	6.99	-	19.29	-	32.23	13.47	-	12.44	-	16.86
Farmers var.	-	-	-	-	-	-	6.68	-	-	6.68
Mean	4.45	5.88	16.50	-	25.43	13.02	9.21	16.11	19.14	
CV(%)	24.61	41.81	63.36	-	36.29	55.22	12.42	32.55	30.31	
LSD(0.05)	0.45	0.99	ns	-	ns	ns	1.06	ns	2.35	

B. Sweet Potato.

B.1. Crop improvement:

Under the breeding programme of sweet potato, 25 selected hybrid lines were further tested under field condition in a replicated yield trial. Lay out of the experiment and its management practices were similar to previous season. Unlike the previous season the crop showed some what poor growth since it was planted during late Yala. This resulted to subject the crop to dry spell during its latter stages of growth.

Root tuber yields were recorded at the age of 4 months and tuber samples were evaluated for their cooking qualities (Baking index). Data presented in Table 15 showed that the new CARI lines; 242, 248, 311, 223, 266 and 315 significantly superior in yields than the others. The particular sweet potato line CARI 242 had smooth, well shaped, red purple enter skin and yellowish flesh colour. It showed very minimum colouration of browing when freshly out (observed after 5 minutes) and moderate level of sweetness (6.0%, brix value). The over all quality as determined by baking index (Table 15) revealed the maximum value for this particular line and which is being multiplied at CARI to include it as an entry for NCVT in Maha 84/85.

B.2. Plant density studies on sweet potato:

In the germplasm collection there were three types of sweet potato namely bush, semi-vine any viny. However, at present the plant spacing recommendation for sweet potato was same irrespective of its plant types. Hence, a field experiment was carried out at CARI during Yala 84 in order to find out whether there was a yield variation under varying plant densities of different plant types of sweet potato.

By adopting RCB design three sweet potato varieties: C-26 (bush), Wariyapola (semi-vine) and B-1 (Viny) were used in this study in combination with four plant densities: 46296 (S_1), 55555 (S_2), 69444 (S_3) and 92592 (S_4) plants/ha. Other than the plant spacing recommended cultural and management practices were observed throughout the experiment under the rainfed condition. Observations were made on at harvest (3½ MAP) for final tuber yield.

Table 15. Tuber yield and Baking index of selected sweet potato hybrid seedlings.

Accession Number (CARI)	Tuber yield t/ha	Quality (Baking index)
242	17.24	6.94
248	16.89	4.68
311	14.81	6.28
223	14.24	5.90
266	13.19	-
315	12.73	-
214	12.61	-
213	11.92	5.23
289	11.11	4.97
294	10.06	5.43
216	9.83	5.73
226	9.72	5.47
292	9.72	5.09
247	9.72	5.88
258	9.61	4.26
231	9.37	-
310	8.68	6.74
278	8.22	-
314	7.63	-
271	7.29	5.54
250	7.17	4.66
260	7.17	5.16
291	6.82	6.28
303	6.24	5.40
217	6.13	5.42
CV (%)	23.12	

LSD (0.05) value for comparision of means between two entries is 4.54 t/ha.

Table 16 Root tuber yield of sweet potato (t/ha) as affected by different plant types and varying plant densities.

Plant density	Plant Type Bush (C-26)	Semi-Vine (Wari)	Viny (B-1)	Mean
S_1 (60 x 36 cm) 46296 plts/ha	13.19e	17.98d	30.55a	20.57
S_2 (60 x 30 cm) 55555 plts/ha	13.46e	18.59cd	25.53b	19.17
* S_3 (60 x 24 cm) 69444 plts/ha	18.24cd	21.18b	22.45b	20.62
S_4 (60 x 18 cm) 92592 plts/ha	21.56b	13.85e	16.78d	17.39
CV (%)		12.14		

Values with the common letters are not significantly different at 5% probability level according to D.M.R.T.
* Departmental recommendation.

Data presented in Table 16 indicated that different plant types of sweet potato varieties with varying plant densities and their combination effects had a significant effect on the final tuber yield of sweet potato. Maximum yields for 3 different plant type were obtained at 3 different plant densities. The highest tuber yield for bush type(C-26) (21.56 t/ha) was recorded at highest plant density (92592 plts/ha), while the lowest plant population showed maximum yield by viny type (B-1) varieties (30.55t/ha). The present Departmental recommended plant spacing (69444 plts/ha) was suitable for semi-vine type of varieties showing highest yield (21.18t/ha) in this study.

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B.3 Screening of sweet potato hybrid lines for Sweet potato Weevil (Cylas formicarious).

A study on degree of sweet potato weevil attack on different sweet potato hybrid lines was carried out in CARI during the period Yala 84 with 26 hybrid lines of Sweet potato.

The degree of sweet potato weevil attack was related with some of the tuber morphological characteristics such as neck length, skin thickness and biochemical characteristics such as sugar content, latex content and colour of the tuber.

The statistical analysis of the results revealed that the average number of weevil, larvae and maggot per plant has a significant effect on percentage of damage and positive correlations were observed between mean number of weevil, larvae and maggot per plant and damage percentage ($r= 0.761^{**}, P=0.01$) and mean number of weevils and maggot per plant and sugar content of flesh ($r=0.482^{*}$; P.0.05).

Significant negative correlations were observed in relationships between skin thickness and number of weevil, larvae and maggot per plant ($r=-0.401, P=0.05$) and average neck length and mean number of weevil, larvae and maggot per plant ($r= -0.866^{**}$, $P=0.01$). It was observed that the degree of weevil

attack was affected by the colour and latex of the tuber too.

