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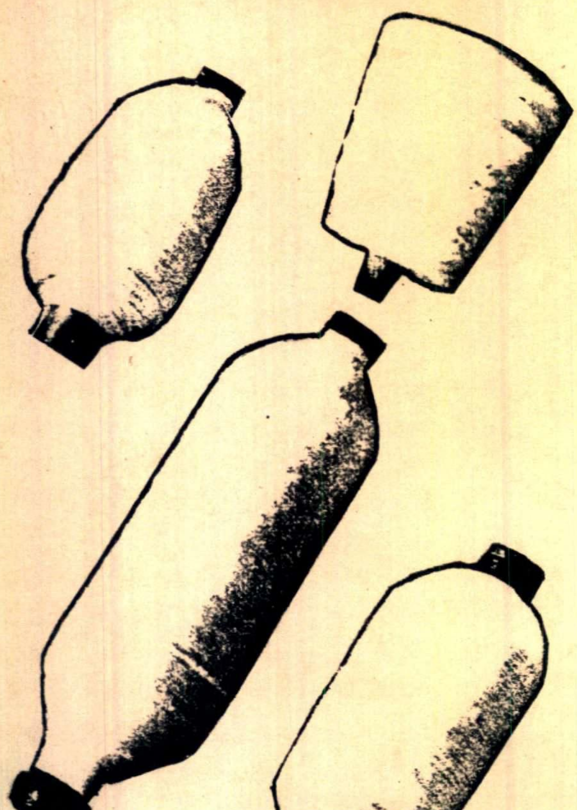
# COTTON

## The Economics of Expansion in Sri Lanka

J. Farrington



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## THE ECONOMICS OF EXPANSION IN SRI LANKA

J.FARRINGTON

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# F O R E W O R D

Cotton is known to be a crop of some antiquity in Sri Lanka, but the self-sufficiency achieved in early times was eroded by import and soil conservation policies pursued in the colonial period. In spite of repeated attempts at revival in the present century, domestically-produced cotton still does not meet more than a very small fraction of national textile requirements.

Several factors contributed towards ARTI's decision to undertake this study: development of the Dry Zone is proceeding at an unprecedented pace under the Mahaweli Project, yet national self-sufficiency in the staple crop, paddy, is imminent. Furthermore, many soils to be irrigated by Mahaweli water are too porous for conventional paddy cultivation. The full benefits of this massive scheme can only be realised by the widespread cultivation of crops requiring smaller quantities of water, and cotton falls firmly into this category.

Much attention is also being focussed on the stabilisation of rainfed farming, and the inherent drought-resistance of cotton makes it a strong contender for inclusion in cropping patterns. Furthermore, the crop's high labour requirements in picking and cleaning may contribute to widespread generation of income in the rural sector. Perhaps most important is that after food and beverages, textiles are Sri Lanka's most costly consumer import.

The study aims to fill the current void in knowledge of the economics of cotton production. It represents the first comprehensive attempt to place its cultivation, both under rainfed and irrigated conditions, firmly within the farming systems context of which it is part. Current prices, costs and yields are analysed in order to assess its profitability to the farmer. Constraints to expanded cultivation and increased profitability are discussed.

The interest already generated by early drafts of the report among those responsible for planning future development of the Dry Zone provides some vindication of ARTI's decision to study this potentially important crop.It is hoped that this published version of the report will serve as a timely and useful data-base among a much wider readership.

This study was done by Mr.J.Farrington who is attached to the ARTI as a Colombo Plan Advisor, I wish to express my deep appreciation to him and to other members of the Institute who made this publication possible.

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Director.

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*Valuable information on the textile industry was provided by Messrs.E. Pararajasingham (Wellawatte), S.N.J.Samarasekera (NTC) and T.M.R.B. Tennekoon (M.T.I.) Mrs. S.Abeytunge (R.C., Angunukolapelessa) discussed current and previous agronomic research on cotton in detail. Dr.I.P.S. Dias (now at the Fertilizer Corporation), commented at length on an early draft, and Mr.E.Jayasekera (D.A.) assisted in achieving a balanced presentation of findings.*

*The author's greatest debt is to colleagues at ARTI: to H.A.Ranbanda who assisted in the selection of study locations, the design of sampling methodology, the training and supervision of investigators and the tabulation of data; to A.S.Ranatunga whose initial encouragement to work on a crop with such potential has been vindicated by the wide interest that early drafts have aroused; to the field investigators for efficient collection and processing of field data, and to Mrs. S. Wiratunga and Miss. Anne Fernando for their typing.*

*The author alone remains responsible for any errors of fact or interpretation.*

*J.FARRINGTON*

*ARTI,*
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M A P S

## GLOSSARY

| | | |
|---|---|---|
| A.I. | : | Agricultural Instructor |
| A.O. | : | Agricultural Officer |
| C.G.A. | : | Cotton Growers Association, Gonnoruwa |
| D.A.E.O. | : | District Agriculture Extension Officer |
| K.V.S. | : | Krushikarma Vyapthi Sevaka (Village - Level Extension Worker). |
| M.T.I. | : | Ministry of Textile Industries. |
| N.T.C. | : | National Textile Corporation |
| R.V.D.B. | : | River Valleys Development Board |

S U M M A R Y

1. Cotton, whilst a crop of great antiquity in Sri Lanka, has in recent centuries provided only a small percentage of national textile requirements; this amounts to some 2½ % with a crop of 26,000 cwt seed cotton in 1977.

2. In the 20th Century, a number of attempts have been made to develop the crop in the North Central, North Western and Southern Provinces and, in recent years, under irrigation at Uda Walawe. These attempts have been singularly unsuccessful in permanently raising production of the crop.

3. Given moderate quality improvements, domestic production of cotton could expand to meet over 50% of current consumption, requiring an annual output of some 400,000 cwt of seed cotton, which represents a 15-fold increase over present production. With more substantial quality improvements, it could supply 92% of consumption, requiring an annual production of 750,000 cwt.

Survey - Rainfed

4. A survey relating to Maha 1977-8 and Yala 1978 was conducted over 209 farmers growing rainfed cotton in six villages in Hambantota district. Cotton was grown almost exclusively as a chena crop, averaging 2.54 acres per farm. 62% of farmers cultivated a chena plot for one year, and 35% for 2 years before abandoning it. 54% of farmers allowed a chena plot to fallow for 4 - 6 years before re-cultivating it.

5. In the 6 villages observed, cotton produced an average net income per household of almost Rs.2,000, whilst paddy produced some Rs.950 and other crops together some Rs.980. Total household income was slightly over Rs.4,000.

6. Insecticide application rates varied from village to village, between 52% and 88% of farmers sprayed, putting on one or two applications. Insecticides were the largest component in purchased

input costs, which averaged out between Rs.50 and Rs.75/acre (not including labour costs). In most villages, farmers had to travel over 10 miles to purchase insecticides. Farmers appear to apply less than the recommended level of active ingredient per acre spray and used several insecticides which are not recommended.

7. At an overall yield of 2.5 cwt of seed cotton per acre, rainfed cotton provided a net return of some Rs.750/acre and Rs.13/labour day, which compared favourably with the returns obtained from other rainfed crops such as chillies, cowpea, gingelly, greengram and groundnut.

*Survey - Irrigated*

8. At Uda Walawe, a sample of 48 cotton farmers was taken. In Yala 1978, they grew an average of 1.06 acres of cotton , which produced a yield of only 3.1 cwt. Average household incomes , at some Rs.3,400, were lower than the average for the 6 villages, and cotton , again was the largest single component in farm incomes. It should be noted , however, that this yield is lower than that achieved by farmers at Uda Walawe in some previous years (cf.Appendix, Table A6) and much lower than the yields of some 10-20 cwt/acre obtained in irrigated research trials (cf.Anthony, 1975). The observed performance of the smallholder irrigated ways is therefore much below its agronomic potential.

9. Almost all farmers sprayed, putting on an average of 6 applications in Yala 1978 and 3.9 in Maha 1977-8. The cost of purchased inputs was Rs.440/acre in Yala and Rs.300/acre in Maha. Because production costs were much higher than for rainfed cotton, but yields only slightly higher , net income from irrigated cotton per acre, at Rs.630, and per labour day, at Rs.9.50, was much lower than for rainfed cotton .

*Constraints - Irrigated*

10. At the observed yield and production cost levels, cotton at Uda Walawe was not competitive with paddy or with other upland crops.At current input levels (which determine the observed production costs) a

*considerable increase in net revenue per acre (resulting from yield increases) would be necessary to make cotton competitive. At input cost levels envisaged by RVDB it is doubtful whether cotton would provide returns per labour day as high as those provided by paddy even at yields as high as 15 cwt/acre.*

11. *The Uda Walawe cotton project was planned on the basis of a yield of 15 cwt/acre, but average yields since 1973 have never exceeded 7 cwt/acre. In 1977 only 820 of the planned 9,710 acres of cotton were cultivated. There has been a slight upward trend in a acreage cultivated since 1973. Yields per acre also rose in the first 3 years of cotton cultivation, possibly as a result of greater familiarity by farmers with the crop, and of improved extension services. Since then, however, they have fallen, possibly because of higher agro-chemical prices and of a shift in attention on to paddy with its increased guaranteed price.*

12. *Kirindi Oya is being planned on yield assumptions similar to those initially envisaged for Uda Walawe. From experience there, the following points seem to require attention in the planning of such new projects:*

*(i) Water Management and Pricing Policy*

*Information for Uda Walawe shows that at current price and input cost levels paddy provides higher returns to labour than does cotton at observed yields. The position is reversed only at yield levels for cotton in excess of 15cwt/acre. There is thus likely to be a preference among farmers for paddy. This can be countered primarily by regulation of water supplies so as to make adequate quantities available for cotton but not for paddy. In the absence of such regulation, the cotton acreage has little prospect of expansion at current price and cost levels. Our price analysis suggests that this problem should not be tackled by upward manipulation of the farm gate price for cotton: it is already a relatively profitable crop, and the internal producer price is broadly equivalent to world market, prices at current exchange rates. Similarly, whilst the indications are that paddy is over priced in relation to cotton (at current yield and input cost levels), and, by extension, in relation also to other upland crops, any* reduction in the farm gate price of paddy is unlikely to be countenanced for political reasons. The most feasible solution therefore appears to lie in effective manipulation of water supplies.

(ii) Agronomic and Irrigation Practices, in spite of a dense extension network are poor, with late planting, rattooning, patchy stands, and inadequate irrigation. These problems need to be sorted out before the relatively high expenditures on fertilizer and insecticide will realise their full potential.

(iii) Seed Quality is low, with poor germination and inferior lint qualities. Efforts should be made to maintain line purity to a higher standard.

## Constraints - Rainfed

13. Measures necessary to obtain higher yields at rainfed sites are:

(i) better seed quality

(ii) more thorough and timely completion of operations (especially weeding)

(iii) increased use of pesticide, through better sources of supply and more readily available extension advice (72% of the sample had not seen a KVS worker in the Maha and Yala.)

(iv) marketing needs to be improved to generate more confidence among farmers. In particular, there is anxiety about the accuracy and consistency of grading, congested markets and delayed payments.

(v) Uncertainty regarding future of legitimate chena cultivation has also had a depressing effect.

## Prices

14. Production increases in recent years are associated with large increases in farm-gate cotton price. Analysis of domestic and world market price suggests that there is no immediate scope for further producer-price increases. To attempt to achieve further production increases by subsidising farm gate prices at a level higher than world market prices seems unwise, since with current prices and existing low yield levels the crop is competitive with

*other rainfed cash crops. Measures should, instead be taken to increase yields and improve input and output marketing efficiency. Additionally, in irrigated production, the issue of primary concern to policy makers should be the prevention of paddy cultivation on lands designated for such other crops as cotton. If such restrictions are thought unfeasible, there would appear to be little future for irrigated cotton production.*

# CHAPTER 1

## COTTON CULTIVATION - THE HISTORICAL SETTING

The origins of cotton cultivation in Sri Lanka are shrouded in the mists of antiquity. Such a brief review as this can do no more than sketch the broad trend of developments over the most recent 2,500 years of its cultivation.

Tradition maintains that when Prince Vijaya reached the shores of this Island in 545 B.C., he found Kuveni, a local princess, seated at a spinning wheel. In the neighbouring Indian sub-continent, cotton is known to have been cultivated as early as 3000 B.C., and it does not appear unrealistic to assume that its cultivation in Sri Lanka is of similar antiquity.

Little is known of the development of the cotton industry up to the arrival of Portuguese Colonists. Siriweera (1977) suggests that cotton was known to have been an important cottage industry between 1000 A.D. and 1500 A.D., and that only the finer cloths for the nobility were imported. Events between this period and the nineteenth century are also uncertain, but it seems that Portuguese, Dutch and British influence led to the cheap import of finished textiles and the local industry entered a decline.

Much discussion of the crop as a possible complement plantation crop to tea, and a substitute for coffee, is contained in early issues of Tropical Agriculturist, For instance, J.Irvine refers to the failure of experiments to establish the crop in various parts of the country, but maintains that it could develop as a commercial proposition in Uva, where the plant has been observed to grow " *in greatest luxuriance* " at altitudes of 4,000 - 5,000 ft. He also mentions that until recently cotton was widely grown and manufactured in Batticaloa, with Badulla the principal distribution point of finished goods, but restrictions on chena cultivation had contributed to the decline of this industry (letter of 22nd April, 1886 in Tropical Agriculturist, 1st June 1886). Similarly, a newspaper article referred to in Tropical Agriculturist of 1st May 1888, mentions the hand - loom industries of Chilaw and Batticaloa, but stresses the need for mechanisation of the process to produce finer woven and cheaper cloths. Shortly afterwards, the Ceylon Cotton Spinning and Weaving Company was established, later to be known as Wellawatte Spinning and Weaving Mills. Further correspondence through the columns of Tropical Agriculturist in 1886 - 1888 discussed potential sites for large-scale cotton development,the conventional wisdom being to cultivate it as a rattooned perennial crop. Only with W. W. Mitchell's experimental introduction of Egyptian seed to Jaffna, Batticaloa and Moneragala do the first references to the desirability of growing it as an annual crop appear (Tropical Agriculturist, 1st August 1888).

With capital committed to a spinning and weaving factory, interest in cotton cultivation continued, although apparently with only limited success. The establishment of a research station at Maha Illuppallama in 1903 marked a progression from piecemal to co-ordinated experimentation with the crop. Immediately after the opening of the station , experimental work started with Sea Island, Egyptian and American varieties. Although cotton is known to have been cultivated in North Central Province as early as 1838(Iever's Manual of the North Central Province, pub.1899), this represented the first systematic experimental work in the area, and indeed in the country as a whole.

However, cultivation of the crop expanded only slowly. Sessional Paper No: 38.,of 1910 states that the North Western Province had the largest area of land under cotton, a total of 245 acres, and that small, but increasing amounts of raw cotton were being exported to the U.K. and India in 1905 - 1908. Cotton was increasingly being viewed as a potential smallholder crop at this time, possibly in competition with paddy on the better-drained soils surrounding restored small tanks in the North of the Island. Thus, a report of the Director of the Royal Botanic Gardens to the Governor of Ceylon, quoted in the same sessional paper, maintains that cotton is *"admirably suited "* to the *"small native capitalists who cannot wait long for a return."* But insects, pests and uncertain rainfall are reported to have restricted expansion of the crop (Sessional Paper No: 52., 1928).

Yields from Maha Illuppallama experiments were encouraging, averaging 4 cwt/acre for the Sea Island and Egyptain varieties in 1904, and 5 cwt/acre for the American Upland varieties in 1905. Lint characteristics were reported on favourably by the British Cotton Growers' Association, and optimism was so rife as to prompt Dr. J.C.Willis, Director of the Royal Botanic Gardens, to the widely-quoted remark that cotton could be cultivated *"anywhere north of a line extending from Negombo to Trincomalee or south of one extending from Matara to Batticaloa "*(Mee & Willis,1906).

Experiments at Maha Illuppallama continued, and reports were made by a number of visiting experts: in 1909, J.S.J.McCall, Director of Agriculture,Nyasaland, pronounced Egyptian cotton ideal for growing under irrigation in North Central Province. In 1901, Prof. J.S.Dunstan of the Imperial Institute, invited to Ceylon by the British Cotton Growers' Association, dismissed the Maha Illuppallama experiments as ill-conceived and ill-conducted, and suggested an extended trial of Americal Upland varieties, which was not, however, undertaken and experimental work declined.

The emphasis for cotton cultivation bagan to shift from the North towards Hambantota District at about this time. It is reported to have been started there by the Mudaliyar of Magam Pattu with the encouragement of the Ceylon Agricultural society (Sessional Paper No: 25., 1927). An experimental station of 72 acres was opened in Ambalantota in 1921, and smaller stations were opened subsequently at Embilipitiya, Bata-ata , Middeniya and Dabarella. Work there in the 7 years up to 1928 is described by Stockdale (1929). Difficulties in the North Western and North Central Provinces had been experienced with insect pests, and unreliable rainfall, in Hambantota weed problems predominated in the September to March grown crop. Work was undertaken on the efficacy of mechanical weed control and of fallow rotations. Varieties included Egyptian, Sea Island (found to be of too long a growth cycle), Indial Karunganni (short staple) and American Upland. The last mentioned achieved yields of 100 - 1,014 lbs/acre, but suffered jassid damage. Work initially concentrated on an early-maturing varieties imported from Madras by the Agriculture Department. Special selection for yields, -hairiness (giving jassid resistance) and early maturation (to prevent boll-shedding attributable to excessive January rains) was conducted.

Shifting cultivation was the only form of cotton production in Hambantota at this time, cultivation areas being designated by the Agriculture Department which issued permits and purchased the seed cotton at fixed rates, deductions being made for packing and transport to the Spinning and Weaving Mills in Colombo. Stockdale (1929) gives the following production figures for Hambantota.

Table 1: Cotton Production in Hambantota in the 1920s

| Cultivation Year | West Giruwa Pattu (cwt) | East Giruwa Pattu (cwt) | Magam Pattu (cwt) | Total (cwt) | Value at Mills (Rs.) | Payment to Growers (Rs.) |
|---|---|---|---|---|---|---|
| 1923 - 1924 | 25 | 647 | 38 | 710 | 18,202.81 | 11,957.41 |
| 1924 - 1925 | 22 | 1,039 | 164 | 1,225 | 30,733,40 | 23,815.58 |
| 1925 - 1926 | 32 | 2,010 | 658 | 2,700 | 55,225,42 | 45,513.59 |
| 1926 - 1927 | 28 | 1,485 | 394 | 1,907 | 38,830,31 | 31,592.35 |
| 1927 - 1928 | 91 | 1,329 | 484 | 1,904 | 34,262,86 | 30,541.14 |

Notes:

1. West Giruwa Pattu corresponds to an area immediately North and West of Tangalle.

2. East Giruwa Pattu lies between Ranna and Ambalantota, extending some 15 - 20 miles inland.

3. Magam Pattu lies to the North and East of Tissamaharama.

Thus, the grower received Rs. 16 - Rs. 19.50 per cwt. during this period, yields varying from 1½ - 7 cwt. per acre , with occasional reports of 9 cwts per acre. A private concern was said to be erecting a gin at Ambalantota in time for the 1928 - 1929 crop.

The Cambodian cotton grown since 1925 had begun to deteriorate severely by the mid-1930's, partly as a result of non-existent seed multiplication and distribution programmes, and Wellawatte Mills in 1937 complained frequently of its inadequate quality. The Division of Botany in the Department of Agriculture started a major breeding and selection programme in 1937, and from 1937 - 1941 imported 19 strains, including 5 long-staple American Uplands. The Uganda cotton, BP79 ( of American Upland Origin) proved to be the best of these, and was issued to growers in 1946 , the only cultivation during the war years having been 5 acres at Wirawila Experiment Station in 1944 - 1945 and 8 acres for multiplication there in 1945 - 1946 (Abeytunge, 1973).

Little information is available on commercial cotton production during the 1930's. Some effort at reviving its cultivation seems to have accompanied the experimental work which started in the immediate pre-war years. Joachim (1973) reports that the guaranteed purchase scheme was re-introduced at Rs.12 per cwt . Harbord (1937) summarises the amounts paid to cultivators in various parts of the Island;

Table 2: Value of Cotton Production in Hambantota in 1936 and 1937

| | | 1936 (Rs.) | 1937 (Rs.) |
|---|---|---|---|
| Southern Division | :: | 20,877.11 | 29,246.89 |
| Central Division | :: | 7,629.41 | 7,171.11 |
| South West Division | :: | 2,199.46 | 2,657.23 |
| Northern Division | :: | - | 2,620.06 |
| Eastern Division | :: | - | 68.60 |
| | | 30,705.98 | 41,763.89 |

Several interesting characteristics of the industry emerge from this table: the Southern division (i.e. including especially Hambantota ) was by far the largest producer, with almost 70% of the production in each year; the price at Rs.12 per cwt., was more than 25% lower than the 1923 - 1928 price (see above); at Rs.12 per cwt., the total production was some 2,559 cwt. in 1936 and 3,497 cwt. in 1937 , a considerably larger crop than was produced in 1923-1928. Yields were reported to lie between 4 and 7 cwts.per acre, with occasional achievement of 10 cwt.per acre.

