

PA-ABT-228

# MAHAWELI ENTERPRISE DEVELOPMENT

## MED/EIED PROJECT

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### TOMATO OUTGROWERS PROJECT IN MAHAWELI SYSTEM B

by  
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Report 8/1994



INTERNATIONAL SCIENCE AND TECHNOLOGY INSTITUTE, INC.

WITH :

ERNST & YOUNG CONSULTANTS (Sri Lanka)  
DEVELOPMENT ALTERNATIVES, INC.  
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CONSULTANTS TO THE MAHAWELI AUTHORITY OF SRI LANKA

## Mahaweli Enterprise Development (MED)

The development of the natural and human resources of the Mahaweli river basin is a high priority of the Government of Sri Lanka. The construction of physical infrastructure, the settlement of the land and the formation of the agricultural production base are largely completed. The challenge now is to build a diverse, dynamic economy capable of steadily raising Mahaweli family incomes. In meeting this challenge, the private sector - farmers, entrepreneurs, companies, community groups, non-governmental organizations - has an important role to play.

MED is a project of the Mahaweli Authority of Sri Lanka and the United States Agency for International Development. MED promotes investment and employment generation by the private sector in non-farm economic activities and contract outgrower programs producing diversified crops. MED does this by: (i) developing technical, marketing, financial and other services which assist self-employed individuals, microenterprises and companies to start and improve their businesses; (ii) developing entrepreneur associations and other participatory groups; and (iii) carrying out studies and analyses to improve the frameworks for development in the Mahaweli areas.

The Employment, Investment and Enterprise Development (EIED) Division of the Mahaweli Authority is the MED implementing agency. Technical consultancy is provided by a consortium led by the International Science and Technology Institute, Inc. (ISTI), and including Agroskills, Development Alternatives, Ernst and Young, High Value Horticulture and Sparks Commodities.

## **PREFACE**

Dr Cedric de Vaz, an agronomist, is a former Deputy Director of Agriculture with extensive experience in agriculture and horticulture.

This report is based on Dr de Vaz's technical consultancy on tomato trials with the Commercial Farmers Association in System B. The trials were part of a program of CPC, Lanka Ltd., to develop outgrower based production of processing tomatoes.

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## 1. INTRODUCTION

The Mahaweli Enterprise Development Project in collaboration with CPC Lanka Ltd. which is the local subsidiary of the CPC International, initiated a tomato outgrowers scheme in the Mahaweli System B to meet their demands of tomato paste, estimated at 1000 mt per year. Currently, CPC Lanka Ltd. markets several processed food items under the brand name "Kist" and over half the quantity of tomato paste which forms the base of their processed tomato products is imported. In an attempt to produce the entire quantity locally, with high quality tomatoes, CPC Lanka Ltd. embarked on an outgrower project in collaboration with the Commercial Farmers Association of Mahaweli System B.

The consultant was invited to attend a meeting at the MED office, Unity Plaza, Colombo, on 10 May 1994 to discuss the project with relevant officials. At this meeting it transpired that the financial commitments of the relevant parties and some project details pertaining to land area, choice of tomato varieties, the use of hybrid seed and raising of plants in plastic pots, had already been agreed upon at an earlier meeting. The consultant at this juncture briefed the participants about the danger of **bacterial wilt disease**, which is a limiting factor for extensive and successful tomato cultivation in Sri Lanka.

The consultant was assigned the task of drawing up a package of agronomic practices relevant to this project. The hybrid seeds of the tomato varieties were supplied by Agro Trends Pvt Ltd. and Royal Sluis Ltd. The activities of the project commenced in June 1994 and the crop was to grow as an off-season trial. This was based on the concept that as CPC Lanka Ltd. were able to procure their requirements of tomato only for about 4 to 5 months of the year during the normal cultivation season, an off-season crop was both relevant and meaningful for a processing industry requiring quality tomatoes all year round.

Mr. Haridas Fernando (Agricultural Manager) was responsible for the interests of CPC Lanka Ltd, while the MED/EIED was represented by Mr. Sunil Wickramasinghe, Deputy Manager EIED and Mr. K. Kodituwakku, consultant EIED. A supervisory officer from CPC Lanka Ltd, Mr. S. Puspakumara was stationed in the area to help out with the project. The project sites were visited by the following personnel:

Mr Sunil Amarasinghe, Director EIED  
Mr Sunil Wickramasinghe, Deputy Manger, EIED  
Mr K. Kodituwakku, Consultant, EIED  
Mr Jayantha Jayawardena, Deputy Chief of Party MED  
Dr Kamal Hyder, Consultant/Business Development  
Mr Peter Smith, General Manager CPC Lanka Ltd  
Mr Nalin Peries, Plant Manager, CPC Lanka Ltd.