The experimental results of this study clearly indicated that the above mentioned tuber characteristics both morphological as well as biochemical could be used as selection criterians against the weewil attack on sweet potato in a breeding programme.

On the basis sweet potato hybrid lines those were considered in this study could be catergorized into three groups such as relatively high resistant hybrid lines, moderately resistant hybrids and least resistant hybrid lines against the weevil attack.

The hybrid line CARI 265 which had the lowest amount of weevil population showed the least value of damage percentage (10.77%).

When the biochemical character of tubers such as latex content was considered the higher the degree of latex content in the tuber the lower would be the damage percentages. This was observed in CARI 208, CARI 255 and CARI 205 which had high degree of latex content and low damage percentages 31.4%, 31.41% and 32.1% respectively.

The percentages of damage was found to be low in long necked and thick skinned tuber. This could be noticed in CARI 205, CARI 255, CARI 265 and CARI 208 which showed low values of damage percentages 32.10%, 31.41%, 10.77% and 31.4% respectively.

The hybrid lines which show the following characters on high latex content long neck length and thick skin could be considered as moderately high relative resistant against the sweet potato weevil. The hybrid lines CARI 208, CARI 255 and 205 showed such a resistance to weevil infestation.

(***A research project was carried out by Miss.P.Sachithanandan for partial fulfilment of requirements of the Advanced course in Genetics and Plant breeding for the Degree of B.Sc in Agriculture 1984, University of Peradeniya under the supervision of Mr.K.P.U.de Silva R.O., IDRC- Root & Tuber crops project.)

Table 17. Yields of Sweet Potato varieties (t/ha) of different location during Yala 84 (N.C.V.T.)

Variety	Locations.									
	A'Pellesse	A'Ganwila	Bombuwela	CARI	G'Kotte	Makandura	Maldeniya	Pussellawa	Total	Mean
Bentota-A	-	33.84	6.32	10.03	11.54	9.08	4.24	9.25	84.30	12.04
B_1	6.11	18.19	3.95	10.57	16.92	2.88	4.62	13.88	77.12	9.64
C_{26}	2.16	-	5.12	10.80	25.16	4.07	5.47	11.95	64.73	9.25
CARI-9	1.79	6.45	7.33	16.28	25.38	10.38	8.10	19.36	95.07	11.88
CARI-99	3.24	28.84	6.17	15.12	20.37	6.71	6.55	15.97	102.97	12.87
Cinchi	1.95	7.53	5.32	12.65	20.61	3.65	5.40	13.88	70.99	8.87
Wariyapola	4.47	28.45	6.17	11.57	26.80	7.62	5.86	9.33	100.27	12.53
Mean	3.29	20.55	5.77	12.43	20.97	6.34	5.75	13.37		
CV(%)	51.00	37.02	34.07	15.75	22.86	39.97	11.65	34.12		
LSD	.689	2.91	ns	.531	1.31	1.98	ns	ns		

Farmers field.

B.4. Coordinated Varietal Evaluation Programme(N.C.V.T.)

Seven promissing sweet potato varieties including two CARI hybrids CARI 9 and 99 were tested again at 8 location during this period. The experimental details were similar to previous season and at every location recommended cultural practices were observed throughout the crop period obher than the management practices of water. The crop at Agunukolapallessa, Aralaganwila and Girandurukotte was irrigated whenever needed and at other locations the crop was maintained under rainfed condition.

Tuber yields were recorded at the age of 3½ months and presented in Table 17. Data revealed that except in Mahaweli area (Aralaganwila and Girandurukotte) the performance of all the varieties were relatively poor as compared with previous season. This might be due to unusual weather condition lead to high precipitation water logging conditions and such condition were unfavourable for the growth of sweet potato. However, under these adverse conditions the new CARI lines appeared to be more promising giving high yields in most of the location. (Table 17).

C. Dioscorea, Cocoyam, Innala and other root crops.

Most of these crops are seasonal and the related experiments of these are still in progress.

D. Collection, Conservation, Cataloging and Evaluation of germplasm:.

Erosion of genetic resources is a problem that haunts all indigeneous root crops species. Steps have been taken to collect, catalogue, evaluate and conserve as much of this variability as possible from within the island. The Root crop division has already been able to identify a number of types possessing a range of desirable characters. They will be utilized both for direct cultivation and for use as parents in hybridization programmes. Simultaneously, action has been initiated to introduce germplasm from CIAT, AVRDC (Thaivan) and VISCA (Philippines) also.

By adding fair range of germplasm from both Sri Lanka and abroad the total collection raised as of following.

1. Cassava: 120	Varieties		10
	Selected evaluations		20
	Selected seedling		90
2. Sweet potato: 71	Varieties		08
	selected seedling		40
	cultivars		13
	Introduced var (Thaiwan)		10
3. Dioscorea: 29	D.alata		19
	D.esculenta		5
	D.rotundata		2
	D.bulbitera		2
	Katuala		1
4. Aroids (Cocoyam) 16	Xanthosoma		08
	Cocacasia		07
	Alocasia		01
5. Innala (Solenostemon rotundifolious) 19	Cultivars		19
6. Others.			
a. Arrow roots (Maranta Arundinacea)			01
b. Artichoke (Helanthus tuberosus)			01
c. Amorphallus (Elephant yam)			01
d. Ginger			01
e. Turmeric			01

Half Yearly Report (Maha 84/85)

Root & Tuber Crops

IDRC Root Crops Project

Phase - II

Officers involved:

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Research Report on Root and Tuber Crops
Maha 1984 - 1985

A. Cassava

A.1 Evaluation programme of open pollinated cassava Seedlings.