Whilst the scarcity of data does not permit exhaustive analysis of these trends between the two decades, it is possible to speculate that the price reduction was at least in part a reflection of quality deterioration (perhaps partly also a reflection of depressed commodity prices following the 1933 Great Depression). That production should be higher at lower prices is not easily accounted for. One may suspect that the novelty of the crop in the 1920's had prevented realisation of its full cultivation potential (both in terms of yields per acre and acres under cultivation) during the reference period, and/or that there was some gereral deterioration of smallholder crop profitability in the 1930's such that the relative profitability of cotton was higher then than in the 1920's, inspite of its reduced price.

In the postwar period, the crop saw a rapid expansion, followed by a levelling off of production. Fernando (1952) supplies the following acreage and production data:

Table 3: Cotton Production in Hambantota 1944 to 1951.

| Year (Maha) | | Area Planted (Acres) | Production of Seed Cotton (Cwt.) |
|---|---|---|---|
| 1944 - 1945 | : | 05 | n.a. |
| 1945 - 1946 | : | 08 | n.a. |
| 1946 - 1947 | : | 16 | n.a. |
| 1947 - 1948 | : | 372 | 1,863* |
| 1948 - 1949 | : | 2,650 | 10,000 |
| 1949 - 1950 | : | 3,737 | 2,800 |
| 1950 - 1951 | : | 3,280 | 10,000 |

* Extracted from Peiris, 1949.

During this period of rapid expansion, several measures were taken to promote cultivation of the crop. Peiris (1949) reports an increase in the number of purchasing centres from a planned 3 to 9 in Maha 1947 - 1948, the attempt being made to bypass middlemen and deal direct with the farmer, giving him Rs.32.50 per cwt. for Grade I and Rs.16.25 per cwt. for Grade 2, which represents an increase of more than 100% over the pre-war price. A total of 399 cultivators were reported to have grown cotton during that season, but 4 of the 9 markets were clearly uneconomic, each attracting fewer than 10 cultivators. The average price received by farmers was Rs.26.84 per cwt., suggesting that slightly more than half of the crop was Grade I. Yields of some 4 cwt. per acre seed cotton were obtained in East Giruwa Pattu, but 5 cwt. per acre was obtained in Tanamalwila and Bodagama, and 6 - 8 cwts. per acre in Migahajandura, Mattala and surrounding villages in Magam Pattu. Further progress is reported for the following season (Peiris, 1949) when the number of purchasing centres was increased from 9 to 15 (but, again 4 of these catered for fewer than 10 farmers), and 97% of the production fell into Grade I. a total of 1,151 cultivators are known to have produced slightly over 6,000 cwts. in the areas investigated, giving some 5 cwts. per cultivator.

This expansion of commercial cotton production was accompanied by a revived research involvement, including seed treatment (Nanayakkara, 1950), manurial trials (Peiris, 1949), and spacing and fertilizer experiments (Fernando, 1952).

A World Bank review of the Ceylon economy in 1952 commented favourably on the rapid expansion of the crop, but advised caution in its further promotion because of the weak research data-base.

From about this time, interest in the crop seems to have waned. Johnpulle (1956) comments that the acreage had declined owing to the high handling charges levied by the agency purchasing seed cotton, the estimated acreage in 1955 - 1956 (Maha) being 2,500, with average yields of 1.5 - 2.5 cwts., per acre in most parts, and 4 - 5 cwts. per acre in the Migahajandura-Gonnoruwa area. Similarly, de Soyza (1955) reports that for the 600 or so acres grown in Wellawaya and Buttala, the seed was provided by Wellawatte Spinning and Weaving Mills. This insight is most important, in that it suggests that such seed was supplied direct from the ginned previous year's crop, and that a certified seed production and distribution programme did not exist. If this was the case, the quality of the crop would have been declining rapidly owing to loss of purity in the strain following from cross-pollination, and to loss of viability arising from necessary storage in conditions of high temperature and humidity. There can be little doubt that such factors prompted complaints by Wellawatte Mills in the late 1950's of poor quality of yarn spun from BP79 (Anon, 1957). These led to the replacement of BP79 by HC101, a selection from 5143 Cambodia (a S.African variety)

Cotton cultivation appears to have received some official promotion at about this time. The report by Ariyanayagam and Panabokke (1957) identified areas of suitable soils for cotton development, and proposed an 800 acre development at Ridiyagama. The 1958 Agricultural Plan and 1959 10 year plan proposed a 2400 acre state farm involving an annual planting of 1,200 acres of cotton with a high degree of mechanisation on a two-course rotation. Although the proposals were not implemented, they did signify an awareness of the country's heavy dependence on cotton imports, which cost over Rs.100 million in 1957. Some saving in this foreign exchange cost was attempted by the establishment of Veyangoda Textile Mills. The 1962 short term implementation programme stressed the importance of encouraging chena cultivation of some 10,000 acres of cotton with a view to establishing the crop as part of a stable dryland farming rotation. At the beginning of the 1960's, the Guaranteed Purchasing Scheme was extended to embrace cotton, and prices of Rs.57 per cwt.,for Grade 1, Rs.50 per cwt., for the intergrade, Rs.45 per cwt, for Grade 2, and Rs.36 per cwt., for Grade 3, were offered.

Experimental work expanded rapidly with the establishment of a cotton experiment station at Suriyawewa ( in the Walawe Basin ) in 1966, and the opening of the Agricultural Centre at Angunukolapelessa in 1971. Trials here were directed towards the possibility of cultivating cotton as an irrigated crop at Uda Walawa; in particular, new varieties were to be tested, cultural, irrigation and fertilizer trials were to be conducted, and pest and disease control measures investigated. Earlier investigations had concentrated on insect control (Thevasagayam and Mohinudeen, 1960; Thevasagayam, 1961 ) spacing (Yogaratnam, 1965), disease prevention (Shivanathan and Gunasingham, 1966; Abeygunawardena and Shivanathan, 1967), breeding (Yogaratnam, 1966) and mineral deficiencies (Thenabadu, 1967).

By 1972, it was thought that sufficient research data were available to permit the launching of an ambitious new programme of irrigated cotton cultivation at Uda Walawe (Five Year Plan, 1972 - 1976); accompanied by an increase in the Guaranteed Price of cotton to Rs.100 for Grade 1. The development of cotton cultivation at Uda Walawe is a complex issue, and merits separate discussion elsewhere (2.2 below).

# CHAPTER 2

## THE CURRENT STATUS OF COTTON PRODUCTION

Estimates of national rainfed and irrigated cotton production are presented in Appendix 1, Table A 5 and A 6. Whilst small amounts of rainfed cotton are grown in Puttalam (Appendix 4) and Moneragala, the bulk is grown in Hambantota, and this is where our attention is concentrated.

### 2.1 COTTON IN HAMBANTOTA DISTRICT

Some historical aspects of cotton cultivation in Hambantota District are presented elsewhere (1, above). Our purpose here is to describe briefly the crop's recent performance and the conditions under which it is grown.

#### 2.1.1. ACREAGES, PRODUCTION, YIELDS, ETC.,

Estimates of acreage are made by the District Agricultural Extension Officer (DAEO) on the basis of both seed issues and the reports of village-level KVS workers. These estimates are necessarily approximate. On the one hand, even if KVS workers can include in their estimate all the cotton within their areas of activity, data supplied to the DAEO will be based exclusively on eye-estimates or on hearsay. On the other, the widespread practice of allowing the crop to carry over from one season to the next, and of allowing it to grow on as part of the chena fallow at the end of its productive life must make it difficult to distinguish between abandoned and productive cotton. Estimates of the cotton acreage nationally, and in Hambantota, are provided below. They clearly contain a number of inconsistencies, particularly in 1971 - 1972 and 1972 - 1973.

Table 4: NATIONAL AND HAMBANTOTA DISTRICT COTTON ACREAGES

1971 - 1978

| | 1971-72 | 1972-73 | 1973-74 | 1974-75 | 1975-76 | 1976-7 | 1977-8 |
|---|---|---|---|---|---|---|---|
| National Cotton Acreage | 2,161 | 1,438 | 2,510 | 3,599 | 4,215 | 8,049 | 11,164 |
| Hambantota District Acreage | 2,560 | 3,281 | 2,500 | 2,680 | 1,938 | 4,873 | 7,508 |

Source : Extension Division, Department of Agriculture, Peradeniya and DAEO, Hambantota.

Perhaps all that can safely be said is that the bulk of cotton cultivation has been located in Hambantota since before World War II and is still located there. Reliable estimates of production and yields are similarly difficult to obtain. The national trend reflects that of Hambantota to a large extent and is estimated in Table A 5., In most years, yields of

2 - 4 cwts seed cotton per acre can be expected (cf Appendix 1, Table A 5).

### 2.1.2. THE ORGANISATION OF PRODUCTION AND MARKETING

Cotton production is located at 17 centres throughout the District. An impression of their widely-varying size can be obtained from the 1978 - 1979 Maha production estimates (Appendix 5).

Planting material is available from the Cooperatives. This is untreated fuzzy seed originating largely from the ginned previous season's crop and is provided in sufficient quantity free of charge to sow upto 4 acres at 30 lbs.per acre, and thereafter is sold at Rs.0.10 per additional pound.Pesticides and sprayers are theoretically available for purchase and hire at Co-operatives, but in practice late arrival or non-availability force the bulk of farmers to obtain their requirements from private sources.

Extension advice is provided by village-level extension workers (KVS) who are responsible for all crops, including cotton, and cover varying numbers of farm households. For instance- the villages surveyed by this study were covered by a total of 3 KVSs; who were allocated to Badagiriya (841 households ), Padaugama and Mattala (684 households) and Gonnoruwa, Mahagalawewa and Migahajandura (449 households) respectively. These operate the *Train and Visit* system, (Benor and Harrison, 1977) in which each KVS has 36 contact farmers, to be visited at the rate of 6 per day, over 3 days per week on a 2 - week rota. The KVS's remaining working days are occupied in keeping records upto data and in reporting to and receiving information from Agricultural Instructors (A.I.) at district headquarters level. The District has a number of A.I. subject matter specialists, but not a cotton specialist. KVS workers have received only the bare bones of training in cotton production techniques.

Marketing of the crop is currently under the general control of the National Textile Corporation, (N.T.C.) which purchases through village-level Co-operative Societies. Grading of the cotton at purchase has been conducted at various times by NTC officials, cooperative employees and extension workers. The crop has been purchased at a guaranteed pprice almost continuously since the 1940's. The trend in postwar farm gate prices is traced in Table A 3. More thorough discussion of marketing practices and problems is reserved for a later section (6, below).

### 2.1.3. AGRONOMIC PRACTICES

The rainfed crop in Hambantota is grown largely under *chena*, or shifting, cultivation. Permits for chena cultivation are issued by Gramasevakas, under the general authority of Assistant Government Agents and District Government Agents. They allow each farmer to cultivate up to 2 acres of rainfed crops. The farmer will generally select a plot which has not been cultivated for at least 5 years, clear and burn the vegetation and cultivate it for 1-3 years, after which it will be abandoned to the fallow cycle. A summary of chena permits issued for the study villages over the last 3 years is presented in Table A 6. No clear trend emerges from this time-series.

General standards of crop husbandry are low , with irregular plant stands, poor weed control and limited insect control. Cotton is grown by some farmers as a single-season crop, while others take a second picking in the Yala season, and others allow the crop to grow over two or more years, either with or without rattooning.

## 2.2. COTTON AT UDA WALAWE

Proposals for cotton development at Uda Walawe Project were formalised in an Asian Development Bank appraisal of 1969 (ADB, 1969). Moves to develop cotton there had previously been put forward in the 1966-1970 Agricultural Development Proposals, where it was suggested that some 19,000 acres of cotton in rotation with other crops would be grown there under irrigation, following experimental work on the irrigation of these crops at a station to be established in the Walawe basin. In the event, the experimental work, although started at Ridiyagama in 1965 and continued at Suriyawewa could not be carried out on a full scale until the establishment of the Angunukolapelessa station in 1971, whilst cultivation by Walawe colonists started in Yala 1973.

The ADB proposals envisaged a total of 24,000 acres of cotton on the right and left banks of the Walawe Project, with an average yield of 15 cwts. giving a total production of 360, 000 cwts., of seed cotton. By early 1973, 400 allotments of 2½ acres each had been settled in Tracts 16 and 17 of the right bank (see map) These settlers were required to agree to cultivate cotton in the Yala season and to receive services and inputs provided by the River Valleys Development Board (RVDB) , the cost of which would be deducted from the value of their sales.

It was envisaged that the cultivated acreage should be divided up into 250 acre blocks, under the charge of a Cultivation Officer, (CO) each CO having 5 extension workers (KVS) each with a 50 acre block. The entire project would be under the management of the RVDB through a committee consisting of the Resident General Manager, Deputy General Manager (Agricultural Research ) and Deputy General Manager (Agricultural Extension). The Assistant General Manager (Cotton) would be in immediate charge.

### 2.2.1. CROPPING PERFORMANCE AT UDA WALAWE

It is interesting to compare the projected cropping performance at Uda Walawe with what was actually achieved.

The ADB appraisal envisaged a 9 year development of irrigation infrastructure and cultivation at Uda Walawe, to start in 1969 and be completed in 1978, by which time some 9,710 acres would be under cotton. The cotton planting programme did not start until Yala 1973, and its progress is summarised below.

Table 5: PLANNED AND ACTUAL COTTON PERFORMANCE AT UDA WALAWE

| | ACREAGE | PRODUCTION (cwt,seed Cotton )[2] | YIELD (cwt./ acre)[2] |
|---|---|---|---|
| YEAR 1. (1973) | | | |
| Proposed by ADB | 1,040 | 10,400 | 10 |
| Achieved[1] | 603 | 1,881 | 3.1 |
| YEAR 2 (1974) | | | |
| Proposed by ADB | 4,400 | 44,000 | 10 |
| Achieved | 480 | 2,596 | 5.4 |
| YEAR 3 (1975) | | | |
| Proposed by ADB | 9,710 | 126,230 | 13 |
| Achieved | 654 | 4,731 | 7.2 |
| YEAR 4 (1976) | | | |
| Proposed by ADB | 9,710 | 145,650 | 15 |
| Achieved | 671 | 1,815 | 2.7 |
| YEAR 5 (1977) | | | |
| Proposed by ADB | 9,710 | 145,650 | 15 |
| Achieved | 820 | 3,036 | 3.7 |

Notes : 1 - Refers to acreage harvested. Data supplied by RVDB.

2 - The yields figures are obtained from records of seed cotton sales through the Project. Farmers' attempts to avoid credit repayment through selling part of their production off the scheme may mean that these figures represent only about 2/3 of true yield and production levels, particularly in the later years.

Many of the reasons for this poor performance were identified in internal RVDB reports as early as 1974. They included :

(i) the fact that about 1/3 of the settlers in the early years did not take up residence on the project, but supervised their crops in a haphazard fashion from outside the scheme, where their main interests lay.

(ii) the late arrival of some pesticide (i.e. Azodrine) in 1973, which allowed heavy build up of American and pink bollworm.

(iii) the lack of experience of both settlers and staff in pest control and in irrigation of crops other than paddy

(iv) the poor quality of seed ;supplied in 1973 from Ambalantota experiment station, it had been stored since Maha 1971/1972 and two trial batches produced germination of 45% and 18% respectively.

(v) poor initial levelling prevented adequate pre-wetting for land preparation; tilling therefore had to be done on hard soil in some places. Similarly, poor levelling prevented the construction of furrows of the planned 200-300 ft. length. The maximum attainable in many parts was only 75 ft.

(vi) a host of water management problems, including illicit tapping of water in the upper reaches of the system, leading to insufficient water supplies at the lower end where cotton was grown; malfunctioning of D-channels arising from faulty bed levelling; a supply of irrigation water at a delay of 3-4 days from the time of its requisition; inadequate frequency of issue of irrigation water (only 2-3 issues having been made in 1973); frequent disputes between paddy and cotton cultivators.

(vii) inadequate enforcement of cropping regulations, resulting in the widespread cultivation of paddy on highly permeable soils.

(viii) problems of labour shortage in mid-season, especially for weeding.

These early RVDB reports saw the inadequate provision of extension advice and the late or non-arrival of necessary inputs as the main constraints to production. They also drew attention to the apparent unattractiveness of cotton at its 1973 price of Rs.125 per cwt., and proposed an increase to Rs.240 per cwt. In the event, Rs.191.25 was paid in 1974, Rs.325 in 1975, Rs.335 in 1976 and Rs.340 in 1977 and 1978 for grade 1 cotton. This virtual trebling of the producer price in 4 years may have been expected to produce a large increase in supply. In fact, there was no such supply response. This may be attributable partly to the fact that production costs were also rising: the per-acre cost, using recommended inputs, but excluding labour, as calculated by RVDB, rose from Rs.505 in 1973 to Rs.791 in 1974 and Rs.1,190.95 in 1978. Over the same period, the cost of labour has almost doubled. But, even allowing for these increases, cotton represents a more profitable opportunity in terms of per-acre returns to the farmer in 1978 than in 1973 or 1974. The reasons for continuing low production of the crop cannot be found by considering the trend in per acre returns to cotton in isolation; they must be sought in the broader consideration of profitability presented below.

Whilst the above-listed deficiencies clearly did exist, and did contribute to the failure to establish cotton- a failure which continued because of the lack of firm corrective action in many cases - the most fundamental reason for the failure of cotton has not been identified by RVDB. To understand fully farmers' reluctance to grow cotton required detailed analysis of its profitability relative to paddy. This has been attempted in Table 6., for both the early period of cotton cultivation at Uda Walawe (1973) and for a more recent time (1977). Data are drawn from RVDB sources and those available in published form. What is most striking is that at the projected yield of 15 cwt. per acre, cotton provides much higher net returns per acre than paddy in both years, but, because of its high labour requirements, gives net returns to labour which are only some two-thirds of those provided by paddy. At a more realistic yield of some 6 cwts., per acre, both the net returns to land and to labour fall well below those attained by paddy.

Thus, a newly-settled farmer at Uda Walawe, even with the most optimistic cotton yield-expectations, will only prefer it to paddy if land suitable for both crops is more constraining factor than labour. Whilst it would be dangerous to make a generalised assessment of the relative availabilities of land and labour, it does appear likely that farmers' leisure-preferences will be high and that, so long as some minimum target total income is achieved from farming , they will tend to maximise net returns to labour rather than to land. Any farmer making a more realistic assessment of his cotton yield prospects (say at less than 10 cwt per acre, instead of 15 cwt., per acre), given his lack of familiarity with the crop; the risk of pest damage; the failure of inputs supplies - in fact the entire list of secondary influences on the crop's performance catalogued by RVDB - will be strengthened in his resolve to cultivate the crop with which he is most familiar, which provides him with the highest return to his labour and for which there is always a ready market outlet available - namely , paddy.

This discussion has so far assumed that farmers settled onto land designated for cotton will have the choice between paddy and cotton cultivation. In theory, of course, they do not. Such farmers, initially at least, had to sign an undertaking to grow cotton and to follow cultivation practices recommended by RVDB. It is worth noting that formal requirements of this kind were hitherto unknown in Sri Lanka, and may have caused resentment among farmers, with subsequent low motivation. The underlying rationale was logical enough : the reddish-brown earths onto which they were settled are highly permeable, and attempts to grow paddy there under traditional practices of puddling and flooding for weed control would lead to water-use rates some 5 times higher than those necessary for cotton , thus preventing water from being distributed according to a use-pattern which provides highest net returns to the marginal acre-foot in each of the several possible soil-type/cropping pattern combinations. In practice, however, very few sanctions have been brought to bear against those farmers designated for cotton production who have chosen, instead, to grow paddy. Adequate water for paddy has been obtained both through the regular channels and through illicit tapping by many farmers in the upper reaches of land designated for cotton. Those lower down have had either adequate water for cotton only, or inadequate water for irrigated cultivation of any crop, and their holdings have consequently been turned over to rainfed crop production, abandoned, or declared outside the irrigable command area. This state of affairs has arisen from a combination of lack of political will to penalise those transgressing the stipulated cropping and water-use patterns, and of inadequate enforcement machinery. These problems have been dealt with at length elsewhere (e.g. Chambers, 1975) and to discuss them here would require an unjustifiably lengthy digression from the main purpose of the paper. Suffice it to say that they are fundamental to the management of irrigated cropping and any future attempt to grow non-paddy crops under irrigation (e.g. at Kirindi Oya) is unlikely to succeed if they are not rectified.