The consultant visited the project sites on 8 occasions, spending 2 to 3 days per visit, depending on the nature of the work.

The members of the Commercial Farmers Association, Mahaweli System B were:

Dr A.M.B. Amunugama  
Mr Norton Fernando  
Mr W. Silva  
Dr P.Randeniya  
Mr Kavikara

## 2. METHODOLOGY

Ten varieties of imported hybrid tomato seeds were supplied by CPC Lanka Ltd. to be tested for their performance in System B of the Mahaweli. Nurseries for all locations were raised during the last week of June 1994 at the NESPA Farm (Dr. Amunugama's), in 2 inch plastic pots, with one seed per pot. A liquid fertilizer (Maxicrop) was applied to the seedlings every 4th day. Approximately three weeks later, seedlings were hardened and subsequently transplanted in the field following the instructions given by the consultant on land preparation, planting method, fertilizer application, earthing up operation etc. (Annexure I). These written instructions were handed over to representatives of all farms. The Varieties planted were as follows:

Hunt - 100  
Sun hybrid-105  
Santa Cruskoda  
RS-862661  
RS-892745  
RS - 862674  
Casper-RS-862699  
RS-902755  
VC-204 C  
Sun-5715

An observational study with 50 plants per row of each of the hybrid varieties, together with two local varieties namely, "Biansz" and "Thilina" were planted in NESPA farm to obtain detailed information on times of flowering, fruiting, fruit quality etc. The consultant provided the OIC with a relevant log sheet for this purpose.

The consultant gave a demonstration at NASPA Farm on 26th June 1994, on the mixing of raw fertilizer, their application in the field and the transplanting of 85 seedlings of tomato in the presence of relevant representatives of the other farms. Consequently, those present had the opportunity of familiarising themselves with these important operations which subsequently had to be carried out in their farms.

A total of 1,500 plants per variety was planted at NESPA Farm in 6 replicates, at 250 plants per replicate. The 10 varieties making up one replicate were randomized within each replicate to obtain unbiased data. This procedure of replication and randomization was done only at NESPA Farm, as the OIC was a Diploma Holder in Agriculture. In the rest of the farms this procedure was not followed, as the people in charge were casual labourers, who may not have been able to comply with such procedures on their own. Consequently, in the latter group of farms, blocks of 1,000 plants of each variety were transplanted contiguously, with no replications or randomization.

### 3. RESULTS & DISCUSSION

The crop planted in the off season (June 1994) had to survive relatively high temperatures, in addition to strong and dry desiccating winds. Artificial wind barriers, using empty sugar bags had to be erected to save the tomato seedlings from severe wind damage. The germination and initial growth of all varieties was good, except in a few isolated areas subject to water logging due to poor land preparation. Subsequently, bacterial wilt disease (*Pseudomonas solanacearum*) took its toll, affecting all varieties. The surviving plants may be due to escaping the infection, rather than any degree of resistance. The incidence of the disease was aggravated after the earthing-up operation, as the irrigation water flowing along the channels could have been instrumental in spreading the disease. In some farms, the continuous cropping of solanaceous crops on the same land, or even in adjacent areas, could have contributed to the spread of the disease, either by the irrigation water, or the use of the same implements for land preparation. All varieties were affected in varying degrees to curly top virus, nematodes and leaf miner damage. There was also blossom end rot caused by irregular irrigation patterns and perhaps calcium deficiency in the soil. The growth of the surviving plants was adversely affected after the middle of August 1994, due to insufficient and irregular irrigation. During the consultant's last visit on 1 and 2 September 1994, it was observed that the soils in all locations where the trial was being carried out, were quite dry and the plants were struggling for survival due to water stress. In one farm, the weeds had completely smothered the tomato plants and the trial was a write-off. Discreet inquiries revealed that there was an acute shortage of labour during this period, due to the regular labour force being involved in their own "paddy work".