During the Phase 1 of IDRC Root Crops project it was able to raise 1058 seedlings from locally collected true seeds by natural polination. After the initial evaluation made by single plant replication trials on the basis of yield parameters, plant type and maturity, 90 seedlings were selected for further advance testing. Upto the last season among the population of this selected 90 seedlings, it was able to test 77 accessions under the advance yield trials compared to widely accepted varieties Mu-51 and CMC-84. Resulting from these studies 3 hybrids namely CARI 492, 526 and 555 were found to have good yield potential with good culinary qualities and included as entries for National Coordinated varietal trials since 1983.

The remaining 13 cassava seedlings laid out in advance yield trial in RCB design with standard variety Mu-51, were harvested during Maha 1984/85 period and presented in Table 1. Among the seedling CARI 899, 881 and 642 showed significantly higher yield of tuber per hectare than the standard variety MU-51. All of the entries were on par with CARI 899 with regards to tuber yield per hactare. However, this particular line had white inner and outer skin caused poor marketing value. None of the tested seedlings in this experiment was as good as Mu-51 with regard to culinary qualities although most of them were fairly good for cooking.

A.2 Cassava-Legume Intercrop systems.

A repetition of intercropping study was carried out at CARI during Yala 84 to Maha 85 by adopting the same experimental procedures similar to the previous trial conducted during Maha 82/83 to Yala 83. (Research Report - Yala 83). In this study, the effect of grain legume

(Black gram , Cowpea and Lanka Kadala) and their planting patterns under two spatial arrangemer: of cassava on yield and land utilization were determined.

As in previous trial the yield of cassava monoculture was significantly higher than those of all cassava-black gram combinations except that of cassava-blackgram (Table 2). Further, the double row planting arrangement of cassava proved to be more favourable producing higher tuber yield as well as legume yield since, it has less competitive effects on legume and tuber yield itself (Table 2 and 3). In addition, black gram significantly outyielded the other two legumes.This observation again proved that as an intercrop black gram showed more favourable combination with cassava as compared with other two legumes.

Table 1: Tuber yield (t/ha) and harvest index of cassava seedlings and the check variety Mu-51. Seasons Yala 84 - Maha 84/85, CARI.

Accession No.	Tuber yield	HI. (3)
CARI 899	36.11	57.7
881	33.69	55.32
642	27.36	53.07
921	27.66	48.57
MU-51 (check variety)	23.24	53.6
410	19.75	44.27
339	18.98	50.32
823	16.92	45.80
16	13.68	52.20
959	13.12	46.42
65	12.08	47.16
1001	7.50	51.80
181	7.41	40.50
CV(%)	25.81	

Table 2: Tuber yield of Cassava (Var. CMC-84, t/ha) as affected by row arrangement of cassava and different grain legume intercrops. Seasons: Yala 84 - Maha 84/85 CARI.

Planting pattern	Cassava - Legume Intercrop systems.				
	Non-legume	black gram	cowpea	Lanka Kadala.	mean
Single-row arrangement	24.65b	24.07b	18.30b	15.04e	20.51b
Double-row arrangement	27.08a	24.57b	24.91b	22.17c	24.68a
Mean	25.86a	24.32a	21.60bc	18.60c	
CV(%)	5.01				

Values with a common letter are not significantly different at 5% probability level according to D.M.R. Test.

Table 3: Grain yield of legume intercrops (Kg/ha, 20% M.C.). Seasons: Yala 84 - Maha 84/85. CARI.

Planting Pattern of Cassava.	Grain Yield			
	black gram	cowpea	lanka kadala	mean
Single-row arrangement	720b	596c	471d	595.66
Double-row arrangement	826a	711b	495d	677.33
MEAN	733a	653.5b	483c	
CV(%)	5.32			

Values with a common letter are not significantly different at 5% probability level according to D.M.R. test.

A.3 Cassava - Vegetable Intercrop systems.

Another repetition of study was conducted during Yala 84 to Maha 84/85 at CARI to find out the possibility of growing vegetables with cassava in Mid country wet zone. Experimental details were similar to previous trial (Research Report - Yala 84) and tomato, winged bean, okra, bushitavo were intercropped with cassava variety MU-51. All cultural and fertilizer management practices were followed similar to previous study except the use of organic manure to tomato in the present study.

Unlike the previous study the tuber yield of cassava in cassava-tomato combination recorded the maximum yield (45.61 t/ha) which was on par with yields obtained of from all other vegetable-cassava combinations and the sole crop of cassava. However, the tuber yield of cassava between monoculture and cassava-tomato combination were not significant in the past study (Research Report - Yala 84). The present variation might be attributed to adding additional organic manure to tomato which substantially affect to increase the tuber yield of cassava-tomato combination. Hence, as an intercrop tomato showed non-competitive and more favourable effects to cassava as compared to other vegetables.

The combination of cassava with tomato gave significantly higher monetary returns (Rs. 89657.00/ha), followed by cassava-cucumber (Rs. 63665.00/ha), Cassava-Okra (Rs. 42262.00/ha) and cassava-winged bean (Rs. 39540.00/ha). These values were significantly superior to monoculture of cassava (Rs. 28807.00/ha). (Table 5)

Table 4: Tuber fresh weight of cassava and pod fresh weight of vegetables in cassava vegetable intercrop system (t/ha). Season: Yala 84 - Maha 84/85.