Let us now examine in more detail the extent to which farmers designated for cotton production have opted for paddy. Information for 1977 is summarised in Table 7. Whilst the data are in some respects necessarily imprecise (particularly in respect of the paddy) it is immediately obvious that the area illicitly planted to paddy is larger by an order of magnitude than that planted to the crop for which it was intended - cotton. Of those land-use categories considered, the largest is unirrigable land, at 26% of the total. Furthermore, tracts 20 and 21, lower down the system, and comprising some 1,500 acres, have been declared outside the command area and will not now be irrigated. It appears reasonable to suggest that the existence of large areas of unirrigable land, levelling problems apart, results from both excessive water-use on illicit paddy cultivation within lands designated for non-paddy crops and also from excessive water-use on paddy at higher points in the distribution system. The project management's inability to regulate water-use and cropping patterns has thus permitted farmers to grow paddy instead of cotton, and this, in turn, has led to water shortages lower down the system and has contributed to a reduction in irrigated acreage.

Table 6 : HYPOTHETICAL PROFITABILITY OF COTTON AND PADDY AT TWO YIELD LEVELS

| | | Paddy | | Cotton | |
|---|---|---|---|---|---|
| 1973 | Yield/acre (bu) | 65 | (Cwt.) | 15 | 06 |
| | Unit price (Rc/bu) | 18 | (Rs/cwt) | 125 | 125 |
| | Gross revenue /acre (Rs) | 1,170 | | 1,875 | 750 |
| | Input costs/acre (Rs.)[1] | 450 | | 505 | 505 |
| | Net revenue/acre (Rs) | 720 | | 1,370 | 245 |
| | Labour-days required[2] | 48 | | 150 | 100 |
| | Net revenue/day (Rs) | 15 | | 09.1 | 02.5 |
| 1977 | Yield/acre(bu) | 75 | (Cwt.) | 15 | 06 |
| | Unit price(Rs/bu) | 33 | (Rs/Cwt) | 340 | 340 |
| | Gross revenue/acre (Rs) | 2,475 | | 5,100 | 2,040 |
| | Inputs costs/acre (Rs)[1] | 500 | | 1,124 | 1,124 |
| | Net revenue/acre (Rs) | 1,975 | | 3,976 | 916 |
| | Labour-days required[2] | 55 | | 150 | 100 |
| | Net revenue/day (Rs) | 35,9 | | 26.5 | 9.20 |

Sources : RVDB unpublished reports; ARTI, 1974: ARTI, 1975.

1 - Excluding all labour costs.

2.- Labour inputs are necessarily approximate. For paddy they are based on the assumption that land preparation is fully mechanised, that seed is broadcast and that weed control is achieved largely by flooding. For cotton, the RVDB estimate of 77 labour days for operations up to harvesting is supplemented by an estimated harvest requirement of approximately 1 day per 0.2 cwt., picked and cleaned.
It has been suggested (Dias, pers. comm.) that this labour input for cotton is excessively high, but even if it were reduced by 25% the same conclusions would hold.

Table 7: CROPPING PERFORMANCE ON LAND DESIGNATED FOR COTTON AT UDA WALAWE

| Tract | Area designated for cotton [1] (Acres) | Area under cotton Yala 1977 (Acres) | Cotton designated land under paddy Yala '77 (Acres) | Unirrigable land (Acres) | Land not yet settled (Acres) |
|---|---|---|---|---|---|
| 15 | 435 | 80 | 35 | 320 | - |
| 16 | 717 | 30 | 50 | 400 | - |
| 17 | 1,105 | 150 | 350 | 511 | - |
| 18 | 600 | 60 | 15 | 240 | - |
| 19 | 697 | 50 | 10 | 200 | 200 |
| 9-11 | 2,950 | 70 | 800 | n.a | - |
| | 6,504 | 440 | 1,266 | 1,671 | 200 |
| % of cotton - designated area | 100 | 7 | 20 | 26 | 3 |

Notes:- 1 - This description is not strictly accurate, in that this land was designated for field crops other than paddy, but the original proposal envisaged the almost exclusive cropping of cotton on this land in Yala.

The most urgent problem facing policy makers in drawing up plans for the future of irrigated cotton is that of water management. Unless water issues and cropping patterns can be strictly enforced, farmers will revert to paddy, which has lower production costs, provides higher returns to labour and requires less labour in total. As experience at Uda Walawe suggests, once some farmers in tracts designated for *other field crops* have succeeded in reverting to paddy, morale and motivation among the remainder will sink resulting in a vicious circle of low yields, unprofitability and disillusionment. If strategies cannot be evolved and *enforced* to prevent illicit paddy cultivation, then the future for irrigated production at Kirindi Oya and Mahaweli, not only of cotton, but of many other field crops, bodes ill indeed.

## 2.3 THE SCOPE FOR EXPANSION

Sri Lanka currently has a severe internal deficit in cotton , made up by imports. The anticipated development of domestic demand for cotton goods, and the scope for import substitution by a local cotton-growing industry depends on a number of complex assumptions about demand elasticities, the relative proportions of cotton and synthetics in total demand, the quality of locally grown cotton and so on, and detailed discussion of these issues is reserved for Appendix I.

The main results of this analysis can be summarised as follows:

(i) Imports of cotton textiles and intermediate goods (especially yarn) is currently running at some Rs.300 million per annum.

(ii) Locally-grown cotton amounts to 2½% of total national requirements at a production of some 23,000 cwt., in 1977.

(iii) With no improvement in quality, locally-grown cotton could supply 18% of current requirements - i.e. upto an annual production level of 150,000 cwt., seed cotton.

(iv) With a qyality improvement to permit spinning of 30s - count yarn, the local component could rise to slightly over 50% of national requirements (some 400,000 cwt., seed cotton.

(v) A further quality improvement to allow spinning of 40s -count yarn would allow 92% of requirements to be supplied by a local production.

We can conclude that the scope for expansion of local production is very large. In recognition of these prospects, plans are in hand to cultivate some 10,000 acres of cotton under irrigation, with heavy pesticide and fertilizer inputs, at the Kirindi Oya Project currently under construction. Similar plans to grow extensive areas of cotton under both irrigated and rainfed conditions are in preparation for the Mahaweli Project. It is hoped that the issues discussed in this study, particularly with reference to irrigated production at Uda Walawe , will assist the design of future cotton production strategies.

## CHAPTER 3

## THE SURVEY

Current information on the economics of cotton production is sparse. A small number of production cost estimates have been made in unpublished RVDB reports for irrigated cotton, by Dias (1965) for irrigated and rainfed cotton, and by the Cotton Growers' Association (see Appendix 9), for rainfed cotton. Little attempt has been made, however, to verify the accuracy of these estimates or to relate them to revenue from cotton production in order to estimate the profitability of the crop. The need for such information is currently all the more urgent with proposals to expand cultivation of the crop under the Mahaweli Project and at Kirindi Oya.

Accordingly, the decision was taken to conduct a sample input-output survey at Uda Walawe for irrigated cotton, and at 6 villages in Hambantota District for rainfed cotton. After a preliminary visit to the area in July 1976, to examine crop production patterns and agronomic practices, a questionnaire was drawn up to obtain information for the previous cultivation year on acreages, yields, crop disposal and value, input use-levels and costs, labour use and agronomic practices for all the rainfed and irrigated crops grown by farmers in the two selected areas. It is firmly held that the economics of cotton production can be analysed only within the context of the general farm economy, since farmers' decisions are not made on the basis of the profitability of any individual crop, but on its profitability relative to that of other farm and non-farm enterprises.

### 3.1. SAMPLE SELECTION

The questionnaire was pre-tested and modified on October, 1978., and in consultation with the DAEO, Hambantota, six of the largest cotton-producing villages were selected for the rainfed cotton survey. These were Badagiriya, Gonnoruwa, Mahagalawewa, Mattala, Migahajandura and Padaugama.

Sample selection at Uda Walawe presented no difficulty, since a list of cotton-growing farmers was available, from which a random sample could be drawn. At the rainfed sites, however, no definitive sampling frame for the reference period (Maha 1977/1978, Yala 1978) was available. Short of a complete enumeration of cotton growers in these villages, which would have been excessively time-consuming, the only prospect of obtaining a reasonably comprehensive sampling frame that presented itself lay in the listing of farmers' names as they came to collect cotton seed for Maha 1978/1979 planting. This was carried out with the assistance of Cooperative and extension officers. A summary of sample and population sizes is presented below. It should be noted that the population sizes are only approximations, and, for reasons that will be discussed in the following section, are probably underestimates of the true populations. Effective sample size is in some cases lower than intended sample size because crop failures during the reference period caused the elimination of certain farmers from the sample.

Table 8 : SAMPLE AND POPULATION SIZES AT HAMBANTOTA VILLAGES AND UDA WALAWE

| Site | No. of Cotton Growers | Sample Size | Effective Sample Size |
|---|---|---|---|
| Uda Walawe | 128 | 54 | 48 |
| Badagiriya | 99 | 36 | 34 |
| Gonnoruwa | 79 | 36 | 36 |
| Mahagalawewa | 97 | 36 | 36 |
| Mattala | 162 | 36 | 36 |
| Migahajandura | n.a. | 36 | 36 |
| Padaugama | 42 | 36 | 31 |

## 3.2 METHODOLOGICAL DIFFICULTIES

It is recognised that the sampling procedure adopted for the rainfed production areas is not ideal. Whilst the reference period was 1977/1978, the samples were selected from farmers intending to plant in 1978/1979. Although the bulk of farmers will have grown cotton in both years, the sampling methodology clearly does not permit inclusion of any of those farmers who grew cotton in the former, but not in the latter. As far as agronomic practices are concerned, a further shortcoming is evident, namely that those farmers growing all of their 1978/1979 cotton as a carry-over crop from the previous season would not be included in the sampling frame, since they would not need to collect fresh seed. There seems no reason to suppose that these sampling problems would introduce bias into the survey's conclusions on costs and returns in cotton cultivation, but the last-mentioned difficulty does mean that the survey cannot present evidence on the extent to which such agronomic practices as rattooning and direct carry-over of the crop from one season to the next are practised.

A more general shortcoming is that single-shot questionnaire surveys of this kind rely on accurate respondent recall, and the further removed the reference period from the point of interview, the less accurate is the recall likely to be. With the practice among some farmers of taking both Maha and Yala pickings from the same cotton crop, it was thought necessary to obtain information on their input-output activities over a full year, and the most appropriate time to interview them, in order to minimize the time-lag between reference year and interview, would have been as soon as possible after sale of the Yala crop. This would normally be completed in July or August, but such factors as lack of a sample frame at that time and widespread absence of farmers from their villages prevented the survey from being conducted until October 1978. Whilst a time-lag of this order may reduce the accuracy of farmer's recall of e.g. labour use, it seems likely that they would be able to remember adequately the physical quantities of other inputs and outputs, especially where they required cash expenditure or brought in revenue.

Reliance was placed throughout on farmers' own estimates of crop acreage. These are likely to be more accurate for asweddumised land than for upland or chena, but must on the whole be treated with caution. The alternative of individual plot measurement with standard equipment was rejected as excessively time-consuming (particularly given the long distances at which chena plots were sometimes located from the homestead), and as potentially unreliable since in some cases it would rely on farmers' ability to retrace the boundaries of abandoned chena plots.

Certain cross-checks were carried out on the data to ensure their consistency and, on the whole, the error resulting from recall deficiencies appears to have been low. It is felt, therefore, that in spite of these methodological difficulties, the survey results make a useful and timely contribution to knowledge of the economics of cotton production.

# CHAPTER 4

## SURVEY RESULTS I - THE SETTING

### 4.1. GENERAL SOCIO-ECONOMIC CHARACTERISTICS

#### 4.1.1. AGE

Little difference was observed in the age distribution throughout the survey locations. At Uda Walawe, the sample appears to be slightly older on average than in the villages. What is remarkable is the high proportion of young men involved in cotton cultivation in the villages. The under 30's category was the largest in each village, with the exception of Gonnoruwa, where it was exceeded by the 30-39 age group.

The age distribution is summarised below:

Table 9: AGE DISTRIBUTION OF SAMPLE FARMERS

| | Six villages | | Uda Walawe | |
|---|---|---|---|---|
| | No: | % | No: | % |
| Under 30 years ... | 71 | 34 | 8 | 17 |
| 30--39 years ... | 51 | 24 | 12 | 25 |
| 40--49 years ... | 43 | 21 | 11 | 23 |
| 50--59 years ... | 34 | 16 | 12 | 25 |
| Over 60 years ... | 10 | 5 | 5 | 10 |
| | == | == | == | == |
| | 209 | 100 | 48 | 100 |
| | === | === | === | === |

#### 4.1.2. PLACE OF BIRTH

A high degree of consistency was found within 5 of the villages, and at Uda Walawe, with some 80% of farmers being born within the District. Of those birth-places falling outside the District, Matara was the most common, with 14% of all interviewees originating from there. A further 5% originated from other areas in the low-country Wet Zone. The only exception to this trend was at Padaugama, where only 35% of farmers were born within the District. The high proportion of outsiders here can be explained by the high degree of spontaneous settlement (*encroachment)* on lands designated for development under the Kirindi Oya Scheme, settlers' intentions being to establish a claim to land in the hope of obtaining asweddumized land with development of the irrigation infrastructure. It is thought that the 35% of Padaugama residents born within the District also contains a high proportion of intra-District migrants.

As would be expected from the age profile data, the majority of interviewers were long-standing residents of the Districts (50% had lived there for between 20 and 39 years), the only exceptions being at Padaugama , where 30% had lived for under 10 years, and Uda Walawe where 58% had lived for under 10 years.

Experience in cotton-growing was similar in 5 of the 6 villages, wtih some 25% of farmers having under 5 years' experience, 15% between 5 and 9 years and 21% between 10 and 19 years. The exception, as might be expected from previous residency data, was Padaugama, where 65% had under 5 years' experience. At Uda Walawe, 83% had less than 5 years' experience, the remainder falling into the 5-9 years category. The relatively high proportion of newcomers to cotton production in the villages appears to reflect an awareness among farmers of the improved profitability of the crop with recent farm-gate price increases (see Table A 5 and Appendix 3).

Five villages displayed broadly the same pattern of family labour availability, with at least one adult relative available to assist in cotton cultivation, Mahagalawewa, Migahajandura and Badagiriya having the largest potential family labour force. At Mattala, the situation was very different, with 22 farmers having no relatives to call upon, and 8 more having only one. At Uda Walawe, only 3 farmers could not call upon family labour, more than half of the remainder having one or two relatives to assist.

### 4.1.3. OFF-FARM INCOME

A summary of the distribution of earnings from off-farm employment is provided below.

Table 10: EARNINGS FROM OFF-FARM EMPLOYMENT BY VILLAGE

| | CASUAL EMPLOYMENT | | | | | PERMANENT AND CASUAL |
|---|---|---|---|---|---|---|
| | No: of farmers reporting. | % of total | Average days worked per reporting farmer. | Average income per report-farmer. | Average income (all farmers) | Average casual and permanent income (all farmers). |
| Badagiriya | 10 | 29 | 64.5 | 653.0 | 192.1 | 192.1 |
| Gonnoruwa | 9 | 25 | 74.7 | 597.3 | 149.3 | 671.0 |
| Mahagalawewa | 9 | 25 | 73.7 | 499.1 | 124.8 | 224.8 |
| Mattala | 2 | 6 | 54.0 | 1392.0 | 38.7 | 481.9 |
| Migahajandura | 12 | 33 | 80.0 | 863.8 | 287.9 | 487.9 |
| Padaugama | 0 | 0 | 0 | 0 | 0 | 38.7 |
| Uda Walawe | 12 | 25 | 109.5 | 975.8 | 244.0 | 244.0 |

Casual employment was undertaken by approximately the same proportion of the samples at all sites, with the exception of Mattala, where it was much lower, and Padaugama, where it was zero. The low proportion in these last two villages will reflect both the degree of commitment to farming and the availability of off-farm employment opportunities, though in what proportions it is impossible to say, except that an area of spontaneous settlement, such as Padaugama may have few employment opportunities. A similar trend is observed in the average income received, taken over the sample as a whole. When earnings from permanent employment are added, the pattern is disturbed by the fact that 3 cotton cultivators at Mattala, and 4 at Gannoruwa, held full-time jobs.

### 4.1.4. LAND HOLDING CHARACTERISTICS

Land cultivated in the sample areas fell into three broad categories, asweddumized lowland, where paddy was grown exclusively ; homegardens, where a variety of vegetable and tree crops were grown and *chena*, or lands under shifting cultivation, where crops for cash sale and home consumption were grown.

Table 11 summarises the average holding sizes for each category per sample member at the 7 survey sites. The average area operated of all three types combined is remarkably consistent, lying between 4.5 and 5.5 acres for all sites except Badagiriya, and Uda Walawe, where better irrigation facilities and the varying availability of chena land appear to have exerted strong influence on cropping patterns. The operated extent of asweddumized land is low in all cases, scarcely rising above half an acre - except at Mahagalawewa (1.48 acres) and Badagiriya (2.38 acres) - where the influence of previous irrigated settlement was strong. At Uda Walawe, farmers had little opportunity of paddy cultivation. This is consistent with our earlier discussion of water-use at the project, where it was suggested that those farmers still growing cotton were, on the whole, those who did not have access to sufficient water for paddy cultivation. The low cropping intensity of paddy lands observed at some locations was almost invariably associated with inadequate water supply.

The average availability of homegarden land in the 6 villages varied from 0.7-2.3 acres, but cropping intensity was very low, chiefly (according to informal accounts) because of low soil fertility resulting from previous heavy cropping. Little differentiation was found among crops grown on homegardens and chena, with the exception that tree crops and vegetables for domestic consumption tended to be grown on homegardens, and cotton was almost exclusively a chena crop.

Little variation existed in the extent of chena land cultivated, the bulk of farmers cultivating some 3-4 acres. Exceptions were at Uda Walawe, where the amount of chena cultivated was negligible, upland crops being grown under irrigation, and at Badagiriya, where slightly over 5 acres were cultivated.

Since cotton is grown almost exclusively on chena in Hambantota villages, a closer investigation of its characteristics was though necessary to a full understanding of cotton cultivation. Details of this investigation can now be discussed.

## 4.2. CHENA CHARACTERISTICS

In 5 villages, cotton was grown almost exclusively under conditions of shifting cultivation. In only one ( Padaugama) was there a strong representation (39% of farmers) of settled cultivation. This is consistent with the suggestion that many farmers here are attempting to establish settled farms with a view eventually to obtaining irrigated land.

Chena lands were typically less than 2 miles distant from the homestead, with the exception of Badagiriya, where the majority were more than 4 miles distant (see Appendix 7). This exception to the general pattern appears to be related to the large expanse of asweddumaized land adjacent to homesteads in Badagiriya.

In 5 villages, 74% of farmers cultivated a given chena plot for only one year. Again, the exception to this trend was at Badagiriya, where 82% of farmers cultivated a given plot for two years (see Appendix 8). This is consistent with the above indication of a shortage of chena land within easy striking distance of the village. It was hoped that by questioning farmers on the duration of the fallow part of the chena cycle some impression would be gained of the extent to which pressure on chena land varied from one part of the District to another. Farmers were asked for how many yeats they abandoned a plot before returning to cultivate it again. While the modal response of 5 years (see Table 12), was consistent with estimates provided verbally (by e.g. DAEO Hambantota), no clear pattern emerged which could be interpreted as indicative of varying pressure on chena land. This may be attributable partly to the fact that farmers were predominantly young and insufficiently experienced in this aspect of chena management, or that there is some trade-off between length of chena cycle and distance from the village centre (i.e. farmers choosing between frequent cropping of less fertile plots close to the village and longer cycle cropping of fertile land at greater distance) which the data obtained do not explain adequately. The extent to which the length of chena cycle reflects pressure on land is clearly a complex question, and requires closer attention than could be devoted to it in the present study.

## 4.3. EXTENSION CONTACTS

The exposure to extension advice was extremely low in 5 of the 6 villages, 72% of farmers not having been visited by a KVS worker during the 12-months reference period. The exception to this was at Badagiriya, where 41% of farmers had received 2 visits, and 38% had more than 5 visits (Table 13). At Uda Walawe, with its much higher density of extension agents, 81% of farmers received over 5 visits. Whilst the *Train and Visit* system's philosophy is one of contact with a small number of selected farmer's which is not inconsistent with these findings, these data do emphasise the high proportion of farmers with no direct extension contact. Two questions should be addressed by any future research on the effectiveness of current extension practice - namely to what extent is essential information disseminated through contact farmers and , how accessible are extension workers if farmers are faced with a problem that requires urgent solution?

Intensive cotton cultivation relies on the use of such high-technology inputs as pesticides, and pest attack can be both sudden and devastating. Cotton, therefore, appears to be an exceptionally strong contender for accurate and timely extension advice, and before any expansion of the crop can be contemplated , the quality of existing extension personnel and the relevance of the *Train and Visit* approach to rainfed cotton cultivation where plots and farms are widely scattered needs close scrutiny. From the present study, the infrequency of farmer contact with extension workers suggests that unless the inter-farmer dissemination process is particularly strong , the stimulus given to production of the crop by the extension services must be very small.