It was however refreshing to note, that in two farms the four varieties RS- 902755; RS 892745; RS-862674 and HUNT 100, showed some promise, standing up to the rigors of pests and diseases, high temperatures, irregular irrigation, combined with strong, dry and desiccating winds, during a greater part of their growth. The variety RS- 902755 recorded an average of about 30 fruits per plant, of small to medium in size, in the few plants that had borne fruit.

In general, the growth and subsequent development of all varieties tested, in all farms do not justify their so called "hybrid seed background". Normally hybrid seed should produce seedlings and growth of exceptional vigour, compared to open pollinated varieties. Their failure in this instance can be attributed to adverse climatic conditions, bacterial wilt disease and irregular irrigation practices un conducive for their optimum performance. Consequently, these hybrid

varieties tested, do not fit into the yala cropping patterns of the Mahaweli System B, although the four varieties showing promise, could perform better during the cooler maha season, provided bacterial wilt disease is not a limiting factor.

The artificial wind barriers erected using empty sugar bags proved extremely useful in preventing the crop from severe wind damage. These farm owners should give priority to planting appropriate wind belts with the commencement of the maha rains.

The study on observational rows on these varieties, together with two other local varieties namely "Biansz" and "Thilina" to obtain detailed information on their performances, did not produce the desired results, due to adverse climatic and growth conditions, combined with poor management.

#### **4. YIELDS**

The tomato yields of all varieties were very low, due to the few surviving plants and also the adverse growing conditions unfavourable for optimum production. The encouraging yield given by variety RS- 902755, appears a justification for testing this line, together with the other three varieties which showed some promise during the cooler maha season in System B of the Mahaweli. However, the selection of lands, free from bacterial wilt disease is imperative.

#### **5. CONSTRAINTS**

- a) The personnel in charge of these farms and their management leave much to be desired. The majority of these farms have casual labourers in charge who lacked the basics and the ability, neither to initiate, nor sustain a viable commercial agricultural programme.
- b) The people in charge were not adequately provided financially (petty cash) to purchase urgent needs of agrochemicals. In one instance, the consultant and the Agricultural Manager CPC Lanka Ltd. had to drive about 15 Km to purchase some urgent agrochemicals, to save a crop from leaf miner damage. The casual labourer in charge of this farm did not have the finances nor the means to procure this vital necessity.
- c) In most cases, remote control from "Colombo" by the land owners was not conducive for a successful agricultural venture of this nature.
- d) There appears to be an acute shortage of labour when the local labour force is involved in their own agricultural activities. This adversely affects important operations, as experienced during the latter part of August 1994, when labour was not available for irrigation, resulting in severe water stress and death of many plants.

- c) All farms lack appropriate heavy machinery and implements for large scale land preparation eg. 4 wheel tractors, ploughs, harrows etc. The current practice of hiring these requirements, does not permit a well planned cropping programme, as the required machinery and equipment may not be available when needed most.

## 6. RECOMMENDATIONS

- a) Commercial tomato cultivator in System B of the Mahaweli using expensive imported hybrid seed, should not be done during the yala season, due to adverse climatic conditions of high temperature, strong, dry desiccating winds and also the incidence of bacterial wilt disease. It can only be done, when supported by conclusive research data. However, the few varieties which showed promise in the yala trial, could be tested during the cooler maha season in System B, in lands where bacterial wilt is not a limiting factor.
- b) Tomato nurseries should be raised in well prepared beds, where the soil has been sterilized and not in expensive plastic pots as done for this trial, where there was no significant advantage.
- c) Commercial farmers should use cheaper locally available seed, of the open pollinated varieties of tomato, rather than the expensive imported hybrid seed, which they are compelled to purchase for every planting. Farmers can retain the seed of open pollinated varieties at no extra cost, for planting over several years.
- d) The Extension Services of the Department of Agriculture should be consulted for promising and recommended tomato varieties, as there appears to be some recent new selections which are very tolerant to bacterial wilt disease and producing high quality fruits, with good commercial yields.
- e) Commercial cultivation of tomato in the Mahaweli areas can be successfully undertaken in paddy fields, after the harvest of the paddy crop. This practice apparently controls bacterial wilt disease as amply manifested over the long years in the Upper Uva regions of Welimada, Boralanda, Bandarawela etc. where solanaceous crops of potato, tomato, capsicum, brinjal etc. are successfully rotated with paddy. It will be a useful practice for the Mahaweli areas, even if paddy is not cultivated, to impound the water for a length of time and following it up with a tomato crop. This can be the answer to cultivate desirable, high quality tomatoes for the processing industry, even though such varieties are susceptible to bacterial wilt disease (see Annexure II).