Crop-Pattern	Tuber yd yield	Pod yield
Cassava(sole)	38.41b	-
Cassava-cucumber	27.32c	46.29a
Cassava-Bushitavo	34.75c	10.28c
Cassava-tomato	45.61a	22.18b
Cassava-winged bean	30.86d	4.11e
Cassava-Okra	30.63d	6.43d
CV(%)	10.09	10.21

Values with a common letter are not significantly different at 5% probability level according to D.M.R. Test.

Table 5: Gross return of Cassava-Vegetable intercrop system (Rs/ha)

Crop pattern	Cassava[a]	Vegetable[b]	Total
Cassava (Sole)	28807.00	-	28807.00
Cassava-Cucumber	22545.00	46290.00	63665.00
Casava-Bushitavo	23662.00	41120.00	64782.00
Cassava-Tomato	34207.00	55450.00	89657.00
Cassava-Winged bean	23100.00	16440.00	39540.00
Cassava-Okra	22972.00	19290.00	42262.00

a. Price of Cassava = Rs. 750/t

b. Price of Vegetable

1. cucumber = Rs. 1.00/kg
11. bushitavo = Rs. 4.00/kg
111. tomato = Rs. 2.50/kg
1V. winged bean = Rs. 4.00/kg
v. okra = Rs. 3.00/kg

A.4 Introduction of Cassava.

For the first time of Sri Lanka exotic genetic stocks of cassava were introduced legistatively from CIAT, Colombia during this period. Seeds of 30 lines, 50 seeds per line (Table 6) were received ((1500 seeds) and they are being germinated under quarantine condition at CARI for initial evaluation.

Table 6: Description of germplasm received from CIAT (Feb 1985).

Identification	Parents	Seeds.
CM 4009	CM 727-38/CM 992-2	50
CM 4011	CM 728-2/CM 681-2	50
CM 4012	CM 728-2/CM 349-1	50
CM 4054	CM 1015-34/CM 849-1	50
CM 4105	M.Col 1468/CM 922-2	50
CM 4397	M.Col 2207/CM 1335-4	50
CM 4504	M.Cub 65/M.Cub 74	50
CM 4830	M.Col 1823/M.Col 1468	50
CM 4836	M.Col 1468/M.Cub 31	50
CM 4912	M.Col 2207/CM 507-37	50
CM 4992	CG 1-62/M.Ven 185	50
CM 5007	CG 5-55/M.Col 1468	50
CM 5046	CM 847-11/CM 955-2	50
CM 5371	CM 1983-3/CM 955-2	50
CM 5436	M.Bra 12/M.Bra 5	50
CM 5452	M.Col 22/Cg 22-2	50
SM 443	M.Bra 12	50
SM 445	M.Col 1468	50
SM 446	M.Col 1505	50
SM 450	M.Col 1826	50
SM 451	M.Mal 2	50
SM 452	M.Tai 1	50
SM 458	CG 1-37	50
SM 462	CG 22-2	50
SM 470	CM 962-4	50
SM 474	CM 982-20	50
SM 481	CM 1305-3	50
SM 500	CM 523-7	50
SM 534	M.Cub 32	50
SM 536	M.Cub 51	50
Tatal		1500

B. Sweet Potato.

B.1 Crop improvement.

1a. Focussing on evolution of lines having higher tuber yield, good cooking qualities, desirable plant type and field tolerance to weevil, a crop improvement strategy of sweet potato was started through polycross method during Yala 1982 (Phase-1, Research Report - Yala 1982). This polyculture nursery has been mainly compromised with indigenous superior genotypes and majority of true hybrid seeds obtained from control pollination were planted to raised seedlings. The initial population, having 211 hybrid seedlings was screened (Research Report - Maha 82/83) and 48 selections were made (Research Report - Yala 83).

In the advance yield trials, they were compared with the widely accepted varieties Cinchi, B-1, Wariyapola and C-26. Resulting from these trials 3 hybrids namely CARI-9, 242 and 271 were found to have good yield potential with good culinary qualities. They were clonally multiplied at CARI and included as entries for NCVT.

In advanced evaluation trials conducted at Pussellava and CARI during Maha 84/85, these 3 lines have been found to be superior in yields giving 31.66, 27.03, 23.88 t/ha for CARI 242, 271 and 9 respectively at Pussellawa and 27.66, 24.66, t/ha for CARI 242 and 271 respectively at CARI. These values were significantly superior to yields recorded by the check varieties (Table 7 and 8).

1b. Open pollinated seeds of the same polyculture nursery were germinated to raised seedlings during this period. Out of 155 seedlings, 124 were screened for field evaluation (Table-9) which will be done at CARI during Yala 85.

Table-9: Parents and accession numbers of newly raised open pollinated sweet potato seedlings.Season Yala 84, CARI.

No of seedlings	Parents ($\overset{\circ}{+}$)	Accession No.
40	C-56	323-362
63	A-1	363-425
01	CARI-99	426
06	Cinchi	427-432
01	B-1	433
13	A-25	434-446
124 (total)		

Table 7: Tuber yield of 24 sweet potato hybrid seedlings and 4 check varieties. Season: Maha 84/85, Pussellawa.

Accession No./Variety	Yield (t/ha)
CARI 242	31.66
271	27.03
09	23.88
249	22.59
Cinchi (check)	21.85
Wariyapola(check)	21.40
CARI 218	20.18
247	20.18
B-1 (check)	19.62
CARI 297	19.25
214	18.88
223	18.33
291	17.96
303	16.24
226	15.55
217	15.36
300	14.81
C-26(check)	14.63
CARI 208	14.62
248	13.51
266	13.33
260	12.96
296	12.96
216	12.59
258	12.40
294	11.66
304	9.62
205	8.14
CV (%)	20.55
LSD (0.5)	5.74 t/ha.