Table 11. AVERAGE ACREAGES CULTIVATED PER SAMPLE FARMER BY LAND CATEGORY*

| | Asweddumized Land: Average acreage per sample farmer. | | | Home Gardens: Average acreage per sample farmer | | | Chena: Average acreage per sample farmer | Average Area operated All Types. |
|---|---|---|---|---|---|---|---|---|
| | Available | Operated | Cropping intensity. | Available | Operated | Cropping intensity. | Operated | (Acres) |
| | | | % | | | % | | |
| Badagiriya | 2.39 | 2.38 | 100 | 1.6 | 0.4 | 25 | 5.2 | 7.98 |
| Gonnoruwa | 1.27 | 0.58 | 46 | 1.4 | 1.0 | 71 | 3.5 | 5.08 |
| Mahagala-wewa | 2.08 | 1.48 | 71 | 1.5 | 0.3 | 20 | 3.8 | 5.58 |
| Mattala | 0.42 | 0.34 | 81 | 0.7 | 0.1 | 14 | 4.1 | 4.54 |
| Migahaja-ndura | 1.22 | 0.19 | 16 | 2.0 | 0.7 | 35 | 3.9 | 4.79 |
| Padaugama | 0.45 | 0.24 | 53 | 2.3 | 1.6 | 70 | 3.0 | 4.84 |
| Uda Walawe | 0.52*** | 0.50 | 96 | 0.3 | 0.2 | 67 | 1.9** | 2.60 |

* Data as for Maha 1977/1978. Since paddy land at Uda Walawe and to a lesser extent at Badagiriya is likely to be cropped also in Yala, the *annual* cultivated acreages at these two locations is likely to be somewhat higher.

** Irrigated Upland, chena cultivation is negligible.

*** Of which 0.44 acres is asweddumized lowland, and the remainder irrigated upland rice.

Table 12 : FREQUENCY DISTRIBUTION OF LENGTH OF PERIOD FOR WHICH CHENA LANDS ARE FALLOWED.

| | YEARS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Badagiriya | 2 | 1 | 11 | 5 | 2 | 5 | 0 | 7 |
| Gonnoruwa | 5 | 6 | 7 | 7 | 1 | 6 | 0 | 2 |
| Mahagalawewa | 8 | 10 | 8 | 4 | 2 | 1 | 0 | 3 |
| Mattala | 0 | 5 | 11 | 9 | 3 | 3 | 0 | 5 |
| Mighajandura | 4 | 7 | 5 | 3 | 4 | 5 | 0 | 6 |
| Padaugama | 3 | 0 | 4 | 2 | 1 | 1 | 1 | 7 |
| Total | 22 | 29 | 46 | 30 | 13 | 21 | 01 | 30 |
| % | 11% | 15% | 24% | 15% | 7% | 11% | 1% | 16% |

Table 13 : FREQUENCY DISTRIBUTION OF VISITS FROM KVS RECEIVED BY FARMERS - OCTOBER 1977/SEPTEMBER 1978.

| | NUMBER OF VISITS | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Badagiriya | 1 | 2 | 14 | 2 | 1 | 1 | 13 |
| Gonnoruwa | 23 | 3 | 4 | 2 | 0 | 2 | 2 |
| Mahagalawewa | 24 | 6 | 4 | 1 | 1 | 0 | 0 |
| Mattala | 28 | 3 | 2 | 1 | 1 | 1 | 0 |
| Padaugama | 25 | 1 | 3 | 1 | 0 | 0 | 1 |
| Uda Walawe | 3 | 0 | 2 | 3 | 1 | 0 | 39 |

## 4.4. THE ROLE OF COTTON IN CROPPING SYSTEMS

Since the sample selected is biased towards cotton farmers, it is not possible to draw general conclusions on the role of cotton in the agricultural economy of the District. Cotton growers do, however, constitute roughly between a quarter and a half of the farming population in the 6 villages surveyed , so whilst the following discussion relates strictly to cotton growers, it may be of some broader relevance to the village farming populations as a whole.

Those farmers who grew cotton allocated a substantial proportion of their resources to it, and it made a correspondingly large contribution to their earnings. For instance, the acreage allocated to cotton is higher by an order of magnitude than that planted to any other crop (Table 14 ).

Table 14: AVERAGE ACREAGE PER SAMPLE FARMER ALLOCATED TO THE MAIN CROPS MAHA 1977/1978

| | Cotton | Paddy | Chil-lie | Kura-kkan | Meneri | Cow-pea | Mai-ze | Gin-gelly | Green gram | Ground nuts |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 villages | 2.54 | 0.87 | 0.44 | 0.52 | 0.53* | 0.07 | 0.07 | 0.15 | 0.10 | 0.07 |
| Uda Walawe | 1.06* | 0.52 | 0.04 | 0.08 | - | 0.02 | 0.02 | 0.02 | 0.28 | - |

* Yala 1978

Similarly, cotton contributed between 29% and 73% of total income from farming activities, and between 27% and 65% of total household income (the latter including the head of household's earnings from any off-farm employment). It was the most important rainfed crop in terms of contribution to farm income at all 6 villages; in 5 of the 6 it was more important than all others combined and in 4 of the 6 generated more income than paddy (Table 15).

Perhaps, as a general comment, it would be reasonable to conclude that in those villages where cotton is widely grown, farmers are much more heavily, dependent on farming as a source of income than on non-farm activities and, within farming , cotton makes the major contribution except where paddy land is abundant.

It should be noted that with gross farming incomes of some Rs.2700 - Rs.4000 (with the exception of Badagiriya at Rs.8000) we are dealing with communities which are poorer than paddy growers of the District (gross incomes of some Rs.6500 in 1977 - Ranatunga and Abeysekera, (1977), but not so poor as the citronella growers (Rs.2500 in 1975 - 76 , Perera and Abeyratne, 1978)

Finally, it is worth emphasising in passing the fact that cotton-growers at Uda Walawe, in spite of the availability of irrigation, crop inputs, extension advice and a ready market, do not earn more than farmers in the 6 villages. This is concrete evidence of the scheme's failure to raise living standards for growers of field crops other than paddy, and must serve as a lesson in the planning of future irrigated cotton production.

## 5. SURVEY RESULTS II - COTTON CHARACTERISTICS

### 5.1. YIELD LEVELS AND AGRONOMIC PRACTICES

Survey methodologies relying on recall techniques and on farmers' own acreage estimates are prone to error in many circumstances. Resource constraints and the requirement to make an early report on the economics of cotton cultivation prevented the use of such techniques as direct plot measurement and yield analysis by sub-plot harvesting. The yield figures presented below should therefore be regarded as approximate, although, for crops with regularly and accurately laid out plots (such as paddy) and with a very high proportion of marketed output (such as cotton) the estimates may be less error-prone. Nor should undue reliance be placed on those estimates based on small numbers of sample observations.

In spite of any methodological shortcomings, the yield estimates show a moderate degree of consistency across villages which suggests that they may not be wildly inaccurate. Cotton yields, for instance, fall between 2.0 and 2.7 cwts. per acre, except for one exceptionally high (3.8 at Mattala) and one low (1.7 at Mahagalawewa) observation. It is also interesting to note that these yields are in line wiht the national averages noted in Appendix I, Table A 5. Further discussion of cotton yields is deferred to the section on input-output analysis. Paddy yields are typically slightly under 30 bushels per acre, except at Badagiriya where guaranteed water supply seems to have encouraged high input-use and improved husbandry. Yields of paddy at Migahajandura and Padaugama lie outside the normal range, but should perhaps be discounted because of the small number of observations. Paddy yields in most areas are considerably lower than the national average of almost 50 bushels per acre. Whilst a digression into the circumstances underlying low paddy yields would not be justified given the context of the present report, it seems clear that uncertain water supplies in many areas have contributed to low input-use and subsequent low yields.

Of the other crops, chillie yields appear to be moderately uniform, with higher input use at Migahajandura and Uda Walawe (and irrigation at the latter) contributing to higher yields. Cowpea, maize and gingelly yields show little variation, if the single observation of maize at Padaugama is discounted. Green gram yields appear exceptionally high at Padaugama, a phenomenon for which no immediate explanation is available.

No single location appears to show consistent superiority in yields of the crops considered, with the possible exception of Uda Walawe, where irrigation may have permitted water stress in chillies, kurakkan and maize to be relieved, with consequent higher yields. At the other end of the scale, Padaugama seems to display generally low yields, a fact which may be explained by the recent arrival of many farmers, their consequent unfamiliarity with cultivation techniques appropriate to local conditions and their interest in rainfed crops only as a temporary measure, pending fulfilment of their aspirations to irrigated land under the proposed Kirindi Oya project.

There is little reliable information on average national yields of these crops which could act as a yardstick for the performance of the survey locations. Unpublished information provided by the Division of Extension in the Department of Agriculture (Sri Lanka Extension, Education and Adaptive Research Project; Acreage Production and Yield of Major Crops, 1967-1976) is patently unreliable in its estimate of cotton yields at

10.6 cwts. per acre (cf Table A5) and should therefore treated with caution in its yield estimates for other crops. These it gives as:

| | |
|---|---|
| Chillies | 397 lbs/acre |
| Kurakkan | 13.4 bu/acre |
| Cowpea | 8.8 bu/acre |
| Maize | 19.1 bu/acre |
| Gingelly | 6.0 bu/acre |
| Green gram | 9.3 bu/acre |
| Groundnuts | 807 lbs acre (shelled) |

If these estimates are taken to be accurate, they suggest that yields of rainfed crops in the villages surveyed are generally lower than the national average . Whilst it would be unwise to attribute too much accuracy to the Extension Division's estimates, this seems a reasonable conclusion in view of :

(I) the possibility that the farmers interviewed are primarily oriented towards cotton, with only peripheral interest in these other crops;

(II) the low and unreliable rainfall experienced in many parts of the district which must contribute to the poor performance of rainfed crops.

Detailed information on agronomic practices was collected only for cotton. Apart from input use levels, which are discussed elsewhere (5.2 below), two major characteristics of the crop's cultivation merit discussion:

(i) the extent to which the crop is carried over to the yala season, with a second round of picking carried out at the end of yala, varies from one location to anther . At Mahagalawewa, Migahajandura and Mattala it was negligible, whereas at Gonnoruwa one-third and at Padaugama and Badagiriya one half of the sample maha planting was picked again in yala when the rains had caused re-generation of the plants and formation of new bolls. Yields from the yala picking were low; 0.7 cwt. per acre at Gonnoruwa, and 1.1 cwt. at Badagiriya and Padaugama. At Uda Walawe, where cotton had initially been introduced as a yala single season crop , some maha planting had been promoted by the Project management in 1976-1977, and subsequent slackening of the cropping schedule resulted in new plantings in both seasons, and carry over from one to the next. In yala 1978, for instance, 27 of the sample farmers planted 39.25 acres, whilst 5 carried over 8.25 from the previous yala. No evidence of carry-over for more than 2 consecutive seasons was found at Uda Walawe.

(ii) the extent to which cotton is planted as an annual crop or allowed to carry over from one year to the next, with or without ratooning. For reasons discussed in the above section on sample selection, it is not possible to report conclusively on this practice here. However, from the samples observed, it was clear that carry-over was widely practised in Badagiriya, to a lesser extent in Padaugama and Gonnoruwa, and rarely at Mattala, Mahagalawewa and Migahajandura. Whilst it would be unwise to place too much emphasis on these findings, certain other evidence seems to be consistent with them, such as the fact that the vast majority of Badagiriya farmers crop their chena land for two or more years before abandoning it (longer than elsewhere - see above). Also, carry-over seems

Table 15: The Relative Contribution of Cotton, Paddy and Other Crops to Tótal Farm and Household Incomes at 6 villages and at Uda Walawe

| | Sample size | Gross value[1] of production from paddy per sample farmer (Rs.) | Net value[2] of production from cotton per sample farmer (Rs.) | Gross value[1] of production from from other crops per sample farmer (Rs.) | Total[3] income from off-farm employment of head of household (Rs.) | Total farming income (Rs.) | Total household income (Rs.) |
|---|---|---|---|---|---|---|---|
| Badagiriya | 34 | 4,407.5 | 2,663.3 | 1,190.0 | 192.1 | 8,260.8 | 8,452.9 |
| Gonnoruwa | 36 | 672.0 | 1,609.3 | 502.1 | 671.0 | 2,783.4 | 3,454.4 |
| Mahagalawewa | 36 | 1,630.7 | 957.1 | 673.1 | 224.3 | 3,260.9 | 3,485.7 |
| Mattala | 36 | 392.0 | 2,927.0 | 661.9 | 481.8 | 3,981.8 | 4,463.6 |
| Migahajandura | 36 | 408.0 | 1,200.8 | 1,488.3 | 487.9 | 3,097.1 | 3,585.0 |
| Padaugama | 31 | 180.3 | 1,570.7 | 1,479.5 | 38.7 | 3,230.5 | 3,269.2 |
| Uda Walawe | 48 | 1,315.4 | 1,369.2 | 716.9 | 244.0 | 3,401.5 | 3,645.5 |

Note : 1. No deductions have been made for cash input costs. These are approximately 30% of gross output value for paddy, but are negligible for crops other than cotton.

2. Net production value for cotton is the total value of sales less expenditure on all inputs other than labour. These input costs are around 10% of the gross output value in the 6 villages, but over 30% at Uda Walawe.

3. This is made up of income from both casual and full-time employment, the latter being of importance chiefly at Gonnoruwa, Migahajandura and Mattala.

Output values throughout are calculated on the basis of prices received by farmers. This presents no difficulty where , as with cotton, the entire crop is marketed, but where only a portion of the crop is marketed (as with all others), to apply the price received for the marketed portion to the non-marketed involves the assumption that both are of similar quality, or more accurately, that the real value of what the farmer retains for home consumption is equivalent to the market price he would have to pay to buy it in. The reference period in preparation of this Table is October 1977-September 1978.

to be practised more in the southern parts of the District, where rainfall is less reliable, than in the north. This is consistent with the fact that a rattooned or re-generated stand of cotton has a higher chance of success than a newly-established crop which suffers repeated water stress. If this interpretation is correct, rattooning and carry-over may be viewed as an insurance measure in areas of unreliable rainfall, whilst the yield potential of a new stand is likely to be higher where rainfall is more regular.

## 5.2 PURCHASED INPUT USE AND PRODUCTION COSTS

Input use and production costs can be considered under three broad groupings; land, purchased inputs and labour. The first has already been discussed: in the sample locations, more land was devoted to cotton than to any other crop. Whilst careful calculations supported by a number of simplifying assumptions would permit some estimate to be made of the opportunity cost of land allocated to cotton, this would be of most value if land were a constraining factor in crop production, but it appears unlikely that if direct economic forces were allowed to prevail land availability would be constraining. The present system of land allocation relies on the issue of chena permits, the operation of which resembles a rationing system, and its influence on cotton cultivation will be discussed in a later section. This section is reserved for a discussion of purchased inputs, which is immediately followed by an analysis of labour inputs (5.3). In examining the production cost estimates presented below it is interesting to bear in mind the much higher estimates prepared by the Gonnoruwa Cotton Growers' Association (Appendix 9).

Purchased inputs take the form of insecticides, sprayers (on hire), gunnies and, at Uda Walawe fertilizer and tractorised land preparation.

### 5.2.1 INSECTICIDES AND SPRAYERS

Contrary to opinions expressed elsewhere (Hughes and Tunstall, 1978), a high proportion of chena cultivators do use insecticides, although the number of applications per spraying farmer is low (Table 17), as is the value of insecticides and spraying equipment applied per acre, averaged across the entire sample. The number of acre-sprays applied provides a crude measure of the varying extent to which this technology has been used in the sample villages. A more accurate estimate is provided if the bias attributable to varying sample and cotton holding sizes is eliminated by dividing through by the total sample acres. The pattern which now emerges is that, of the 6 villages, Badagiriya applies the highest number of sprays relative to its size, followed at some distance by Migahajandura, with Mattala at the lower end of the scale. Whilst such complex issues as the extent to which new technology is adopted defy simplistic explanation, it is interesting to note that Badagiriya farmers also receive more visits from extension workers than do others, and the two factors may not be entirely unconnected.

At Uda Walawe, spraying levels and costs are higher by, roughly, a factor of three. This is not surprising in view of the high density of extension workers and the pressure on farmers to apply insecticides, although it is interesting to note that a significant minority of farmers there did not spray in either maha or yala season, (chiefly because their crop was carried over from the previous season, and therefore deemed unprofitable to spray), and the average number of sprays applied per spraying farmer, at 3.9 in maha and 6.0 in yala, was substantially lower than the 10 applications envisaged in internal RVDB cost of production studies.

Table 16 Yield Levels per Acre and Numbers of Observations for the Main Crops in 6 Villages and at Uda Walawe

| | Cotton (Cwt) | Paddy (Bu.) | Chillies (lb. dried) | Kurakkan (Bu.) | Meneri (Bu.) | Cowpea (Bu.) | Maize (Bu.) | Gingelly (Bu.) | Greengram (Bu.) | Groundnut (Bu.) |
|---|---|---|---|---|---|---|---|---|---|---|
| Badagiriya | 2.5 (34) | 46.9 (28) | 171 (21) | 10.4 (09) | - | 5.4 (04) | - | 2.9 (02) | 4.6 (17) | 550 (11) |
| Gonnoruwa | 2.0 (36) | 29.1 (10) | 125 (09) | 9.7 (20) | 3.8 (03) | 3.4 (04) | 10.0 (04) | 2.8 (05) | 7.0 (02) | 723 (04) |
| Mahagalawewa | 1.7 (36) | 28.1 (22) | 118 (25) | 6.8 (22) | 6.7 (27) | - | 8.9 (09) | 3.0 (07) | - | |
| Mattala | 3.8 (36) | 28.7 (10) | 145 (18) | - | 7.1 (21) | 6.1 (06) | 8.6 (05) | 2.7 (03) | 4.4 (03) | 672 (02) |
| Migahajandura | 2.7 (36) | 54.4 (04) | 309 (30) | - | 10.2 (28) | 5.0 (01) | 4.7 (14) | 3.7 (17) | - | 1067 (05) |
| Padaugama | 2.6 (31) | 18.9 (04) | 178 (19) | 5.3 (13) | 4.6 (07) | 6.6 (11) | 20.0 (01) | 3.6 (04) | 12.7 (07) | 444 (05) |
| Uda Walawe | 3.1 (48) | 40.8 (16) | 357 (09) | 14.3 (07) | - | 5.9 (03) | 12.5 (05) | 2.9 (07) | 3.0 (15) | 896 (01) |

Notes :

1. Number of observations given in parentheses .
2. Yields for maha and yala are not differentiated. In the majority of cases, crops are grown exclusively or mainly in maha, except for meneri, which is exclusively a yala crop; gingelly is also extensively grown in yala. With cotton in the 6 villages, yields are estimated by combining maha production with any yala picking, and dividing the total by planted acreages, to give the crop's yield over a full year.

In the yala season, only in 3 villages did a small percentage of farmers apply insecticide, and then at low rates, as reflected in the lower cost per acre-spray. At Uda Walawe, whilst the percentage of spraying farmers was smaller than in maha, they applied more insecticide, as is evidenced by the higher number of sprays, acre-sprays, acre-sprays/acre and total insecticide costs. There is no obvious single reason for this inter-seasonal difference in behaviour at Uda Walawe; it could arise from associated inter-seasonal differences in a number of other variables, such as the degree of pre-occupation with other crops, the percentage of the crop carried over and newly planted, extension pressure to apply insecticide, the degree of pest infestation, and so on. What does emerge clearly is that irrigation facilities at Uda Walawe encourage cotton growers to invest in purchased inputs in yala, by contrast with rainfed cotton, which in yala is a carry-over from maha planting, and may or may not produce a crop, depending on rainfall; there is therefore little incentive to invest in cash inputs which may yield no return.

Spraying generally accounts for more than 50% of all purchased input expenditure, and so is a major item in the farm budget. There appears to be no relationship between spraying and yield levels among the villages, indeed, Mattala, with the highest yields, has the lowest spraying input. Whilst a low degree of pest attack there might account for this, a more likely explanation is to be found in the high standards of husbandry acknowledged to exist there (DAEO, Hambantota, pers. comm.) and in a rainfall pattern which, whilst adequate for cotton , is not excessive in the late season and therefore not a source of boll-rot.