- f) Outgrower projects of this nature, sponsored by private funds or other aid sources, should strictly confine initial testing of introduced varieties to observational rows of 100 plants per variety, per location. This approach will drastically cut down the costs of study and also produce the same results even if they were planted in larger blocks. However, the only drawback could be that larger quantities of fruit will not be available for a processing test, as in this instance, where CPC Lanka Ltd. required big quantities for processing tests.
- g) Projects of this nature involving outgrowers, sponsored by Company funds or other sources should give more meaningful results if done in farmers small holdings, rather than in large commercial farms. The small time farmer and his family labour will devote greater care and commitment to the project and follow the advice of relevant officials to achieve maximum benefits for themselves. On the contrary, commercial farmers in such ventures are usually saddled with their own problems of finances, labour and perhaps survival, which seriously dilutes their commitment and efforts towards the projects.

If these projects must necessarily be done in collaboration with commercial farmers, it is suggested, that the only agreement between the farmers and the private company should be the purchase of the total marketable yield of tomato at a competitive price. This ready outlet for immediate marketing of the produce in large quantities at a guaranteed price, should provide sufficient incentive to any commercial farmer who is dedicated to the cause.

- g) Farm owners should give priority to planting appropriate wind belts with the commencement of the maha season.

## 7. SUMMARY

CPC Lanka Ltd. in collaboration with MED/EIED of the MASL, initiated a tomato outgrowers project with selected farmers from the Commercial Farmers Association of Mahaweli System B, in an attempt to produce quality tomatoes for processing during the off season.

Ten hybrid varieties of tomato were tested during the off season of yala 1994. (June to September), in System B of the Mahaweli. All varieties tested, were severely affected by bacterial wilt disease. (*Pseudomonas solanacearum*) and also the adverse climatic conditions which normally prevail during this time of the year in this region. Consequently, the commercial cultivation of these varieties during the yala season in System B of the Mahaweli is not recommended.

However, the varieties RS- 902755; RS- 862674; RS-892745 and HUNT- 100 showed some promise, inspite of adverse growth conditions and these could therefore be subject to a further test during the cooler months of the maha season, in lands where bacterial wilt is not a limiting factor.

Tomato nurseries should be raised in beds on the ground, and not in plastic pots, as done for this trial which has shown no significant advantage, considering the expense and time consuming efforts.

## **ACKNOWLEDGEMENTS**

My sincere thanks and appreciation to Dr. Jim Finucane and to all those who visited the trial sites at different stages of crop growth; the members of the Commercial Farmers Association of Mahaweli System B who were involved in this study and to Mr. S. Puspakumara, the resident representative in System B, of CPC Lanka Ltd. who showed great interest and dedication in his assignment.

Finally, it was a refreshing experience and a pleasure for me to work with Mr. Haridas Fernando, Agricultural Manager, CPC Lanka Ltd. whose sincerity, commitment and loyalty to his Company, enabled this pilot project to achieve the results under some trying conditions.

**TOMATO (*Lycopersicon esculentum* L)****Agronomic Practices to be Followed for the Tomato  
Outgrowers Project  
Commercial Farmers Association of Mahaweli System B****Varieties**

Hybrid tomato varieties supplied by CPC Lanka Ltd.

**Land Preparation**

Deep ploughing and two harrowings to bring the land to a fine tilth. Levelling and proper drainage are imperative to prevent water logging which is detrimental to the crop. If organic manure is available, incorporate at about 6 to 10 tons per hectare at harrowing. The land is prepared for planting by opening up ridges and furrows at a spacing of 60 cm (2 ft.) from the centre of one furrow to the other. Furrows should be 10 to 12 cm deep.

**Fertilizer and top dressing application**

Urea	200 Kg/ha
Conc. superphosphate	375 Kg/ha
Muriate of potash	135 Kg/ha

1/3 Urea; the full quantity of conc. superphosphate and ½ the quantity of muriate of potash should be applied as the basal dose prior to planting.

1/3 Urea to be applied 3 weeks after transplanting.

1/3 Urea and the balance half of potash to be given 3 weeks later.

The basal fertilizer mixture should be applied a day prior to planting into the furrow and lightly mixed into the soil.

Transplanting of seedlings towards the bottom of the ridges is done at 60 cm apart, at one seedling per hill. Seedlings should be hardened for about a week before planting.