Table No. 8 Tuber yield of 26 hybrid Sweet potato seedlings (t/ha), Season: Maha 84/85, CARI.

Accession No.	Yield (t/ha)
CARI 242	27.66
271	24.76
223	23.26
281	21.75
218	21.6
Cinchi (check)	20.9
248	20.8
208	19.07
216	18.05
284	18.05
203	17.8
282	15.62
255	15.04
215	14.8
211	12.84
247	11.80
260	10.76
285	10.06
213	10.06
207	9.60
266	7.75
258	7.29
205	6.96
214	6.02
249	4.39
212	4.39
219	3.35
CV (%)	25.33
LSD (0.5)	9.16 t/ha.

1c. As the on going crop improvement programme has been mainly confined to the indigenous population a new polycross nursery was established at CARI with 20 exotic and indigenous superior genotypes (Table-10) with the aim of combining all possible crosses naturally to increase the genetic variability.

Table- 10: Entries included for new poly-cross nursery, Season; Yala 84, CARI.

Variety/Accession No.	Country/Source.
1. Wariyapola	Sri Lanka
2. Bentota-A	Sri Lanka
3. Cinchi	-
4. Belibatala	Sri Lanka
5. Dandila	Sri Lanka
6. Geogia-red	-
7. CARI-9	Sri Lanka
8. CARI-99	Sri Lanka
9. CARI-223	Sri Lanka
10. CARI-242	Sri Lanka
11. VSP-1	VISCA
12. B-1	IITA
13. C-26	IITA
14. Selection-11	Sri Lanka
15. 1421-56	AVRDC
16. CN-1108	AVRDC
17. VSP-2	VISCA
18. AIS	AVRDC
19. CN-1367	AVRDC
20. VSP-3	VISCA

1d. Since the crop improvement strategy has been confined mainly to the indigenous breeding population, introduction of superior exotic genotypes were done to increase the genetic variability. Three Philippines (VISCA) and ten Taiwan (AVRDC) lines were received.

B.2 Plant density studies.

A repetition of density trial carried out at CARI in order to find out whether there was a yield variation under different plant densities of varying plant types of sweet potato. By adopting same experimental procedures similar to last season the study was carried out by using 3 sweet potato varieties C-26 (bush), Wariyapola (semi-vine) and B-1 (viny).

Data presented in Table-11 agree with the findings obtained in past trial (Research Report - Yala 83) which showed that the tuber yield of bush, semi-vine and viny types of sweet potato varied with the different plant densities. In the present study similar to previous results, the highest tuber yield for bush type (21.85 t/ha) was recorded at highest plant density (92592 Plant/ha), while the lowest plant population (46296 plant/ha) obtained maximum yield by viny type (29.13 t/ha). Semi-vine type of variety showed its highest yield response (24.33 t/ha) at the present departmental recommended plant spacing (69444 plants/ha).

Table 11: Root Tuber yield of sweet potato (t/ha) as affected by varying plant types and different plant densities. Maha 84/85, CARI.

Plant density	Plant Type Bush (C-26)	Semi-vine (Wari.)	Viny (B-1)	mean
46296 plts/ha (60 x 36 cm)	13.80 e	16.70 d	29.13 a	19.88 c
55555 "/ha (60 x 30 cm)	16.40 d	17.73 d	25.33 b	19.82 c
69444 "/ha (60 x 30 cm)	18.73 cd	24.33 b	21.36 c	21.47
92592 "/ha (60 x 18 cm)	21.85 e	19.16 c	17.33 d	19.43
mean	23.38	19.48	17.70	
CV (%)		20.28		

Values with the common letters are not significantly different at 5% probability level according to D.M.R.T.

B.3 Farmers Field Trials.

As the experiment station is not located in an environment representive of most farms, the determination of technology created by experiment station under farmer's field was more appropriate. Hence, trials involving varieties were conducted at 3 farmer's fields at different locations namely Pangolla, Rikillagaskada and Pallekelle. These three field studies were laid out in replicated block design involving advance selection materials of CARI hybrids, present accepted varieties and local traditional cultivars.

Data presented in Table 12, indicated that a CARI hybrids namely CARI 242 and 9 having highest yield at every locations and consistently outyielded the local traditional cultivars and some present accepted varieties.

Table 12: Tuber yield of sweet potato (t/ha) at farmer's fields. Season: Maha 84/85.

Variety/Accession No.	Location		
	Pangolla	Pallekele	Rikillagaskade
CARI-9	20.76	20.37	34.56
CARI-242	22.22	19.13	33.95
CARI-304	18.75	-	24.19
Cinchi	17.01	14.56	31.60
CARI-315	13.47		-
CARI-99	11.38	13.37	25.55
Wariyapola sel.	10.97	13.17	21.72
C-26	10.32	11.52	15.92
B-1	10.97	4.88	22.46
Local var-1	5.90	-	23.33
Local Var-2	-	-	23.46
CV(%)	22.25	17.02	9.15
LSD (.05)	5.45	4.13	4.11

B.4 Studies on cultural control of Sweet Potato weevil (Cylas formicarius)

To find out the cheaper source of weevil control with locally available green manures, a study was conducted at CARI with the leaves of Clyricidia, cassava and wild sunflower. (@ 5 t/ha). By using the Sweet potato variety Cinchi the trial was laid out in RCB design. All recommended cultural practices were followed throughout the crop growth and the green manures were used to mulch the crop $1\frac{1}{2}$ and $2\frac{1}{2}$ months after planting.