Three sets of issues arise in comparing farmers' spraying performance with extension recommendations; first, do farmers apply insecticide of the correct type; second, do they apply the correct concentration and volume of solution per acre-spray; third, do they apply enough sprays. These can be examined in turn:

(i) At Uda Walawe, all insecticides are supplied through the Project and so generally conform to the recommended types (i.e.DDT, carbaryl - Sevin - and monocrotophos). For rainfed cotton, carbaryl, DDT, endosulfan, dimethoate, monocrotophos and methamidophos are recommended. Reference to Appendix 10 suggests that of these, only monocrotophos and methamidophos are widely used. Endrex is the only insecticide regularly used without being recommended. This gives some cause for concern in view of its high persistence in the enviromment. Further,Hughes and Tunstall (1978) have expressed concern about the high mammalian toxicity of two recommended insecticides (methamidophos and monocrotophos); unfortunately, they severely underestimate the extent to which the former is used. Whilst the evidence at both irrigated and rainfed sites suggests that recommended pesticides are widely used, the question remains as to whether the appropriate insecticide for a given pest species is used. Some of these pesticides are broad-spectrum in their control potential, whereas others are more specific. In the absence of farmer training to identify pests, and given the need in rainfed areas for farmers to rely on the advice of the private sector from which they generally purchase, it seems highly likely that inappropriate insecticides are frequently used.

(ii) Spraying costs per acre-spray vary widely between rainfed and irrigated locations. This is indicative of the application of insecticide at less than the recommended concentration and/or volume per acre-spray in some areas. At Uda Walawe, the recommendation is:

| | | | | |
|---|---|---|---|---|
| DDT | .. | ..1kg.acre | per application | (x4 applications) |
| Sevin | .. | ..1kg/acre | " | ( " ) |
| Monocrotophos | .. | ..1 lb. acre | " | (x2 " ) |

At yala 1978 prices, this would cost a weighted average of some Rs.40/- per acre-spray, to which Rs.2.50 should be added for sprayer hire. This is slightly lower than the observed Uda Walawe costs of Rs.52.80 and Rs.46.60 in maha and yala respectively. The difference is small and could be accounted for by variations in the composition of the insecticide mix to suit the types of pest attack, and/or the availability of insecticides. We might therefore conclude the Uda Walawe spraying farmers follow recommendations on the quantity of insecticide to be applied per acre-spray, and that in doing so, they incur costs of Rs.45-50 per acre-spray. At only 2 of the villages are costs approaching this level incurred (Migahajandura and Gonnoruwa), whilst at the remainder, acre-spray costs average out at some Rs.24.27 (Table 17). Since the sprayer hire charge component of spraying costs is similar at both irrigated and rainfed sites (approx.Rs.2.50 per acre-spray), this suggests that, in the majority of villages, farmers spray at less than the recommended per acre-spray rates, either by over-diluting or by applying less than the recommended volume of solution, or both. The force of this conclusion could be moderated if rainfed cotton growers used less expensive insecticides than at Uda Walawe. The evidence is, however, that they do not, since the most commonly-used insecticide, Tamaron, costs some Rs.60 per 16 oz. bottle, which is recommended for a single-acre-spray, and is comparable with the costs at Uda Walawe of Sevin (Rs.54/kg/acre) and Monocrotophos (Rs.84/lb/acre). (cf.Appendix 10) If it can be assumed that the recommended insecticide concentrations and volumes per acre-spray are relevant to farmer circumstances, there appears to be much scope for extention activity here to raise per-acre application rates to the recommended levels.

(iii) A problem of different dimensions is presented by the low number of sprays applied by rainfed cotton growers. The average per farmer lay between 1.1 and 1.7 over the 6 villages, as against a recommendation of some 6 applications. While some doubt has been cast on the validity of research-based spray application recommendations to small farmers' circumstances (Farrington, 1977a), and the research base itself is small in Sri Lanka, it appears reasonable to suggest that farmers could profit from higher spraying levels than those observed. Evidence from the survey suggests that, for many farmers, there is no reluctance to spray; the problem lies in the difficulty of obtaining insecticides or sprayers. For instance, at 5 of the 6 villages, farmers travelled on average between 10 and 15 miles to buy insecticides, whereas at Uda Walawe the distance was between 1 and 2 miles, and at one village with highly developed infrastructure (Badagiriya), less than 1 mile (Appendix 11). Similarly farmers at Mattala and Padaugama frequently had to travel as far as Tissamaharama in order to hire sprayers. It therefore appears likely that spraying levels would rise, and with them an increase in the quality and yield of the crop , if insecticides and sprayers were made more accessible to rainfed cotton growers.

At Uda Walawe, the average level of 3.9 applications in Maha and 6.0 in Yala is considerably lower than the recommended 10 applications. By contrast with rainfed cotton, it is questionable whether farmers would profit from higher spraying levels here. On the one hand , Hughes and Tunstall (1978) report a generally low level of pest infestation, and, on the other, the recommendation of 10 applications was developed under research-station cultivation conditions , with high standards of husbandry and water control, and with seed of high viability and purity of line. Given the lower quality of all of these factors in current commercial production at Uda Walawe, it seems unlikely that farmers would benefit from spraying levels higher than those currently applied. More exhaustive discussion of the practical and theoretical issues underlying farmer decision-taking in pesticide application has been published elsewhere (Farrington, 1977a,b).

### 5.2.2 OTHER PURCHASED INPUTS

At the rainfed production sites, the bulk of other input costs were attributable to the purchase of gunny sacks for marketing the crop (Table 18), and a much smaller amount was spent on transport of the crop to market and a variety of miscellaneous items. The use of gunnies for marketing was a matter of discontent to many farmers. Cotton growers bore their cost, but they were then absorbed into the marketing network, without compensation. Depending on the farmer's yield, this process could cost him Rs.30 - Rs.70 each season. A more general disadvantage of marketing in sacks has been noted by Hughes and Tunstall (1978) , who suggest that the practice of packing seed cotton tightly into the sacks - and inevitable consequence of the farmers' having to meet their cost and often accomplished with the assistance of a heavy wooden or metal pole - is highly likely to damage the fibre.

There seem, therefore, to be good reasons for modifying present methods in one of the following ways :-

(i) By paying compensation to the farmers for gunnies not returned to him, and discouraging the tight packing of cotton.

(ii) By using local materials as containers, instead of gunnies. In many African countries, cotton is transported to market in large baskets, and in a variety of other multi-purpose containers. It is not difficult to imagine in Sri Lanka how cotton could be wrapped and tied in palm leaves, or even banana leaves as a cheap and temporary means of transport. Such use of local materials could save the farmer much of his current expenditure of Rs.6.50 - Rs.7.24 per sack but would require some re-orientation, prompted through the extension services .

At Uda Walawe, transport to market and gunnies are provided by the Project. The chief item of expenditure was tractor hire, an average of over Rs.100 per season per farmer, followed by expenditure on fertiliser. Tractorised land preparation is carried out at fixed rates, viz. one disc ploughing at Rs.86.25/acre , a double harrowing at Rs.63.25/acre and ridging at Rs.63.25/

Table 17 Cost and Use-Level of Purchased Inputs - I, Insecticides & Sprayers at 6 villages & Uda Walawe

| | Cotton acres per sample farmer | Yield per acre (cwt) | Per-acre cost of all purchased inputs[1] (Rs.) | Ratio of all input costs to gross output value | No. of sprays applied per spraying farmer | % of farmers spraying | Spraying costs per acre over entire sample (Rs.) | No. of acre-sprays applied | No. of acre sprays per acre | Spraying costs per acre-spray (Rs.) |
|---|---|---|---|---|---|---|---|---|---|---|
| Maha 1977/78 | | | | | | | | | | |
| Badagiriya | 3.8 | 1.9 | 54.1 | 0.09 | 1.4 | 88 | 37.7 | 180 | 1.41 | 26.7 |
| Gonnoruwa | 3.0 | 1.8 | 74.6 | 0.15 | 1.7 | 83 | 49.4 | 106 | 0.99 | 50.0 |
| Mahagalawewa | 2.3 | 1.7 | 40.6 | 0.08 | 1.3 | 67 | 24.2 | 76 | 0.92 | 26.4 |
| Mattala | 2.4 | 3.8 | 51.2 | 0.04 | 1.1 | 53 | 14.3 | 51 | 0.58 | 24.7 |
| Migahajandura | 1.7 | 2.7 | 103.8 | 0.13 | 1.5 | 72 | 65.5 | 75 | 1.24 | 52.9 |
| Padaugama | 2.1 | 2.1 | 53.4 | 0.08 | 1.6 | 52 | 27.5 | 64 | 1.00 | 27.3 |
| Uda Walawe | 1.0 | 3.2 | 298.9 | 0.29 | 3.9 | 82 | 175.2 | 166 | 3.32 | 52.8 |
| Yala 1978[2] | | | | | | | | | | |
| Badagiriya | 2.0 | 1.1 | 14.3 | 0.04 | 1.5 | 12 | 6.7 | 25 | 0.36 | 18.4 |
| Gonnoruwa | 1.0 | 0.7 | 15.8 | 0.11 | 3.0 | 3 | 8.9 | 24 | 0.64 | 13.4 |
| Padaugama | 0.9 | 1.1 | 18.4 | 0.06 | 1.0 | 6 | 5.8 | 4 | 0.15 | 38.7 |
| Uda Walawe | 1.1 | 2.9 | 440.9 | 0.47 | 6.0 | 68 | 252.4 | 276 | 5.40 | 46.6 |

Note: 1. Includes insecticides, sprayer hire, gunnies, transport and at Uda Walawe, fertiliser and tractorised land preparation

2. Spraying was carried out only at these sites in yala.

Table 18 Cost and Use-Level of Purchased Inputs - II, Gunny Sacks, Tractor Hire, Fertiliser & Other Items - Maha 1977/78

| | Average expenditure per sample farmer on gunny sacks (Rs.) | Average No. of gunnies used per sample farmer | Average cost per gunny (Rs.) | Average expenditure per sample farmer on: Fertiliser (Rs.) | Tractorised land preparation (Rs.) | Other items (Rs.) |
|---|---|---|---|---|---|---|
| Badagiriya | 59.3 | 9.0 | 6.50 | - | - | 2.7 |
| Gonnoruwa | 57.0 | 8.0 | 7.15 | - | - | 18.0 |
| Mahagalawewa | 32.1 | 4.7 | 6.80 | - | - | 5.8 |
| Mattala | 70.2 | 9.7 | 7.24 | - | - | 19.8 |
| Migahajandura | 40.0 | 6.0 | 6.63 | - | - | 24.2 |
| Padaugama | 37.1 | 5.4 | 6.92 | - | - | 16.1 |
| Uda Walawe | - | - | - | 19.5 | 109.4 | - |
| Uda Walawe* | - | - | - | 64.7 | 169.8 | - |

* Yala 1978

acre, (yala 1978), and these rates are not widely different from hire charges in the private sector.

The use of fertiliser raises a number of interesting issues. Recommendations in yala 1978 were 1 cwt superphosphate/acre at Rs.81.60 as a basal application, followed by a topdressing of 0.5 cwt/acre of urea at Rs.27.25. Farmers' total expenditure on fertiliser should, therefore, be Rs.108.85/acre, but was only Rs.51.97 in yala and Rs. 18.68 in maha across the sample as a whole. Eliminating those farmers who did not apply fertiliser (i.e. chiefly those cultivating the crop as a carry-over), these figures are raised slightly to Rs.65.04 and Rs.42.94 per farmer respectively. Farmers therefore apply fertiliser at approximately half the recommended rate.

Given the high density of the extension network, it would be reasonable to suppose that farmers are fully aware of the recommended fertiliser use-levels, and may perhaps be subject to pressure to apply these levels. That they do not may be indicative of some conviction that application of the full rate is uneconomic and, to some degree, of a shortage of cash resulting from the withdrawal of credit facilities to defaulters. The credit argument, however, may be of only superficial validity, since rainfed cotton growers manage to raise sufficient funds to purchase what they regard as necessary inputs ( insecticides, gunnies), in the majority of cases without credit (cf Table 19). We are therefore left with the possibility that recommended fertiliser levels are higher than those that provide maximum net returns to the farmers' investment in this input. Whilst no firm evidence from the survey or from the literature can be advanced to indicate what the optimum level might be, it is interesting to note that the 1966-7 Department of Agriculture Administration Report referred to trials in which variety HC101 was found to respond only to nitrogen (at up to 80 lbs/acre) but not at all to phosphate or potash, a finding reiterated by Anthony (1975). Unless there is strong evidence of interaction among the various types of fertiliser to warrant the use of some phosphate, it is difficult to see how the continued recommendation, and use, of such large quantities of super-phosphate at Uda Walawe can be justified. It would appear that this recommendation should be investigated by agronomy trials if it is proposed to continue cotton cultivation there, and the whole question of fertiliser use on cotton might usefully be reconsidered ,with particular attention to yield responses under the crop husbandry performances achieved by farmers,before its proposed cultivation at Kirindi Oya. Input costs on a crop such as cotton are high enough already without being raised by any unnecessary fertiliser use.

### 5.2.3 FARM INPUTS & CREDIT USE

A discussion of use-levels of purchased inputs in cotton would not be complete without some consideration of the extent to which non-availability of funds constrains their use, and the potential role of credit in relieving such constraints.

At Uda Walawe, the majority of farmers receive credit for the full value of purchased inputs over the season, which is then recovered at point of sale . A few sample farmers were refused credit in consequence of their earlier defaulting on repayments. On the whole, non-availability of funds is unlikely to have constrained input use at Uda Walawe ,although the crop's poor performance in relation to its high level of input costs - presumably a major reason for defaults - give cause for concern, and unless rectified may reduce the availability of funds for input purchase both at Uda Walawe and at other proposed areas of irrigated production.

In the 6 villages credit use was generally low (Table 19); less than one third of the sample used credit in 5 villages, whilst the proportion was two-thirds in the remaining one. The amount borrowed ranged between Rs.22 and Rs.128 for those farmers using credit, which averaged out at Rs.0.8 - Rs.85.6 across the samples as a whole. There was a distinct tendency for the amount of credit to rise among those villages where net revenue earned from cotton was low (Table 19). This suggests that farmers in the higher income villages had no need of credit, whereas the need was greater (but by no means universal) in the lower-earning villages. Whilst all of these farmers obtaining credit also used insecticides, a high proportion of spraying farmers did not need credit in some villages. (Table 19). In most cases, the credit was obtained from friends, relatives and private traders. Only 7 farmers in the entire sample reported using institutional credit. It seems reasonable to conclude that wider availability of institutional credit would permit greater use of purchased inputs, particularly in those villages with low cotton earnings, and may reduce the burden of interest payments, but it should be borne in mind that many farmers do not rely on credit when purchasing their inputs, and in the long-term, the encouragement of self-reliance through individual or group savings may be a sounder policy than blanket availability of subsidised credit.

Table 19 Credit Use in Relation to Net Income from Cotton & Spraying Intensity in 6 Villages

| | No.of farmers using credit | Average[1] credit per farmer using it (Rs.) | Average credit per sample farmer (Rs.) | Net value[2] of cotton production per sample farmer (Rs.) | Percentage of spraying farmers who used credit |
|---|---|---|---|---|---|
| Badagiriya | 0 | 0 | 0 | 2663.3 | 0% |
| Gonnoruwa | 6 | 88.2 | 14.7 | 1609.3 | 20% |
| Mahagalawewa | 10 | 66.3 | 18.4 | 957.1 | 42% |
| Mattala | 2 | 22.0 | 0.8 | 2927.9 | 11% |
| Migahajandura | 24 | 128.4 | 85.6 | 1200.6 | 92% |
| Padaugama | 12 | 83.4 | 32.3 | 1570.7 | 75% |

Notes : 1. Credit data are taken from maha 1977-8

2. Net value of cotton production is as defined in Table 15. Data apply to the full reference year, but yala production contributed minimally to the total.

### 5.3 LABOUR USE

Labour is perhaps the most difficult input to measure in the analysis of crop production. Studies of labour inputs invariably use some measure of the time worked as a proxy for the effective human energy input. This implies homogeneity in work performance per unit of time and in work-rest patterns, and thus amounts to a sweeping over-simplification of reality, which is rarely made explicit. More complex models have attempted to allow for variations in the length of working day (cf.Farrington, 1975a), and for the extent of variation, by crop operation, in the physical work-rate achieved among various worker categories (Farrington, 1975b), although the attempt to incorporate these differentials into a production model met with little success. In general, the effective work input per unit of time worked was found to vary considerably according to age, sex, status and the method of payment of hired labour. Even within categories homogeneous in these characteristics much variation existed.

The measurement of labour input is thus beset with difficulty. When the shortcomings of using time as a proxy for effective labour input are compounded (as in our case) by the potential unreliability of long respondent recall, the resulting estimate of labour inputs can be regarded only as very approximate. Ih the present study, in attempting to minimize respondent recall error, labour data were collected only for cotton. The amount of work done by children was extremely small and no weighting factor was applied to reduce their labour to a "man-day". The same procedure was adopted for female workers, since they participated only rarely in the heavier tasks, and, from work conducted elsewhere (Farrington, 1975b), their effecttive labour input on lighter operations (weeding, picking cotton , etc.)is known to be equal to or greater than that of men per unit of time.

In spite of these methodological shortcomings, the results presented below (Table 20) display a moderate degree of uniformity across villages. In particular, the inputs for planting and picking (on a per hundredweight basis) vary little (with the exception of Mattala, which is discussed at more length below). The inputs for land preparation do not vary excessively, considering the widely differing jungle densities that farmers must face, with the exception of Mahagalawewa, which is well below average. This aberration may be attributable to the light bush density facing farmers there (therefore requiring little labour for clearing) resulting from the trend towards a very short chena cycle (see Table 12). Some farmers there have complained of shortage of land suitable for cotton cultivation. The per acre labour inputs for pruning (i.e. cutting back a senescent crop to permit rattoon growth) and spraying will clearly be determined by the extent of adoption of these practices, and from the point of view of data reliability, it is interesting to note that the extent of their adoption among villages is broadly in line with recorded labour inputs(cf. above Table 17). Labour inputs for picking and cleaning will vary with yield, and inputs per hundredweight of seed cotton picked are presented in brackets. These picking performances of some 5 days/cwt correspond with those extensively observed among African smallholders, of some 20-25 lbs/day (Farrington, 1975b), another small point supporting the view that the data are not excessively wide of the mark. Labour inputs over all operations in the 6 villages average out at some 62 days/acre for an average yield of 2.3 cwt in maha. Mahagalawewa falls well below this average, whilst Migahajandura and Padaugama exceed it. These aberrations can be accounted for in several ways; first and foremost, the methodological shortcomings discussed elsewhere may have introduced error into the estimates; second, at Mahagalawewa low land preparation inputs may be accounted for by light bush cover resulting from short-cycle chena; third, paddy represents a major activity at Mahagalawewa (more so than everywhere else, except Badagiriya)and so may absorb much of the available labour, since average (and possibly also marginal) returns to labour are higher in paddy than in cotton (see below, Table 24); the paddy acreages at Migahajandura and Padaugama are, conversely, much lower than average; fourth, some correlation does appear to exist between labour inputs and yields at these villages, Mahagalawewa having the lowest observed maha yield of all villages, whilst Migahajandura has the second highest, thus suggesting that the recorded variations there are real, not apparent, and have an impact on yield levels.

In the final analysis , none of these factors, taken singly or in combination, explains fully the variation in labour input. This is especially true

Table 20

Per Acre Labour Inputs (all types) by Operation, Maha 1977-8

| | Land preparation. | Pruning. | Planting. | Weeding. | Spraying. | Picking. | Cleaning. | Marketing. | Other | All[1] operations. |
|---|---|---|---|---|---|---|---|---|---|---|
| Badagiriya | 25.6 | 2.3 | 4.6 | 13.2 | 0.5 | 10.6(5.5)[5] | 4.3(3.2)[5] | 0.3 | neg.[4] | 61.4 |
| Gonnoruwa. | 20.9 | 1.2 | 4.4 | 23.4 | 1.3 | 7.8(4.4) | 2.4(1.3) | 0.7 | 1.2 | 63.3 |
| Mahagalawewa. | 14.3 | 0.4 | 3.3 | 13.1 | 0.4 | 8.9(5.3) | 2.7(1.6) | 0.9 | 0.1 | 44.1 |
| Mattala. | 19.0 | 0.1 | 2.8 | 19.1 | 0.3 | 5.9(1.8) | 4.1(1.1) | 0.5 | 0.6 | 52.4 |
| Padaugama. | 27.2 | 0.2 | 4.7 | 22.3 | 0.6 | 14.5(6.9) | 6.7(3.2) | 0.5 | 2.4 | 79.1 |
| Average (all[2] villages) | 22.4 | 0.9 | 4.1 | 19.0 | 0.7 | 9.5(4.2) | 3.9(1.7) | 0.7 | 0.7 | 61.9 |
| Uda Walawe. | 4.2 | 2.8 | 4.1 | 19.9 | 5.8 | 17.7(5.5) | 11.7(3.7) | 0.2 | neg. | 66.4 |
| Uda Walawe.[3] | 0 | 1.2 | 5.0 | 24.9 | 7.9 | 19.7(6.8) | 9.5(3.3) | 0.1 | 0.6 | 68.9 |

Notes:

1. The figures in this column are arrived at by dividing all labour inputs for the village by the cotton acreage cultivated.
2. The figures in this row are similarly weighted by dividing by total acreage.
3. Yala.
4. neg. = negligible.
5. Days per cwt.

of Mattala, where labour use is lower than average, but yields higher than in any of the other villages. It has to be accepted that such exogenous factors as farmer skill, work intensity levels and weather characteristics are likely to vary among villages and influence the productivity of labour, but their impact cannot be adequately assessed here.