## **Earthing-up**

At the first top dressing, 3 weeks after transplanting, an earthing up operation is done, which besides incorporating the applied top dressing into the soil, will also provide a weeding. Similarly, a second top dressing should be done 6 weeks after transplanting with the earthing up operation.

## **Agrochemicals**

Pomarsol Forte (WP 80%) : Common Name Thiram. Applied for damping off and leaf spot diseases. Dilution 28gm/9 litres water.

Tokuthion (EC 50) : Common name - Prothiofos; for cut worm and caterpillar. Dilution 28 ml/8 litres water.

Carbofuran : (Curater Granules 3%) for cut worm and nematodes at 22 to 35 Kg/ha. Nematodes 15 g/hole.

Tamaron - LC 60 : for caterpillar and sucking insects. Dilution 28ml/10 litres water.

Metasystox : (REC-25) Systemic insecticide for sucking pests, aphids, thrips, white flies and mites, Dilution 28 ml/10 litres water.

Antracol (WP 70%) : Controls late and early blight, mildew and leaf spot diseases. 2 to 2.5 Kg/ha; dilution of 28g/9 litres water.

Fruvit (WP 66%) : Controls early and late blight diseases. Similar rate of application as antracol.

Common diseases and pests : Bacterial wilt; Late blight; Early blight; Anthracnose; Curly top virus; Tobacco mosaic virus; Damping - off; Leaf miner; Cut worms and Nematodes.

## **NURSERIES**

- a) Sterilize potting mixture with methyl bromide.
- b) Treat seed material with Captan or Thiram (2g/125g seed).
- c) Row sow seed at 15 cm apart, planting depth about one cm. If plastic pots are used, place one seed per pot.
- d) Protect seed beds from rainfall, wind and continuous sunlight.
- e) Irrigation and weeding to be done as required.
- f) Liquid fertilizer (Maxicrop etc.) to be applied to the nursery every 4th day.
- g) Harden seedlings by exposing to sunlight for about a week prior to planting.
- h) Appropriate agrochemicals to be used for insect and pest control.

## TOMATO CULTIVATION

The important factors needed for Sri Lanka to succeed as a competitive tomato producer are ability to generate higher yields and quality (control of bacterial wilt and other diseases). The two factors will ensure high quality tomatoes are available for processing at a lower price. However, the wilt problem is common in this country and does not permit cultivation of high yielding improved varieties because the majority of them are susceptible to the disease.

Dr De Vaz has suggested an excellent method to overcome the problem by submerging the land for a limited period.

To adopt this idea to practice it is necessary to find the minimum time required to keep soil under anaerobic conditions to destroy the bacteria (*Pseudomonas solanacearum*) which causes bacterial wilt in tomatoes. This could be determined by impounding water in a series of selected small plots for one to several weeks and then planting tomato varieties which are susceptible to the disease. (This is not an expensive and time consuming research; Dr Vaz agreed to assist, if anyone wishes to work on this).

If this bacterium could be controlled there would be a huge extent of Mahaweli land available for tomatoes. On the other hand there won't be any restriction of selection of varieties given that they are agronomically viable.

## MED/EIED PUBLICATIONS AVAILABLE

*Local Market for Pickled Products* (December 1990)

*Non Farm Small Scale Enterprise Credit on Selected Mahaweli Systems*, Geoffrey Peters and M.W. Fanditha (December 1990)

*Crop Profiles - Spices, Herbs and Aromatics*, L. Denzil Phillips (July 1991)

*Study of the Tourism Development in the Uda Walawe* (July 1991)

*Potential for Silver Skin Onions in the Mahaweli*, Walter Nueberg (August 1991)

*Nursery Development of Papaya and Mango, Papaya Growers' Guide and Technical Notes for Business Plan for Mixed Fruit Cultivation Investment*, Ben Hatfield (November 1991)

*Dehydrated Fruit Processing Opportunities and Trends in Sri Lanka*, Wanchai Somchit, (November 1991)

*An Evaluation of the Entrepreneur Development Programmes*, Dr. Susan Exo and Hina Shah, (December 1991)

*Aromatics PIP Interim Report on Trials Establishment*, Dr Thomas Davies (December 1991)

*Agro-Business Financing Review*, Dennis De Santis (December 1991)

*Integrated Fruit Drying, juicing, Pulping project - Prep Feasibility Study*, Michael Smedley, Ben Hatfield and Wanchai Somchit (December 1991)