Weather data indicated that during the experimental period the temperature was low and the total rainfall was high. Both climatic factors (T° & RF) deteriorated the rate of multiplication of weevil and consequently no significant differences of percentage of tuber damage, mean population of weevil and larvae were observed among the treatments (Table 13). The same trial will be repeated next season at CARI.

Table 13: Percentage of tuber damage, mean population of weevil and larvae of sweet potato as affected by mulching of different green manures. Season: Maha 84/85, CARI.

Green Manure	Percentage of Tuber damage	Mean Population	
		Weevil	Larvae
G_0(Control)	7.00	1.66	23.00
G_1(Glyricidia)	8.16	2.00	23.66
G_2(cassava)	9.36	2.00	21.00
G_3(Wild Sunflower)	7.66	2.00	23.00
CV (%)	35.41	32.21	20.54

B.5 Studies on cultural operations.

Studies indicated that control of vine growth and the level of soil Nitrogen had a significant effect on final tuber yield of

viny types of sweet potato (Research Report - Yala 83 & Journal of Agricultural science Vol 20 1983). At the low nitrogen levels vine control was not necessary and a moderate control of vine growth such as turning over vines would be most beneficial at a moderate level of nitrogen (46 kg N/ha). Excessive nitrogen favours excessive vine growth, indicating the need for more extensive control of vine growth to obtain high yields in viny type of varieties. However, this concept would not be applied to bush and compact viny types (semi-vine) of varieties. Hence a field study was carried out at CARI to determine the effect of varying levels of nitrogen and control measures of vine growth on final tuber yield of bush and semi-vine types of varieties.

Using the sweet potato varieties c-26 (bush) and Wariyapola (semi-vine) the experiment was laid out in the form of factorial randomized block design with 3 replications. The treatment consisted of 4 levels of nitrogen as urea viz. 0, 25, 50, 100 kg N/ha and 2 methods of control of vine growth viz. uncontrolled and turning over vines fortnightly.

As the experiment was established and maintained mainly under rainfed condition, more vacancies were observed in every plot. Hence the data gathering has been mainly confined to the observations and the same study is hoped to be repeated next season.

B.6 Coordinated varietal trials.

Eight promissing sweet potato varieties including another new CARI hybrid CARI-242 were tested 6 locations during Maha 84/85. Experimental details were similar to previous season and at every locations the crop was maintained under rainfed condition other than at Girandurukotte, where supplemantary irrigation was provided whenever necessary.

Data presented in Table 14 revealed that new CARI hybrids, CARI-9 and CARI-242 showed good yield response as compared to present accepted varieties at most of the locations tested.

Table 14: Tuber yield of sweet potato varieties (t/ha) at different locations during Maha 84/85.

Variety	Location						
	Aralaganwila	CARI	Girandurukotte	Makandura	Monaragala	Pussellawa	Mean
CARI-9	36.2	21.13	28.25	7.48	21.14	23.83	23.00
CARI-99	-	18.51	15.72	10.17	-	-	14.80
CARI-242	-	25.61	21.85	6.02	22.37	31.66	21.50
B-1	21.29	13.42	11.63	5.16	15.43	19.62	14.42
C-26	19.44	14.50	15.33	4.75	9.49	14.63	13.01
Wariyapola	10.35	17.89	21.24	8.81	-	21.4	19.94
Cinchi	19.29	18.82	8.47	6.41	30.24	21.85	17.51
Bentota-A	8.65	10.64	5.46	9.62	18.67	-	10.61
Mean	19.20	17.56	15.99	7.30	19.55	22.15	
CV(%)	26.44	11.69	28.50	20.64	23.26	20.44	
LSD (.05)	3.39	3.58	8.33	2.64	7.50	5.74	

C. Aroids, Dioscorea, Innala and other Root and Tuber Crops.

None of these crops was included in field trials during this season other than the maintenance of following available genotypes for future studies.

1. Aroids.

a. Colacasia (9)

C_1 - Dehi ala
C_2 - Sevela ala
C_3 - Weli ala
C_4 - Demas ala
C_5 - Kurundu ala
C_6 - Kandala
C_7 - Tadala/Handunala
C_8 - Wel ala (purp-wild)
C_9 - Wel ala (gr-wild)

b. Xanthosoma (7)

X_1 - Kiri ala/Desai ala - (Gr petiole with Red stripe)
X_2 - Kiri ala/Desai ala - (Gr petiole with yellow stripe)
X_3 - Kiri ala/Desai ala - (Dark purple petiole)
X_4 - Kiri ala/Desai ala - ($\frac{1}{2}$ purple, $\frac{1}{2}$ Gr petiole)
X_5 - Kiri ala/Desai ala - (Blackish green petiole)
X_6 - Kiri ala/Desai ala - (Kandala/Kanda Raja/Naw ala)
X_7 - Panu ala - (wild)

c. Alocasia (5)

A_1 - Wal Habarala
A_2 - Polon Habarala
A_3 - Kolakana Habarala/Andi Habarala
A_4 - Mal Habarala (leaves with white patches) } Ornamental
A_5 - Mal Habarala (brownish green plant) }

d. Lasias (2)

L_1 - Ath Kohila
L_2 - Angili Kohila

e. Armorphophallus (Kidaran) (1)

K_1 - Kidaran

2. Coleus - (Innala) (20)

In 1 - CARI
In 2 - KD-3
In 3 - KD-4
In 4 - KD-6
In 5 - KD-8
In 6 - KD-11
In 7 - Diwlapitiya
In 8 - Kananwila
In 9 - Medagama
In10 - Walpita
In11 - Matugama
In12 - Badureliya
In13 - Labuduwa
In14 - Malimboda
In15 - Indunisia
In16 - Horana
In17 - Piliyandala
In18 - Rathnapura
In19 - Kandetiya
In20 - Elpitiya