Labour inputs for the two reference seasons at Uda Walawe are remarkably similar, both in total and in individual operations. The total input is slightly higher than that in the 6 villages. At first sight, this is surprising in view of the mechanised land preparation provided by RVDB, but on closer examination the difference is more apparent than real, much of it being attributable to higher yields and spraying levels.

### 5.3.1 HIRED LABOUR INPUTS

Whilst the data would permit a breakdown of family labour inputs into broad age/sex groupings, it is thought to be of much interest to the present study to examine the role of hired labour in cotton production, since any expansion of the crop's cultivation, unless on the basis of very small holdings, is bound to involve employment of hired labour for certain operations (especially picking).

The overall employmnet of hired labour in cotton production is high, varying between 31% and 54% of all labour use in the 6 villages (45% over all villages on a weighted average), but , at 29% is much lower in Uda Walawe, (Table 21). Whilst it would be unwise to draw firm conclusions about the whole-farm balance between family and hired labour use on the basis of results for a single crop, the proportion of hired labour in total labour input seems to be higher with rising total labour use on cotton per farm across all survey sites (Table 21). For instance, whilst total labour input is only 71 days per cotton crop at Uda Walawe and 102 at Mahagalawewa, with hired labour proportions of 29% and 31% respectively, at Badagiriya, where total labour input per farm is more than double at 232 days, the proportion of hired labour is almost 55%.

Table 21 Total Labour Use on Cotton per Farm and the Hired Labour Component - Maha 1977-8.

| | Total labour use on cotton per farm (Days) | Proportion of hired labour in total labour input per farm on cotton (%) |
|---|---|---|
| Badagiriya | 232 | 54.5 |
| Gonnoruwa | 189 | 49.4 |
| Mahagalawewa | 102 | 31.4 |
| Mattala | 128 | 43.4 |
| Migahajandura | 137 | 41.3 |
| Padaugama | 163 | 43.3 |
| Uda Walawe[1] | 71 | 29.1 |

Notes : 1. The figures for Uda Walawe represent an average of Maha and Yala.

Given the observed combibation of crops in the farming enterprise and their respective acreages, chena farmers are unable to supply more than 34 of the average 62 days/acre needed for cotton cultivation. Expansion of the crop under similar conditions will place heavy demands on the labour market, and the adequacy of labour reserves should be ascertained before such expansion is envisaged, particularly since the peak demand is yield-determined and cannot be even partially mechanised.

There is considerable variation in the employment of hired labour over the season (Table 22). As would be expected , virtually none is employed for marketing, the financial transactions involved requiring the farmer's own attention. For operations such as purning and planting, for which the total labour requirement is low ( cf. Table 20 above) and little pressure is exerted on family labour resources, the employment of hired labour is also low. Although spraying falls into the same low labour requirement category, the hired labour component is high, since there was a tendency for some farmers to hire both sprayer and operative, both because of market conditions sometimes preventing alternative hiring arrangements and also because of the superior skill they attributed to him.

Table 22 The Component of Hired Labour in Total Labour Use, & of Female Labour in Hired Labour Use, by Individual Operation - Maha 1977-8.

| 6 Villages | Preparation | Pruning | Planting | Weeding | Spraying | Picking | Cleaning | Marketing | Other | All operations |
|---|---|---|---|---|---|---|---|---|---|---|
| % hired labour in total labour use | 44.5 | 51.9* | 30.8 | 47.6 | 45.7 | 67.9 | 19.5 | 2.1 | 39.7* | 45.6 |
| % female labour in hired labour | 0.2 | 0 | 7.2 | 10.6 | 12.5* | 86.6 | 44.5 | 0 | 0 | 25.0 |
| <u>Uda Walawe</u> | | | | | | | | | | |
| % hired labour in total labour use | 14.2 | 35.0 | 40.4 | 32.4 | 31.0 | 34.5 | 9.6 | 0 | 0 | 29.1 |
| % female labour in hired labour | 43.3 | 0 | 58.4 | 49.3 | 0 | 97.4 | 85.5 | 0 | 0 | 50.5 |

* If we exclude single, highly a typical observations, these figures are reduced to: Pruning 5.1; Spraying 0.1 and Other 9.3, which are thought to be more realistic

With the high labour input operations, the hired labour proportion rises (weeding, land-preparation), and is particularly high for picking, which has to be completed shortly after boll opening. It is in this operation also that the component of female labour in total labour us is particularly high. Farmers frequently referred to their higher picking efficiency, and similar male-female differentials have been noted elsewhere for cotton picking (Farrington, 1975b).

5.3.2 WAGE RATES

Data on the cost of hired labour were collected by operation at all sites. To allow for varying practices in the provision of meals, the following conventions were adopted:-

| | | | |
|---|---|---|---|
| Provision of 1 meal | - | add Rs.1.50 to daily wage | |
| " 2 meals | - | " Rs.3.00 | " |
| " full board & lodging | - | " Rs.4.50 | " |

Little variation was found to exist among operations, with the exception of spraying, which may be viewed as a more skilled, and therefore higher paid, operation, (Table 23). Nor was there any substantial difference between payments at Uda Walawe and the average across villages. In all cases, female labour received less, except for picking, where its reputed higher productivity was matched by higher payment.

Across villages little variation was evident, except at Mattala where some Rs.1 to Rs.2 above average was paid. Several farmers complained of the lack of local labour and high rates necessary to induce labour from Tissamaharama to this village. This reported shortage corresponds with the small household sizes here noted above.

Recorded wage-rates correspond closely with those reported previously for the district, being only marginally higher than the Rs.10 per day given by Ranatunga and Abeysekera (1977) for maha 1976-7.

5.4 PROFITABILITY - COTTON & OTHER CROPS

The data assembled in the previous sections on inputs and yields can now be applied to a simple modelling exercise in which the net returns to cotton and other crops are compared, this being the most direct way of assessing the crop's attractiveness to the farmer.

As throughout the study, net returns are defined as the gross value of output minus the cost of purchased or hired inputs, but not labour. The exercise is repeated for the 6 villages and for Uda Walawe, and for the upper and lower ends of the observed yield range at rainfed sites (cf. Table 16).

Price data are as obtained from survey schedules and thus relate more directly to farmers' circumstances than, say, an overall average national price. Production costs again are taken from data supplied by farmers.

Table 23

Average Daily Payments to Labour by Operation,
Uda Walawe & Average for 6 Villages, Maha 1977 - 8

| Average for 6 villages | Preparation | Pruning | Planting | Weeding | Spraying | Picking | Cleaning |
|---|---|---|---|---|---|---|---|
| Male | 10,86(128)[1] | 10,50(8) | 11,08(78) | 10,83(121) | 13,30(56) | 0,27[2](33) | 11.64(29) |
| Female | 10,00 (1) | - | 9,14 (7) | 9,18 (17) | - | 0,29[2](89) | 7.70(10) |
| **Uda Walawe** | | | | | | | |
| Male | 8,88 (4) | 10.63(4) | 11.25 (6) | 11,04 (13) | 13,53(12) | 9,00 (1) | 9.00 (1) |
| Female | - | - | 10,00 (4) | 9,00 (5) | - | 9,40 (15) | 8.67 (6) |

Notes: 1. Number of farmers hiring in parenthesis

2. Per pound of seed cotton

Recorded labour inputs are used for cotton; for other crops a variety of sources are drawn upon, including Ranatunga and Abeysekera (1977) and Sathasivampillai (1976), the inputs being modified to allow for such factors as the degree of mechanisation.

Results are presented in Table 24 and 25. Whilst it must be stressed that this is essentially a "round numbers" exercise, the results do allow some consistent and interesting conclusions to be drawn. First, for rainfed production :

(i) In most crops, average returns per labour day are high enough to cover the daily cost of hired labour. Only in those crops grown chiefly for domestic consumption (Kurakkan, meneri, maize, groundnut) is this not the case. Except for chillies and gingelly, this holds true even for the low yield estimates. The high recorded hired labour input for cotton is therefore not illogical: farmers are likely to allocate family labour to those non-paddy crops essential for domestic use, whilst hiring labour for cash crops whose revenue will cover the wage bill.

(ii) Paddy provides the highest returns to labour and to land at both high and low yield estimates. Its returns to land are only slightly higher than those provided by chillies, suggesting that an acre of upland can be made to produce the same value-added as an asweddumized acre - but the farmer must work much harder to do so. With chillies the labour input is almost twice as high and returns to labour correspondingly reduced. It is not difficult to imagine how profitable a crop of chillies must have appeared in 1977, with prices some 30% higher and paddy prices 25% lower.

(iii) If we subscribe to the view that labour is a more limiting factor of production than land, and that farmers will tend to maximise returns to labour, then the crops we have analysed present four broad levels of profitability to the farmer:

(a) paddy, which gives the highest returns to labour in both high and low yield estimates.

(b) at an intermediate level, cotton, cowpea and green gram, all of which offer broadly the same returns within both high and low yield estimates.

(c) chillies and gingelly with returns some 25% lower than category (b) .

(d) other crops - particularly those for domestic consumption.

(iv) This exercise has not considered the additional yield obtained in those areas where rainfed cotton is carried over to the yala season . Yields per acre from a yala picking, at 0.7 to 1.1 cwt, are low, but the labour required is also low (at between 9 and 27 days/acre) and returns to labour much higher than obtained at the same villages in maha (i.e. in yala Rs.11.4, Rs.13.5 and Rs.20.3/day) . This raises slightly the overall return to labour on an annual basis, and in areas where low rainfall does not permit cultivation of an alternative yala crop, increases the attractiveness of cotton. It should also be noted that this relatively high return to labour may make it difficult to introduce improved agronomic practices designed to prevent pest build-up (as advocated by Hughes and Tunstall (1978) which involve a closed season during yala, with the destruction of all cotton residues.

We can conclude that at rainfed production sites, given the observed yield and cost structure, cotton provides lower returns to land and labour than paddy, but is competitive with such other major cash crops as cowpea and greengram, and is superior to gingelly, chillies and the range of crops grown chiefly for domestic consumption. On grounds of profitability alone, there therefore seems to be a strong potential for expanded cotton cultivation. Its production could, however, be constrained by the limits of labour availability, since its labour requirements are high, and by problems of input supply and marketing. These will be discussed in more detail in the following section.

At Uda Walawe a different picture emerges :

(i) It is disconcerting to note, that by comparison with the upper end of the observed yield range at the 6 villages, returns both to land and to labour at Uda Walawe are inferior, and this in spite of the massive investment on irrigation infrastructure and on crop inputs. Nor are average household incomes higher than in the 6 villages (Table 15).Performances at Uda Walawe do not live up to the higher yields and incomes expected from a programme of intensification.

(ii) Cotton at Uda Walawe, instead of being among those crops following immediately behind paddy in profitability, is among the lowest earners of net revenue per acre and per labour day. It scarcely generates sufficient revenue per labour day to cover the average daily wage of hired labour; chillies perform almost 100% better, and must appear much more attractive to farmers there. Maize and groundnuts also perform better than cotton , and urakkan and cowpea are broadly on a par.

(iii) It should be noted, however, that on permeable soils cotton will require some 2.5 acre-feet of water, and flooded paddy more than 10 acre-feet , so that cotton will give a typical net return of Rs.250.6/acre-foot, and paddy only some Rs.100 . Even if we take the more pessimistic water-use rates suggested by Anthony (1975) of of 4 acre-feet and 18 acre-feet respectively, the net returns still give cotton an advantage at Rs.156.6 against paddy at Rs.55.6. Thus cotton, even at the low yields observed, clearly gives much higher returns to water-use.

At Uda Walawe, in conditions of virtually unresticted water supply, cotton has therefore little to recommend it, on the basis on observed yields and production costs. The investment in purchased inputs (some Rs.350/acre ) seems misplaced insofar as it does not generate the anticipated high yields. Part of the failure may be in overinvestment in fertiliser (see above , 5.2(ii) )and over-use and /or incorrect use of insecticide , possibly resulting from applications made when pest population densities are low. In the absence of organised scouting procedures (see Hughes and Tunstall, 1978) this is almost inevitable. The gap between actual (3.1 cwt) and projected (15 cwt) yields at Uda Walawe must be closed, before it has any chance of competing with paddy or other well-managed cash crops. Policy makers must ask themselves whether such yield increases can be achieved at Kirindi Oya and Mahaweli.

These profitability estimates suggest that cotton is an attractive crop to rainfed producers. This, however, is not the only consideration; farmers will be concerned with the risk associated with achieving expected net revenue. In the case of cotton the risk arising from rainfall uncertainty will be no greater than with the majority of other crops, given its low water requirements. The risk of pest attack does not appear exceptionally high at present; it seems likely that only with more concentrated production of the crop will pest populations build up to threatening levels. Viewed at a fairly general level, the risk of not achieving expected yield and revenue levels does not appear particularly high with cotton.

With profitability and risk factors in its favour, it is not immediately obvious why cotton cultivation should not expand. Some answer may be found in 3 sets of factors discussed in the next section, namely; seed quality, input supply and marketing.

Table 24 High & Low Yield Models Comparing the Profitability of Cotton with Other Crops - 6 Villages

| | | Paddy (Bu) | Cotton (Cwt) | Chillies (Cwt, dried) | Kurakkan (Bu) | Meneri (Bu) | Cowpea (Bu) | Maize (Bu) | Gingelly (Bu) | Greengram (Bu) | Groundnut (Cwt in shell) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Price assumed | | 40,00 | 315,00 | 560,00 | 45,00 | 45,00 | 150,00 | 55,00 | 150,00 | 155.00 | 110.00 |
| **High Yield** | | | | | | | | | | | |
| | Assumed input costs/acre (Rs) | 500.00 | 75,00 | 150.00 | 20,00 | 20,00 | 45,00 | 20,00 | 40,00 | 100.00 | 150.00 |
| Returns to land | Yield/acre | 45 | 3.5 | 2,5 | 10 | 10 | 6 | 10 | 3,75 | 7 | 6 |
| | Net revenue/ac.(Rs) | 1300,00 | 1027,5 | 1250,00 | 430,00 | 430,00 | 855,00 | 530,00 | 522.50 | 985.00 | 510.00 |
| Returns to labour | Labour input per acre (days) | 55 | 62 | 100 | 50 | 50 | 50 | 60 | 50 | 50 | 60 |
| | Net revenue per labour day (Rs.) | 23,64 | 16.57 | 12,50 | 8,60 | 8.60 | 17,10 | 8,83 | 10.45 | 19.70 | 8.50 |
| **Low Yield** | | | | | | | | | | | |
| | Assumed input costs/acre(Rs) | 400.00 | 50,00 | 100,00 | 20,00 | 20,00 | 45,00 | 20,00 | 40,00 | 100,00 | 125,00 |
| Returns to land | Yield/acre | 30 | 2.0 | 1,5 | 5 | 5 | 4 | 5 | 2,75 | 4 | 4 |
| | Net revenue/ac(Rs) | 800,00 | 580,00 | 740,00 | 205.00 | 205,00 | 555,00 | 255,00 | 372,50 | 520,00 | 315.00 |
| Returns to labour | Labour input per acre(days) | 50 | 55 | 90 | 45 | 45 | 45 | 55 | 45 | 45 | 55 |
| | Net revenue per labour day | 16.00 | 10.54 | 8.22 | 4.56 | 4.56 | 12,33 | 4.64 | 8,88 | 11,56 | 5.73 |

Sources; Labour data - for cotton are based on survey findings; for paddy from Ranatunga and Abeysekera, 1977; for other crops, adapted from Sathasivampillai, 1976, the last two with modifications to allow for varying observed degrees of mechanisation.

Price data - from survey data on prices received for sale of crops by farmers.
Input cost data - from survey data on expenditure on inputs.

Table 25 Model Comparing the Profitability of Cotton with Other Crops – Uda Walawe

| | | Paddy (Bu) | Cotton (Cwt) | Chillies (Cwt dried | Kurakkan (Bu) | Cowpea (Bu) | Maize (Bu) | Gingelly (Bu) | Greengram (Bu) | Groundnut (Cwt in shell) |
|---|---|---|---|---|---|---|---|---|---|---|
| Price assumed (Rs.) | | 40,00 | 315,00 | 560,00 | 45,00 | 150,00 | 55,00 | 150,00 | 155,00 | 110.00 |
| Assumed input costs/acre (Rs.) | | 600,00 | 350,00 | 300,00 | 20,00 | 100,00 | 20,00 | 40,00 | 300,00 | 150.00 |
| Returns to Land | Yield/acre | 40 | 3,1 | 3 | 14 | 6 | 13 | 3 | 3 | 8 |
| | Net revenue/ac (Rs.) | 1000,00 | 626,50 | 1380,00 | 610,00 | 500,00 | 695,00 | 410,00 | 165.00 | 730.00 |
| Returns to labour | Labour inputs/ acre (days) | 50 | 66 | 80 | 50 | 50 | 62 | 50 | 20 | 60 |
| | Net revenue per labour day (Rs.) | 20.00 | 9.49 | 17.25 | 12.20 | 10,00 | 11,21 | 8,20 | 8.25 | 12.17 |

Soruces : See Table 24

# 6. PROBLEMS AND PROSPECTS

## 6.1 RAINFED COTTON

Farmers were asked, in an open-ended question, to state what problems they faced in cotton production. The information they provided, taken together with the results of interviews with officials involved in cotton production, permits the problems of rainfed cotton production to be classified into the following broad categories:

i. those relating to the type and quality of seed
ii. those concerned with input supply
iii. marketing problems

(i) SEED

Although only a small proportion of farmers mentioned seed deficiencies as a problem in cotton cultivation (20 of the 209 interviewed), it is evident from interviews with a spinning firm that the quality of lint is well below the varietal potential.

Reference in our historical survey (Section 1) has been made to the introduction of new seed varieties in pre- and early post-war periods. The more recent history can now be pursued. This is both complex and interesting in itself; it sheds light on the extent to which growers are harrassed by maladministration and illuminates the psychology underlying introduction of new varieties.

First, it should be noted that cotton, as an open-pollinated species, is highly susceptible to cross-fertilization and therefore to loss of individual *line* characteristics. This potential deterioration of the purity of lines which have been carefully selected for lint characteristics, pest resistance, boll-size etc., is prevented by ensuring that a high proportion of each year's commercial planting material originates from government-controlled multiplication farms, on which seed purity, in theory at least, is guaranteed.

Our historical survey terminated with the introduction of HC101 to all cotton-growing areas in the late 1950s. The characteristics of commercial cotton produced from this strain were found satisfactory, but attempts to grow HC101 under irrigation at Uda Walawe in 1972 revealed a tendency towards excess vegetative growth. The decision was taken to issue Acala 1517D, on which some field trials had been conducted, for the following season. Accounts of what happened after this point are divergent. The seed breeder at Angunukolapelessa suggests that the issue of Acala was not from pure seed but from cross-fertilised material produced in varietal trials some time earlier. Since Acala was issued without ensuring an adequate supply of pure seed for subsequent seasons, the 1973 yala crop was ginned and used as planting material for seasons up to 1975, by which time the multiplication programme had caught up, and the quality of Acala seed for irrigated production could be improved. It is unfortunate, however, that at about this time the RVDB at Angunukolapelessa started to gin part of the rainfed crop (HC101) on behalf of the National Textile Corporation (NTC). The two varieties were not segregated with the result that the component of planting material which could not be supplied from multiplication farms (more than half with rainfed cotton) was made up of a mixture of the two. In the attempts to improve seed quality for rainfed growers, a multiplication programme for HC101 was started in 1976 and all rainfed seed will be provided from this pure line by 1980-1981 maha. It seems, however, that no firm steps have been taken to tighten segregation procedures at ginning, and without these, the quality of planting material could again deteriorate.

An alternative explanation is offered by Hughes and Tunstall (1978) who maintain that the variety initially issued as Acala in 1973 was in fact HC101. The technical details of the case need not concern us too closely here; enough information exists to draw the following conclusions:

(a) Lack of coordination between RVDB and Department of Agriculture has allowed seed issues to be made without the necessary support of multiplication programmes.

(b) Lack of control of seed quality and purity at RVDB gins has resulted in the issue to growers of varietal mixtures with poor germination and lint characteristics.

(c) Pure seed for rainfed growers has not constituted a high enough proportion of total planting material to counteract this tendency towards loss of purity of line.

Whilst it is encouraging to note that efforts are in hand to strengthen the role of multiplication farms, no conclusive strengthening of supervision at ginning, and improved collaboration with the breeding programme, seems to have been achieved.

We have noted in the 1930s and 1950s how the breakdown in quality control of existing seed led to calls for a new variety. Similar calls are being made now; but it is not the seed variety which is at fault, it is the lack of rigorous application of measures to ensure its purity. A new variety is not a cure-all for these ailments; cotton has improved in quality with the introduction of new varieties not so much because of the varietal changes, but chiefly because more care is taken with line purity when new varieties are distributed. The absence of such care later leads to its degeneration, and to a repeat of the new variety-degeneration-disillusionment syndrome. Unfortunately, sufficient steps have not yet been taken to ensure that this cycle will not be repeated.