*Cold Chain Requirements for Uda Walawe*, Fredrick E. Henry (March 1992)

*Field Manual for Processing Tomatoes*, Peter Florance (March 1992)

*Processing Tomato Trials in Mahaweli System H*, Peter Florance (March 1992)

*Processing Tomato Trials in Mahaweli System C*, Peter Florance (March 1992)

*Dried Fruit Processing in the Mahaweli*, Dr. Kamal Hyder (September 1992)

*Feasibility Study on Commercial Potential of Snake Venoms in Mahaweli Systems*, Anslem de Silva, (January 1993)

*Census of Mahaweli Enterprises and Employment* (January 1993)

Most publications are priced at Rs.100/-. The publications are available at the MED Office at 8th Floor, Unity Plaza, Colombo 4. (inquiries, Ph. 508682-4)

An EIED publication entitled - "Information Available for the Mahaweli Investor", is also available at the MED Office.

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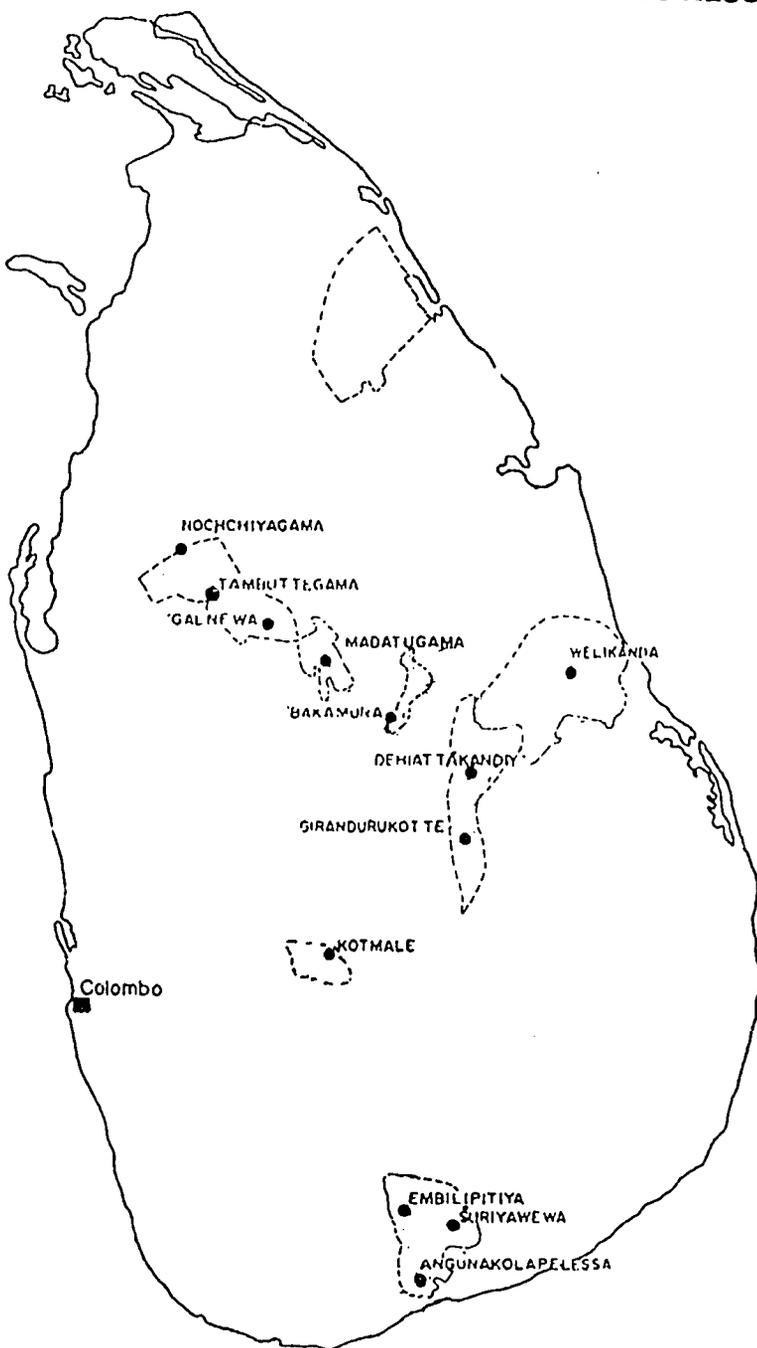
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