3. Dioscorea

a. Dioscorea alata

Da 1 - Rathu ala
Da 2 - Ini ala
Da 3 - Kiri kondol
Da 4 - Raja ala
Da 5 - Kiri ala

Da 6 - Kiri wal ala
Da 7 - Kindala
Da 8 - Rata ala
Da 9 - Jaffna purple
Da10 - Kahata ala
Da11 - Raja walli
Da12 - Dandila
Da13 - Dandila Kondol
Da14 - Rasa walli
Da15 - Thabala
Da16 - Rathna walli
Da17 - Kiri wal wila
Da18 - Modaka Walli
Da19 - Kombu walli

b. Dioscorea esculenta

De 1 - Hingurala
De 2 - Angiliala
De 3 - Hindurala
De 4 - Heen Kukulala
De 5 - Maha (Rata) Kukulala
De 6 - Java ala
De 7 - Sidu wal

c. Dioscorea bulbifera

Db_1 - Moku walli
Db_2 - Udala
Db_3 - Badi Kondol (poisonous)

d. Dioscorea rotundata

Dr_1 - Ezumaha
Dr_2 - Boki

e. Wild spps.

Katu ala - D.pentaphyla
Uyala - D.tomentosa, Hyne.
Hondala - ?
Tabala - ?
Gonnala - D.spicata
Hingurala(Panu kondol) - D.sativa
Hirithala - D.oppositifolia

4. Other Root & Tuber Crops

Ginger & its wild relatives (2)
Turmeric & its wild relatives (3)
Aritichoke (Helathus tuberosus) (1)
Arow roots (Marata Arundinaces) (1)
Canna spps. (2)

1. Collection, Conservation, Cataloguing and evaluation of germplasm.

During the period Maha 84/85 the collection work of native tropical root and tuber crops was strengthened. Two districts namely Kalutara and Galle of the wet zone have been covered. Districts of Monaragala, N'Eliya, Kegalle and Kurunegala were not fully covered. Districts falling in northern and eastern parts of the island were not even visited due to problems like natural hazards and the peace and order situation of the locality.

Collection of varieties/cultivars was made in garden plots, farmer's field and in public markets where the materials represent varieties that are widely grown and accepted in the locality.

All the collected materials were given accession numbers and planted in the germplasm nursery at CARI for observation and characterization. Characterization was made in order to eliminate duplicate accessions and obvious duplicates were immediately discarded. In some cases, two or more varieties obtained from different regions

had slightly different names but similar characters were treated as duplicates. After the elimination of the duplicates the germplasm collection was trimmed down. Number of original accessions with their source or origin is presented in Table 15. The number of eliminated duplicates and the existing distinct accessions were also in the same table.

During the same period a number of exotic genotypes was also aquired.

The evaluation and documentation of these collections (indegenous and exotic) are now in progress.

Table 15: Number of original accessions, duplicates and distinct accessions of Tropical root & tuber crops.

Source or Origin	Number of Acquired Materials					
	Ca[a]	Sp	Di	Co.	In.	etc.
Sri Lanka						
Kalutara Distric	9	11	12	10	9	2
Galle District	11	16	20	9	2	2
NuwaraEliya District	4	1	-	4	-	3
Kegalle District	3	-	4	1	-	-
Monaragala District	-	-	5	2	-	-
Baticaloa District	5	-	-	-	-	-
Anuradhapura District	1	-	-	-	-	-
Kurunegala District	-		5			
Badulla District	-	-	3	2	-	-
Kandy District	90	48	10	10	1	4
CIAT (Colombia)	50	-	-	-	-	-
AVRDC (Taiwan)	-	10	-	-	-	-
IITA (Nigeria)	-	3				
VISCA (Philippines)		3				
Indunisia	-	-	-	-	01	-
Total	190	97	65	38	20	11
No. of duplicates	?b	-	26	14	?	3
No. of distinct accessity	?	97	39	24	?	8

a- Ca - Cassava, Sp - Sweet potato
Di - Dioscorea, Co - Cocoyam & other Aroids.
In - Innala (Coleus)
etc- Ginger, Turmeric Artichoke, canna spps.

b- Not catergarised.

RESEARCH REPORT ON ROOT & TUBER CROPS

- Food Technology Yala 1984 and Maha 1984/85.

Cassava.

HCN Content of Eight months maturity sixteen cassava seedlings (tubers) were determined for their varietal screening purposes.

Results.

Seedling No:	Age of the Tuber	HCN/ppm.
CARI 1	8 months	17.28
" 2	" "	16.74
" 101		41.58
" 102		50.22
" 136		19.98
" 137		12.96
" 132		82.08
" 145		108.00
150		18.36
" 143		67.50
" 142		30.24
116		170.28
" 104		36.00
" 105		24.30
" 106		37.80
" 107		47.25

From the above results it is observed that all the seedling numbers are suitable for human consumption except seedling no. 145, 132 and 143.

Starch content of 10 varieties of cassava tubers were determined at 9 months maturity. These tubers were harvested at Angunakolapalassa Research Station.

Contd 2

Sample	Starch Content (Dry wt. basis) %
CMC - 84	70.14
MU - 51	80.42
Wagalle	72.49
CARI 84	70.14
CARI 86	72.49
CARI 103	77.60
CARI 109	80.42
CARI 111	74.95
CARI 112	77.60
CARI 114	73.62

The starch content varied from 70.14% to 80.42% on dry weight basis.