(ii) INPUT SUPPLY

When asked to list the main problems they faced in cotton cultivation, 34 of the 209 rainfed farmers mentioned the difficulty of obtaining sprayers on hire (14 of them at Mattala alone) and a further 33 complained of the non-availability of insecticides through institutional channels (esp. cooperatives). 10 farmers complained of the high price required for gunnies in the private sector, resulting from their non-availability through cooperatives. A total of 65 farmers complained of the impossibility of obtaining timely cultivation loans from institutional sources.

These complaints could be supported and amplified in great detail . For the purposes of the present discussion, it is sufficient to note that the many ways in which the State attempts to promote farming (input supply, credit etc.,) have made little impact on the communities surveyed; they still obtain the bulk of their requirements from the private sector.

Of the other problems regarding inputs, 14 farmers complained that they could not obtain extension advice when they required it, and 12 mentioned difficulty in finding adequate hired labour. Whilst the availability of hired labour may emerge as a long-term constraint to cotton production, particularly if its production is highly geographically concentrated, the adequacy of extension advice is a more serious and urgent constraint. As was suggested above, the extension network is very thinly spread, and the bulk of farmers interviewed had no contact at all with an extension worker. If agronomic practices are to be improved, more advice will have to be made available; indeed, the applicability of the whole *Train and Visit* concept to wide areas of scattered production may require re-assessment. Where farmers are geographically remote from one another, what is the likelihood of achieving the necessary degree of inter-farmer contact?

(iii) MARKETING PROBLEMS

By far the highest proportion of farmers' complaints, however, concerned the sale of the crop. 63 farmers mentioned general difficulties in marketing the crop, whilst 88 complained specifically of what they thought were inconsistencies in grading at the markets, 34 mentioned long delays between marketing and payment for the crop (as much as 3 months in some cases), 28 farmers had had to make repeated visits to congested markets in order to sell their crops and 24 complained of the disappearance of their gunnies into the marketing system without compensation (although this was a problem common to all).

Whilst some of these difficulties may be common to many crops and therefore have been discussed extensively elsewhere, two problems specific to cotton require examination in this study. These are the disappearance of gunnies without compensation (which has been discussed above), and the inadequacy of procedures for grading.

This latter point was subject to a number of specific charges:-

(a) that graders were insufficiently trained and experienced to make accurate and consistent judgements

(b) that examination of the crop was often cursory

(c) that farmers were not told what standards cotton was supposed to reach for each of the grades.

Grading has, at various times, been conducted by officials of the NTC, the Department of Agriculture and the cooperatives. In future it will be conducted by the NTC, with two grading officers at each purchasing point. The NTC is proposing to take over the purchasing from cooperatives for Maha 1978/1979 in order to reduce congestion at markets and to make direct over-the-counter payments to farmers on sale of their crops. However, no improvement to the training of grading officers seems to be in prospect; and such simple measures as the placing on view at each purchase point of sample boxes of seed cotton for each grade, had not been considered. In addition to leaving these specific grading problems unsolved, a more general difficulty of the NTC proposals is the intention to purchase on a rotational basis among villages. Whilst some attempt clearly must be made to keep purchasing teams fully employed, one wonders whether, under the proposed rotational system, farmers will receive adequate notice of marketing dates, and whether they will be prepared to transport any late-harvested cotton to the permanent purchasing point at Hambantota town, once the rotational market has closed, even with a proposed transport allowance of Rs.15 per cwt.

The NTC proposals, although adequate in theory, require a high degree of organisational ability to be effective in practice, and past experience suggests that in cotton, as in many other crops, organisational ability is a perhaps the scarcest of all inputs. Whether it will be forthcoming to the necessary degree remains to be seen.

### 6.1.1 PROSPECTS - RAINFED COTTON

Our analysis suggests that, at observed yield levels, cotton is a highly competitive crop for the small farmer. Yield levels are currently low, and it should not prove impossible to raise them by at least 50% with better seed, extension advice and pesticide use. The status of the crop could therefore easily be enhanced. Factors currently preventing expansion of the crop include : the poor quality of seed, non-availability of purchased inputs, inadequate extension advice and problems in marketing the crop. Improvement to some of these are proposed, but the efficacy of such improvements is questionable. A further problem posed to chena cultivators is in the issue of chena permits. The Forestry Department no longer issues these for the clearing of virgin jungle, and is attempting to tighten up on illicit cultivation there. Permits are issued for Crown land in the close vicinity of villages, which has traditionally been cultivated. The extent to which these permits will allow adequate land (of adequate fertility) for cultivation, and the degree to which farmers will illicitly cultivate non-permit land, cannot be predicted here. What is clear is that considerable uncertainty exists among farmers concerning the future of legitimate chena cultivation , and cotton will be among the most seriously affected crops if land availability is reduced, or if the current uncertainty is allowed to persist.

## 6.2 IRRIGATED COTTON

The main problem in irrigated cotton production is altogether different. Extension advice and inputs are all abundantly available; marketing works smoothly and there is no uncertainty about future land availability. What is fundamentally different is that at current yield levels cotton is grossly unprofitable in both returns to land and labour by comparison with paddy and with other cash crops. Even at the originally envisaged yields of 15 cwt. per acre, cotton would not have provided returns to labour equal to those provided by paddy (2.2 above). This fact, coupled with inadequate control over water issues and cropping patterns, has meant that many farmers on land designated for cotton have resorted to paddy cultivation. Those farmers continuing to cultivate cotton obtain household incomes on higher than in neighbouring rainfed cotton villages (Table 15). It cannot be stressed too strongly that, unless there are dramatic changes in relative crop prices and production costs (which appear unlikely for cotton - Appendix 2), nowhere will cotton provide the same returns to labour as paddy, even at optimistically high yields, and farmers will repeatedly attempt to substitute paddy, an inclination which can only be be resisted by strict water and cropping control. Where such control is lacking , paddy will be grown to the detriment of such other field crops as cotton.

Among those farmers growing cotton, morale is low *(a poor relation* mentality), recommended input use-levels appear to have inadequate empirical base, water is in erratic supply, both to and within fields, and standards of husbandry are low, Main priorities for attention are the reduction of input costs by more selective use of fertilizer and insecticides and the generation of higher yields by better timing and quantity of water availability, more timely agronomic practices (e.g weeding and planting), more careful picking and cleaning and a pure strain of seed.

## APPENDIX 1

## THE TEXTILE INDUSTRY

Certain economic characteristics of domestically-produced cotton, such as quality, and the demand and price offered for a given quality, are inextricably linked to its end-use, and for this reason an over-view of the domestic textile industry is essential to an understanding of the economics of cotton production. Similarly the future demand for domestically produced cotton will depend both on the expected expansion in total demand for textiles, and on the prospects for substituting domestically produced for imported textile within the existing demand structure. Examination of these factors is thus essential to an assessment of the economics of cotton production in Sri Lanka.

It is proposed, first, to examine the total consumption of textiles in Sri Lanka, with the intention of gaining at least an impression of the scope for an expansion of demand and , second, to examine the current composition of production in the textile industry, the share of imported lint, yarn and textile, and the scope for substitution by domestically produced raw cotton.

### A 1.1 Textile Consumption

Estimates of present and future consumption, taking into account changing population and income levels, have been made by the Ministry of Textile Industries.

| | Total national textile consumption | Percapita consumption of : | | |
|---|---|---|---|---|
| | | Cotton textile | Non cotton textile | Total |
| | (m.yds) | ( .yds) | ( .yds) | ( .yds) |
| 1978 | 152.40 | 7.33 | 3.39 | 10.72 |
| 1979 | 162.94 | 7.23 | 4.06 | 11.29 |
| 1980 | 174.16 | 7.12 | 4.77 | 11.89 |
| 1981 | 186.40 | 7.02 | 6.52 | 12.54 |
| 1982 | 199.50 | 6.91 | 6.32 | 13.23 |

Given the balance of consumer preferences between cotton and non-cotton textiles in 1978, it is evident that some 104 m. yds. of cotton textile will be consumed in 1978, the balance being synthetics and mixtures. The MTI (1978-82 Sector Plan) postulates, however, that the 1978 consumption pattern conceals a high element of unsatisfied demand for synthetics, and suggests that cotton and synthetics will be consumed in roughly equal proportions in 1982, by which time modifications to existing machinery and the installation of new synthetic weaving equipment will have eased the supply bottlenecks. The annual production of cotton textiles is therefore thought likely to rise only slightly during the Plan period, to reach 130 m. yds. in 1982, this being only slightly higher than current production levels. Some additional demand for cotton to make up blended yarns will arise, but has not been quantified by MTI. Present MTI estimates suggest a domestic production of 24.5 m. lbs. of cotton yarn in 1978, rising to 33.1 m. lbs. in1982, with blended yarns rising from zero to 17.0 m. lbs. over the same period. The basis on which these estimates of the cotton-synthetics balance have been made is not entirely clear and it would be outside the scope of the present study to investigate them more thoroughly, but two observations can be made in passing: first, it appears clear from other information that the demand for textiles is highly income-elastic. The Central Bank estimates an income-elasticity of demand of 1.56 in its survey of Consumer Finances, 1973, at the mean 2-month sample income of Rs.116.60 per person. Second, the consumption of cotton textiles in Sri Lanka, appears low by comparison with the Regional average. The Central (Determination of Labour Force Participation Rates in Sri Lanka, 1973) has suggested 25 yds. per capita per annum as a poverty criterion, and, although it is not made clear, this is presumably based on some international standard of comparison. Also in an unpublished study of cotton-growing under irrigation in Sri Lanka (Report on cotton development in the Uda Walawa Project, Sri Lanka, by K.R.M. Anthony, 1975 ) it is suggested that average per capita consumption of raw cotton in Southern Asia was 4.4 lbs. in 1972. If Sri Lanka's 1978 consumption were equivalent to this, it would imply a demand of some 60 m. lbs. of raw cotton per annum. At an 85% yarn conversion factor and a ratio of 1lb yarn: 3½ sq. yds. cloth [1], this is equivalent to a total of 192.5 m. sq. yds. cloth, which is almost double the present production level of cotton textile. These calculations do not allow, of course, for a possible lower proportion of synthetics consumption in the Regional average and whilst they do not contradict the MTI's prediction of large increases in total textile consumption, they do suggest the possibility of a higher proportion of cotton textile in the future total demand than has been allowed for by the MTI.

We have established that there is likely to be a slow expansion of demand for cotton textile (and, therefore, for cotton yarn) over the next 5 years. The scope for substituting domestically-produced for imported lint into the production of yarn is not, however, immediately apparent , and depends on relative price and quality characteristics requiring the more detailed investigation of the textile and associated industries presented in the following section.

A 1.2. The scope for Substituting Locally-Produced for Imported Lint

We have established in the preceding section that there is likely to be a steady increase in the domestic demand for cotton over the period 1978-82. On the face of it, there is therefore scope for expansion of the domestic cotton production industry.

In this section the attempt will be made, first, to quantify more precisely the total domestic requirement for lint and , second, to examine the composition by quality of this requirement , so that the scope for substitution of local for imported lint under various quality assumptions can be made.

[1] Conversion factors supplied by Wellawatte Spinning and Weaving Mills. These are very approximate : the former will vary slightly with the quality of lint, the latter will vary between 1 lb : 4½ yds and 1 Lb: 2 2/3 yds according to the thickness of the cloth.

### A 1.2.1 Total Domestic Demand for Lint

Since cotton is imported as lint, yarn and textile for the local market, and is consumed both as a textile end-product or as a lint or yarn intermediate-product for cotton-synthetics blending processes, the analysis of total lint requirement is complex and subject to a number of uncertainties. For the purposes of this study, an approximate guide to the market potential for locally-produced lint is all that is required, so a certain amount of information supplied by MTI is taken at face value, and a number of simplifying assumptions are made. Since the projection of future demand is, even under the best of conditions, a notoriously error-prone undertaking, it is thought that such simplifications will not prove to be unduly large additional sources of error.

The fact that cotton is imported at various stages of manufacture (lint, yarn, textile) requires its reduction to a lint-equivalent base for comparison with local cotton production. Several data sources exist for such a calculation:

(i) Foreign trade statistics (Table A 4) indicate that the approximate lint-equivalent of imports[1] was:

| | |
|---|---|
| 1975 | 36.1 m. lbs. |
| 1976 | 20.3 m. lbs. |
| 1977 | 52.3 m. lbs. |

Since imports were liberalised only under the present government, it appears reasonable to assume that the 1975 and 1976 statistics conceal considerable unsatisfied demand and that the 1977 figure in part satisfies this backlog. It is therefore assumed that total lint-equivalent requirement (including domestic lint production of approximately 1 m. lbs in 1977 (Table A 5 and A 6) is some 45 m. lbs. Of this, a certain proportion goes to meet the requirements of the export-garment industry. The MTI estimated this requirement to be 30 m. yds. in 1977, equivalent to 8.8 m. lbs . lint at 4 sq.yds/lb[2] and a lint:yarn ratio of 1:0.85. The domestic consumption appears to be (45 minus 8.8) = 36.2 m. lbs.

(ii) for a 1978 production of 110 m. yds. cotton textile almost entirely for the domestic market, the MTI estimates a yarn requirement of 30 m. lbs. equivalent to 35.3 m. lbs. lint. This is estimated to rise to 33.1 m. lbs. yarn (= 38.9 m. lbs. lint ) by 1982.

This second set of calculations does not take into account specifically the lint requirements for cotton-synthetic blending for home or export consumption nor does it take into account the export-garment requirement for domestically-produced cotton textile. The MTI estimates that blended yarn requirements will be 17.0 m. lbs. in 1982, giving an 8.0 m. lbs. cotton-yarn requirement at a 50-50 blending ratio (≑ 9.4 m. lbs lint equivalent ). Current demand for blends is difficult to determine and

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1. Cotton and cotton mixtures.

2. 4.0 sq. yds/lb is taken in preference to the 3.5 sq yd. lb used elsewhere because of the requirements of the export-garment sector for relatively lightweight cloth.

appears partially unsatisfied, It is assumed in 1978 to be 5 m. lbs. cotton lint-equivalent.

It is thus assumed that for domestic requirements the amount of cotton will be

in 1978 40 m. lbs. lint-equivalent
in 1982 47 m. lbs. lint-equivalent

On this basis, 1977 domestic production of lint would satisfy

$$\frac{978283}{40 \text{ m.}} \times 100 = 2.45\ \% \text{ of the 1978 requirement}$$

$$\frac{978283}{47 \text{ m.}} \times 100 = 2.09\ \% \text{ of the 1982 requirement}$$

These preliminary calculations suggest wide scope for the substitution of local for imported lint, but closer investigation of the respective qualities of local and imported is necessary before any firm conclusions can be reached.

A 1.2.2 The Quality Composition of Domestic Demand for Lint

The MTI Sector Plan 1978-82 implies that local lint is equivalent in quality to medium-staple, imported lint and giving an import of 4,150 tons of medium staple lint in 1976 and a local production of 1017.8 tons of cotton in 1977, suggests that "locally grown cotton has constituted about 25% of the annual (medium staple ) requirements".

There are several a errors in these calculations.

(1) Cotton production in 1977 was not 1017.8 tons, but 1310.2 tons of seed cotton (Table A 5 and A 6)

(2) More seriously, the analysis omits to recognise that the local production figure is in the form of <u>seed</u> cotton, not lint, so that at an approx. 33% ginning out turn, only 454.6 tons (on a production of 1363.8 tons seed cotton) of lint would be obtained, this being 11% the 1976 import, not the 25% suggested.

(3) It seems unlikely that the present quality of locally-produced lint is adequate for spinning all counts in the medium-quality range. The Acala and HC-101 varieties grown are therortically suited to medium-quality yarn production, but poor seed, pest control, grading and handling result in their use chiefly for spinning up to 20s counts, with some blending for 30s counts (Wellawatte, pers. comm.) It is thus unrealistic to assume that domestic lint, as currently produced, is of adequate quality to replace imported medium-staple lint.

A more realistic assesment of the market potential for domestically produced lint is attempted below:

In 1977 the total cotton yarn produced was 14.6 m. lb. broken down into the following counts:

| Spinning count | Lb. | % of 1977 total yarn Production | Estimated 1978 % | Estimated 1982 % |
|---|---|---|---|---|
| 10s + 20s | 2,208,504 | 15 | 18 | 17 |
| 30s | 7,058,565 | 48 | 34 | 35 |
| 40s | 4,703,768 | 32 | 40 | 40 |
| 50s | 570,470 | 4 | 7 | 7 |
| 60s | 56,294 | 1 | 1 | 1 |

This total amounted to slightly more than half of the cotton yarn requirements for that year. Cotton textiles production was 89.63 m. yds. and at a lint weight (lbs) to cloth yardage ratio of 1:3.5, the yarn requirement was 25.61 m. lbs. the balance (25.61 less 14.60 m.Ibs ) of 11.01 m. lbs being supplied by imported yarn.

The quality of imported cotton yarn was generally higher than that of the domestically produced, the bulk of it falling into the higher counts. Plans for the industry propose an expansion of the spinning industry to produce 24.5 m.lbs. of the 1978 total requirement for cotton yarn of 30.0 m. Ibs. Imports will thus be reduced to the remaining 5.5 m. Ibs., and it is estimated that local production will account for 30.2 m.lbs. of the 33.1 m. lb. requirement in 1982 , thus reducing the import requirement to 2.9 m.Ibs.

As local yarn production expands, the proportions of higher count yarn will rise at the expense of lower counts. This is reflected in the difference between count-wise percentages 1978 estimates and 1977 actual production levels in the above table. The 1982 percentages are estimated as continuations of the trend, and are, by definition, approximate.

On the basis of these trends, the lint requirement for various counts based on a total national requirement of 30 m.lbs. in 1978 and 33.1 m. lbs in 1982 will be as follows:

| Spinning count | 1978 (000 lbs.) | 1982 (000 lbs.) |
|---|---|---|
| 20s | 5,400 | 5,627 |
| 30s | 10,200 | 11,585 |
| 40s | 12,000 | 13,240 |
| 50s | 2,100 | 2,317 |
| 60s | 300 | 331 |

The potential requirement for domestically produced lint can now be estimated under various assumptions regarding its quality:

(i) If domestic lint cannot be used to spin higher than 20s counts, the total requirement for it will be some 5½ m. lbs. p.a. from 1978 - 82 . This would permit a five-fold expansion of 1977 production levels, and represents the market potential for lint of the quality currently produced.

(ii) If the production, handling and marketing conditions of domestic lint are improved sufficiently to allow it to be used unblended for 30s counts, (with some of lower quality meeting the 20s count requirement) then the potential market becomes much larger: 15.6 m.lbs. at 1978 production levels, and 17.2 m.lbs. in 1982.

(iii) If longer-staple varieties can be introduced in some growing areas adequate for 40s counts, then local lint could supply 27.6 m. lbs to the domestic market in 1978 and 30.4 m.lbs. in 1982, representing 92% of the total domestic requirement in both years.

Finally, although we have not considered the lint requirement for the export-garment sector in our analysis, it is clear that if varietal improvement permit 40s count yarn producitoń, then the lint market in this sector is open to domestically-produced cotton, thus making the total potential demand some 20% - 50% higher according to the future world market performance of this sector.

A 1.3. The Textile and Garment Industries

General

Limited data exist on the contribution to the national economy made by the textile and garment industries. Central Bank published statistics suggesting that in 1974 the spinning, weaving and garment industries made up in total some 12.5% of the value of national industrial production, and were surpassed in importance only by the food preparation and petroleum and coal product industries (Table A 1.)

Table A 1. Value of Industrial Production - Textile & Garment Industries (Rs. Million at contemporary prices)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|---|---|
| Knitted fabrics & articles, made up garments, & other apparel, except footwear | 56.0 | 64.3 | 70.8 | 66.7 | 64.1 | 100.0 | n.d | n.d |
| Spinning, weaving and finishing of textiles | 172.2 | 173.3 | 189.4 | 271.2 | 295.6 | 399.4 | n.d | n.d |
| Total | 228.2 | 237.6 | 260.2 | 337.9 | 359.7 | 499.4 | 891.7 | 680.4 |

Source: 1969-74 : Central Bank Annual Reports
1976 : Ministry of Textile Industries, Sector Plan 1978-82
n.d. : No data available

Since 1974, the garment industry in particular has expanded rapidly, its exports alone totalling almost Rs.140 m. in 1977. We are thus dealing with industries of substantial national importance. However, the low local production of the main input, raw cotton, has meant that a high proportion

Table A 2 Exports of Made Up Garments by Value, 1970-77 (Rs.)[1]

| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|
| Outer garments[2] (61.11A) | 7,819,341 | 6,513,683 | 6,561,731 | 11,374,054 | | | | |
| Under garments (61.11B) | 171 | 4,603 | 269 | 207 | | | | |
| Mens' & Boys' outer garments (61.01) | | | | | 13,266,154 | 15,697,953 | 47,242,948 | 65,785,951 |
| Women's girls' and childrens' outer garments (61.02) | | | | | 10,951,275 | 7,687,759 | 21,473,055 | 51,772,637 |
| Men's etc, under garments (61.03) | | | | | 193 | 2,320 | 1,802 | 20,045,187 |
| Women's etc, uner garments (61.04) | | | | | - | - | - | 1,688,740 |
| Handkerchiefs (61.05) | | | | | 50,049 | 1,693 | 500 | 57,843 |
| Total | 7,819,412 | 6,518,286 | 6,562,000 | 11,374,261 | 24,227,671 | 23,389,725 | 68,718,305 | 139,350,358 |

Notes: 1. Source : Sri Lanka Customs Returns (Annual)

2. Figures in parenthesis refer to Brussels Tariff Nomenclature. The categorisation was changed in 1974.

of the value of raw materials has to be imported, Of the Rs.394,09 m, raw materials value in 1976, 73.7% was in the form of imported raw materials (MTI , Sector Plan 1978 - 82).