B. Sweet Potato.

Storage Studies on Sweet Potato.

A study was undertaken to evaluate the performances of available storage methods of sweet potato in local conditions. The methods include (i) Wooden boxes, (ii) Bamboolined pits, (iii) Sand beds covered with grass, (iv) Racks in straw huts, (v) Cold room stores. An open air store was also included as control. Samples were taken once in every two weeks to determine the weight losses, degree of rotting, sprouting and changes in chemical composition. (suger %) And also sensory evaluation was carried out by a taste panel once in four weeks.

i) Bamboolined pits, ii) Sand beds, iii) Racks in Straw huts and iv) Wooden boxes were evaluated for storing sweet potatoes. Sand bed stores found to be the best store sweet potatoes for 3 months.

Baking Quality as a Selection index for Screening Sweet Potato Seedlings.

Using 8 different parents 25 sweet potato seedling were cultivated at C.A.R.I., Gannoruwa. At the stage of 3 months tubers from each seedling were harvested seperatly and tuber yield was determined. From each seedling 2-3 tubers of the same size were selected and stored for 3 days at

Contd 3

room temperature before baking. Roots were baked 60 minutes at 190°C in an electric oven. After baking they were cut open lengthwise and tested for flavour, texture, flesh colour, sweetness, fibre, moistness and general acceptability. The baking index was calculated as the mean of the rating for these characters.

The baking index of the seedling of each variety were classified in to 3 groups.

0 - 4 poor
4 - 6 medium
6 and above good or superior

Out of 25 seedlings tested 7 fell into the medium group. Seven seedlings fell into the good or superior group.

Some of the tuber yield and quality (baking index) data of sweet potato Seedlings.

Sweet Potato Seedling No:	Tuber Yield t/ha	Quality (baking index)
CARI 242	25.86	6.94
" 248	25.34	4.68
" 311	22.22	6.28
" 223	21.35	5.90
303	18.92	5.40
208	17.88	6.65
310	13.02	6.74
291	10.24	6.28

According to the table seedling No. 242 showed maximum yield and superior quality. Hence this particular line was included as an entry for N.C.V. trial.

Analysis of nutriens in cassava and sweet potato leaves.

The leaves and tips of four cultivers each of cassava and sweet potato were analysed for their dry matter content, Protein, Fibre, Calcium and Ascorbic acid. Carotene, Iron, A The range of nutrients observed per 100g edible portion are given in following table.

Contd 4

Table 1.

Physical, Chemical and Organoleptic Characteristics of Dioscorea (Dalata) tubers.

Dioscorea Cultivar	Tuber skin thickness (mm)	Texture of the skin	Mucilagenous	Browing of the flesh when freshly cut(after 5 mins.)	Starch granule size(length of largest granule) (x 1.05 µm)	Cortex Colour at the head of the tuber
Kiri Ala	0.20	Rough	Much	Some	31.3	Dark Brown
Raja Valli	0.70	Rough	Little	None	43.7	Dark Brown
King Yams	0.55	Rough	Much	Severe	57.2	Dark Brown
Jaffna Purple	0.35	Rough	Little	Severe	51.3	Dark Brown
Kahata Ala	1.20	Very Rough	None	Some	70.2	Dark Brown
Ini Ala	0.50	Smooth	Little	Some	48.4	Light Brown
Ratna Welli	0.45	Rough	Little	Some	39.5	Light Brown

RS/5.

Wound heding	Consistency (Cooked)	Cooked tuber Aroma	Degree of fibrousness of tuber	Starch Content as amylose % (dry wt. basis)	Protein % (dry wt. basis)	Ash % (dry wt. basis)	Palatability
delayed	neither	none Aromatic	Slightly fibrousness	12.96	9.26	2.46	Unsatisfactory
delayed	mealy	Aromatic	no fibre	30.72	10.41	3.71	Very good
delayed	mealy	Aromatic	Slightly fibrousness	28.64	10.21	2.75	Satisfactory
quick	mealy	Aromatic	Slightly fibrousness	20.80	9.19	2.26	Satisfactory
delayed	neither	Aromatic	Very fibrousness	15.68	11.95	3.16	Unsatisfactory
quick	mealy	Aromatic	Slightly fibrous	27.52	6.30	1.64	Unsatisfactory
delayed	mealy	Aromatic	Slightly fibrousness	25.29	7.84	2.05	Satisfactory

	Dry matter	Protein	Fibre	Carotene	Iron	Calcium	Vitamin C
	g.	g.	g.	mg.	mg.	mg.	mg.
Cassava	10.8-18.7	5.4-6.2	2.0-2.2	3.8-7.8	3.9-7.6	92.4-159.1	60-95
Sweet Potato	17.4-21.4	3.5-3.7	2.2-2.5	0.6-1.9	2.9-5.4	67.8-120.5	15-35

From the results it is clearly seen that if the consumption of these leaves and tips is popularised they could supply some of the nutrient needs of human diet.

OTHER ROOT CROPS.

Analysis and Quality Testing of Dioscorea Tubers Dalata

Nine months matured seven Dioscorea cultivars were analysed for tuber skin thickness, texture of the skin, muciligenous, browning of the flesh when freshly cut, cortex colour, starch granule size, wound healing, consistency (cooked tuber), degree of fibrousness of tuber and palatability. Ash%, Protein% and starch content as amylose of the tuber were also analysed. Results are shown in Table (1).

According to the table (1) Rajawalli showed the highest Ash and amylose content. It also showed the excellent eating quality.