A 1.3.1. The Garment Industry - Structure & Performance

Many small privately-owned firms supply both internal and export requirements The export of garments has increased spectacularly in recent years, rising from Rs.7.8 m. in 1970 to Rs.139.4 in 1977 (Table A 2.) The import of garments has been negligible during this period (less than Rs.1 m. each year). suggesting that the garment industry possesses (and utilises) the capacity to meet domestic demand and to provide a sizeable surplus for export .

A 1.3.2 . The Textile Industry - Structure & Performance

Both State-owned and private companies are involved in the production of textiles. The largest public enterprise, the National Textile Corporation had a capacity of some 35 m. yds. of textile in 1978 (NTC, pers. comm.). Statistics published by the Central Bank, although containing several inconsistencies, and hampered by a change in accounting year in 1970-71, suggest that this has increased from some 27 m. yds. in 1970. Capacity utilisation has remained below 50% in the current decade, averaging 41% over the period 1973-78 (Department of Textile Industries, pers. comm.,) The remainder of the powerloom sector (including synthetics production) is somewhat larger, with a capacity of 126.3 m. yds. in 1977 (ibid.), and the handloom sector had 93 m. yds. capacity of which only some 36 m. were in productive use (ibid). The industry therefore has a capacity of over 250 m.yds., which, if fully used, would be more than adequate to meet the current total textile consumption (153 m. sq.yds. in 1978) though not necessarily in the preferred cotton: synthetic proportions, or, indeed, the postulated consumption at the Regional average of 4.4 Ib raw cotton per capita. Processing capacity in the textile industry is slightly lower than weaving capacity but, even so, at 175, m. yds. would be more than adequate to cover current national requirements, though, again, not in the preferred cotton: synthetic ratios. (MTI pers. comm.) Cotton and synthetic textile production in recent years is summarised in Table A 3 below.

Table A 3. Total National Production of Cotton & Synthetic Textile - 1972-77.[1]

| | Cotton (m.yds)[2] | Synthetic (m.yds.) | Total (m.yds.) | Lint[3] equivalents (m.yds.) |
|---|---|---|---|---|
| 1972 | 93.4 | 14.13 | 107.53 | 31.39 |
| 1973 | 83.9 | 12.2 | 96.10 | 28.20 |
| 1974 | 93.05 | 11.9 | 104.95 | 31.28 |
| 1975 | 96.05 | 16.3 | 112.35 | 32.28 |
| 1976 | 91.62 | 26.3 | 117.92 | 30.80 |

1. Data supplied by Ministry of Textile Industries, and modified to correct minor inconsistencies.
2. Although the bulk of data are presented as square yards, some are given as yards of cloth, which may be 28" , 36" or 48" wide. Thus the data only approximate to square yards.
3. Lint equivalent is calculated for cotton textile only, on the assumption that 1 lb.yarn is equivalent to 3½ sq.yds. cloth and 1 lb. lint = 0.85 lb. yarn.

## Table A 4 Cotton Imports[1]

| | Raw Cotton[2] | | Cotton Yarn[3] | | Cotton Cloth[4] | | Lint equivalent[5] (Textile + yarn + lint) | Lint equivalent[5] (Yarn + lint only) |
|---|---|---|---|---|---|---|---|---|
| | lb. | Rs. | lb. | Rs. | $yd^2$ | Rs. | lb. | lb. |
| 1970 | n.a. | 20,840,483 | n.a. | 33,923,560 | n.a. | 94,803,639 | n.a. | |
| 1971 | n.a. | 11,076,664 | n.a. | 35,941,649 | n.a. | 79,234,369 | n.a | |
| 1972 | n.a. | 48,856,114 | n.a. | 55,870,612 | n.a. | 23,290,587 | n.a. | |
| 1973 | n.a. | 50,982,638 | n.a. | 18,576,770 | n.a. | 40,020,934 | n.a. | |
| 1974 | 19,762,003 | 113,347,016 | 7,817,209 | 61,567,819 | 7,730,415 | 20,987,170 | 31,548,102 | 28,958,719 |
| 1975 | 30,960,128 | 77,913,833 | 4,113,325 | 23,287,050 | 772,231 | 2,646,834 | 36,058,906 | 35,799,333 |
| 1976 | 13,090,612 | 72,227,436 | 4,842,307 | 50,600,577 | 4,473,681 | 15,169,738 | 20,291,201 | 18,787,443 |
| 1977 | 15,108,269 | 78,512,812 | 11,465,904 | 123,870,680 | 70,447,174 | 113,177,611 | 52,277,611 | 28,597,567 |

Notes: 1. Source : Sri Lanka Customs Returns, Various years

2. Refers to BTN category 55.01

3. Refers to BTN category 55.05

4. Refers to BTN category 55.09 A, B, C

5. Raw cotton (lint), yarn and cloth are reduced to a lint equivalent total on the basis of the following conversion coefficients:

$$1 \text{ lb lint} = 1 \text{ lb yarn} / 0.85$$

$$1 \text{ lb lint} = \frac{1 \text{ yd}^2 \text{ textile}}{3.5 \times 0.85}$$

derived from the assumption that
1 lb yarn gives 3½ yds textile.

3. Lint equivalent is calculated for cotton textile only, on the assumption that 1 lb. yarn is equivalent to 3½ sq.yds. cloth and 1 lb. lint ≐ 0.85 lb. yarn.

It is evident that the expansion of the domestic textile industry has been sluggish. Since 98% of its output is consumed domestically, either directly or in the production of garments for local consumption, it appears that it will barely have been able to maintain its share of the domestic textile market. This hypothesis cannot be tested directly by reference to currently available foreign trade statistics (Table A4) since :

i) Date on imports of textile by quantity are only available since 1974;

ii) Large annual fluctuations in imports, with consequent fluctuations in carry-over stocks exist;

iii) A large proportion of imported textile is used in the manufacture of garments for export.

However, some indication of the poor performance of this industry is given by the fact that textile imports for both domestic consumption and export-garment manufacture amounted to 45 m.yds. in 1977 and are expected to approach 70 m. yds in 1978 (though a portion of this may be allocated to carry over stocks) at a time when the domestic textile industry is operating at less than 50% capacity. (Ministry of Textile Industries, pers. comm).

Supply linkages within the textile and garment industries can conveniently be considered in two components: first, the export garment sector imports virtually the whole of its textile requirement, and so for the purposes of our analysis impinges only marginally on domestic cotton and textile production. In the context of the present study it would be unprofitable to examine the extent to which imported textiles for the export garment sector could be replaced by locally-produced textiles, since:

i) domestic textile production is insufficient to meet even internal demand;
ii) a high proportion of domestic textile production costs are incurred by the necessary import of the major input, yarn;
iii) a high proportion of the textile used by the export garment sector is synthetic or cotton/synthetic mixtures.

On the other hand, the domestic requirements for textile are met both by imported textile (1/5) and domestically-produced textile (4/5 approx.) and this sector will thus be the main focus of our import substitution analysis.

A cross check on the internal consistency of assumptions and data on supply linkages within the textile industry can be provided by examining whether the cotton textile output of the domestic industry is equivalent to the yarn and raw cotton inputs both from internal and external sources. It is necessary to reduce textile and yarn to a lint equivalent in order to make quantitative comparisons between inputs and output which are qualitatively different. This is done in Tables A3 and A4. The average annual imported lint equivalent (for lint plus yarn) for 1974-77 is 28 m.lb. Given the necessarily approximate nature of the conversion coefficients, and the possibility of different inventory levels at the beginning and end of the period, this corresponds moderately well with an average output lint equivalent of 31 m. lb over the same period (cf. Table A3). The gap is further reduced by the addition to imported lint of domestically produced lint, at an annual average of some 0.44 m. lb over the same 4 year period.

### A1.3.3 SPINNING

The spinning industry is dominated by State-owned units. The National Textile Corporation alone had a spinning capacity of 28.3 m. lbs yarn in 1978, the remainder, including a small percentage of private firms, had only 9.8 m. lbs yarn capacity (NTC, pers. comm). Expansion of the spinning industry has been slow - the NTC capacity in 1970 was some 20.6 m. lbs and capacity utilization has been less than 50% in the 1970s. Attention recently appears to have been given to the possibility of importing lint instead of yarn or textile and increasing the efficiency of the domestic spinning industry to cope with it(MTI, Sector Plan 1978-82). On the face of it, such a policy would appear to have direct economic and employment advantages and has much to recommend it. Detailed consideration of the issues involved would be inappropriate to the present study, but the main capacity parameters can be quantified approximately as follows: annual imports of lint over the period 1974-77 have fluctuated widely, but have averaged 19.7 m. lb. Imports of cotton yarn have averaged 8.31 m. lb lint equivalent and of cotton textiles 18.03 m. lb lint equivalent (Table A4). Thus, if fully utilised, the spinning industry would have the capacity to replace all current cotton yarn and textile imports by internally spun yarn from either imported or domestically produced raw cotton (38.1 m. lbs yarn capacity against 29.79 m. lbs input requirement). This would imply an increased yarn production of 18.03 m. lbs, equivalent 63.11 m. sq. yds. of textile, which appears to be within the available spare capacity of the weaving industry (see textile section above).

The implications of this (admittedly crude) analysis are that Sri Lanka has enough spinning capacity to produce yarn for all its internal textile requirements and at one stage higher in the production process has enough capacity to weave all the yarn thus produced. It has the capacity to be virtually self-sufficient in cotton yarn and cotton textile.

### A1.3.4 GINNING

Up to 1974, the Wellawatee Spinning and Weaving Mills were the sole ginners of locally produced cotton. They have a ginning capacity of 9,000 lbs seed cotton per day, but currently work only two of the available three shifts, thus ginning some 6,000 lbs seed cotton daily. In 1974, the RVDB started ginning cotton purchased at the Uda Walawe Project, and in surrounding production areas, at the single roller gins at Angunukolapelessa which they had purchased second hand and renovated. They currently operate only one shift per day with a throughput of 3,600 lbs seed cotton. The NTC is proposing to install 12 new double roller gins in Hambantota by the end of the 1978, which will have a capacity of some 448,000 lbs (4,000 cwt) seed cotton per month.

Although the single roller mills operated by Wellawatte and RVDB are old and potentially unreliable, there is no reason to suppose that the country's ginning capacity would be unable to cope with increased cotton production. There is some potential trade-off between higher utilisation of ginning capacity (in terms of ginning for more months per annum) and deterioration of seed cotton in store and/or pilfering and/or costs of storage space, watchmen, etc. Conventional practice requires that gins located in the production areas should operate for 3-4 months in the drier part of the year (i.e. as soon after cotton harvest as possible) and then transport the ginned lint (normally) to Colombo for further processing. Thus, even if the new NTC double-roller gins were to operate for only 4 months p.a., they could gin 16,000 cwt. seed cotton, implying that they could have coped with the entire national production in the majority of years hitherto.

If we then add to this a notional RVDB capacity of 6,250 cwt seed cotton p.a. (3,600 lbs/shift/day x 2 shifts x 100 days) and a Wellawatte capacity of some 16,000 cwt p.a. (6,000 lb/day from 2 shifts x 300 days), it is evident that tat a conservative estimate the national ginning capacity is some 38,250 cwt p.a., which is some 10,000 cwt higher than the previous peak production level (See Tables A5 and A6.) Furthermore, ginning potential could be increased by adding an extra shift at Wellawatte or at the RVDB gins or by extending the ginning season at RVDB and NTC factories.

GINNING COSTS

A study conducted by Wellawatte suggested that the current costs of ginning 1 cwt seed cotton were Rs.28 in 1975. Inflation is thought to have pushed this figure up to Rs.37 in 1978. Information supplied by the RVDB suggests that their ginning costs were Rs.13.50/cwt seed cotton in 1974, although they quoted a commercial charge for outside custom work of Rs.25 per cwt seed cotton ginned in the same year. Higher labour costs in Colombo may account in part for the differential between Wellawatte and RVDB and it would appear unrealistic to assume a standard cost of ginning without reference to location specific factors.

Table A5 Rainfed Cotton Production Estimates 1949 - 77

| Source[1] / Year[2] | Seed Cotton Production Estimates (cwt) by Source | | | | | | Estimated Acreages[10] (rainfed) | | Estimated Yields (cwt/acre) |
|---|---|---|---|---|---|---|---|---|---|
| | Wellawatte | RVDB | Agrarian Services. | Department of Agriculture. | Other | Best production estimate. | Department of Agriculture | Other | |
| 1977 | 23,088 | 80 | | np | | 23,168 | np | 8,049[12] | 2.9 |
| 1976 | 8,305 | 6,661 | | np | 53,000[5] | 14,966 | np | 4,885[12] | 3.1 |
| 1975 | 2,153 | 4,976 | | np | 40,600[5] | 7,129 | np | 4,253[12] | 1.7 |
| 1974 | 10,080 | | | np | 20,700[5] | 10,080 | np | 2,510[12] | 4.0 |
| 1973 | 4,830 | | | np | 17,600[5] | 4,856 | np | 1,438[12] | 3.4 |
| 1972 | 9,667 | | | np | 23,000[5] | 9,667 | np | 2,161[12] | 4.5 |
| 1971 | 12,019 | | | nd | | 12,000 | nd | | n.d. |
| 1970 | 9,959 | | 11,456 | nd | 7,600[6] | 11,456 | nd | | n.d. |
| 1969 | 15,076 | | 12,427 | 14,227 | | 14,227 | 4,800 | | 3.0 |
| 1968 | 9,286 | | 6,744 | 12,500 | 6,000[7] | 12,500. | 4,500 | | 2.8 |
| 1967 | | | 9,177 | 8,300 | 6,000[7] | 8,300 | 3,300 | | 2.5 |
| 1966 | | | 12,003 | nd | 6,000[7] | 12,003 | nd | | n.d. |
| 1965 | | | 3,793 | nd | | 3,793 | nd | | n.d. |
| 1964 | | | 1,800 | 5,500 | | 5,500 | 2,325 | | 2.4 |
| 1963 | | | 9,600 | 9,600[3] | | 9,600 | 2,809[11] | | 3.4. |
| 1962 | | | 1,846 | 1,846 | | 1,846 | 2,465 | | 0.7. |
| 1961 | | | 3,758 | 3,758[4] | | 3,758 | 4,130 | | 0.9 |
| 1960 | | | | 9,578 | | 9,578 | 6,390 | | 1.5. |
| 1959 | | | | 12,635 | | 12,635 | nd | | n.d. |
| 1958 | | | | nd | | | nd | | n.d. |
| 1957 | | | | nd | | | nd | | n.d. |
| 1956 | | | | nd | 5,000[8] | 5,000 | nd | 2,500[8] | 2.0. |
| 1955 | | | | 3,640 | | 3,640 | | | - |
| 1954 | | | | | | | | | - |
| 1953 | | | | | | | | | - |
| 1952 | | | | | | | | | - |
| 1951 | | | | | 10,000[9] | 10,000 | | 3,280[9] | 3.0. |
| 1950 | | | | | 2,800[9] | 2,800 | | 3,737[9] | 0.7. |
| 1949 | | | | | 10,000[9] | 10,000 | | 2,650[9] | 3.8. |

Notes _

1. A number of organisations have maintained more or less complete records of cotton transactions or production. Many inconsistencies exist in these records, both inter and intra-organisationally. It was therefore considered appropriate to present all the data assembled , indicate the inconsistencies, and arrive at a "best estimate".

   The following designations are used:

   Wellawatte : Wellawatte Spinning and Weaving Mills, up to 1973 the sole ginners of cotton , have provided ginning throughput records since 1968 relating to each year's production. These are thought to be highly reliable.

| | |
|---|---|
| RVDB | River Valleys Development Board started ginning cotton at Angunukolapelessa in 1973. This came from 3 sources: Uda Walawe irrigated production, some ginned for National Textile Corporation, and some purchased directly from cooperatives. Only the final 2 are included here. Figures appear reliable and are to be added to Wellawatte data. |
| Agrarian Services: | This Department, responsible for marketing inputs and administering GPS purchases from 1961 - 70 maintained records of transactions during the period. These are extracted from their Annual Administration Reports (AAR). |
| Department of Agriculture: | Annual Administration Reports contain estimates based on seed issues, extension agents' estimates and records of cooperatives. These are thought to be more comprehensive than Agrarian Services records. |

In general, production statistics pre-1968 are thought to be less reliable than those of recent date. Statistics for 1971-77 were also provided by the National Textile Corporation, but are not presented here since, with only detail differences, they duplicated the Wellawatte figures.

2. The year for which production data are given is that in which the cotton was purchased from farmers - for 1977 purchases, the relevant production seasons are therefore Maha 1976-77 and Yala 1977 for rainfed and Yala 1977 for irrigated cotton.

3. Given as 12,000 cwt in the 1963-4 AAR, but 9,600 is taken since it coincides with the Agrarian Services estimate.

4. 1960-1 and 1961-2 AARs give 6,130 cwt as purchased by Wellawatte, but this figure is not incorporated here since it is not clear whether it refers to the appropriate production period.

5. Data provided by the Extension Division. These are widely inconsistent with the ginning figures, and perhaps provide some measure of the likely inaccuracy of pre-1966 data, since they were reached in a similar way to those of the Department of Agriculture.

6. Extracted from the 1970-75 5-year plan

7. Figures used in the Asian Development Bank's appraisal of Uda Walawe Development Project, 1969.

8. Estimate made by A.L.Johnpulle, "Agriculture in the Southern Division" Tropical Agriculturist, 1956, CXII p.11-24.

9. Estimate made by I.P.S.Dias , "An Appraisal of Ceylon's Cotton Crop" Tropical Agriculturist, 1965, p.117-131.

10. Acreage data for rainfed cotton are based on a combination of estimates from seed issues and from extension agents' reports. They are highly unreliable. For irrigated cotton they are provided by Uda Walawe Project and are reliable.

11. Given as 3,260 acres in the 1963-4 AAR.

12. Extension Division estimate, highly unreliable.

13. Yields are obtained by dividing "Best Estimate" production by acreage. Because of acreage data approximations, the yields; presented should be treated as no more than a rough guide.

n.p. = not published.

n.d. = published but contains no relevant data

- = insufficient data could be gathered for yield estimation.

Table A6 Irrigated Cotton Production

| | Seed Cotton production (cwt) | Acreage[1] | Yield (cwt/acre) |
|---|---|---|---|
| 1977 | 3,036 | 820 | 3,7 |
| 1976 | 1,815 | 671 | 2,7 |
| 1975 | 4,731 | 654 | 7,2 |
| 1974 | 2,596 | 480 | 5.4 |
| 1973 | 1,881 | 603 | 3,1 |

Notes:

Data provided by RVDB Angunukolapelessa

1. Acreage refers to that harvested, since in most years some of the planted acreage was abandoned. Includes some Maha acreage, especially in 1976 and 1977.

## APPENDIX 2

### COTTON PRICE ANALYSIS

In terms of international resource-allocation efficiency, there would be no purpose in expanding Sri Lanka's cotton production, if this has to be achieved by offering a farm-gate price higher than that sustainable given current world market prices for lint and seed. This section attempts to discover whether local cotton production is currently subsidised in this way, or has been subsidized in the recent past, and examines the future outlook for producer prices.

Lint is the most valuable cotton product to enter international trade, and data supplied by Wellawatte Spinning and Weaving Mills suggest the following c.i.f. Colombo prices for imported lint. No import duty is payable:

| Lint suitable for spinning : | Average Price Paid per lb. Lint for Jan - June 1978 | |
|---|---|---|
| | US$ | Rs. |
| 20s count | 0.5633 | 8.63 |
| 30s count) ) 40s count) | 0.6180 | 9.48 |
| 50s count) ) 60s count) | n.a. | 15.0 |

Locally-produced cotton delivered to Colombo gin is purchased by Wellawatte at Rs.360/cwt seed cotton (Grade I), which includes a Rs.20/cwt transport allowance. Ginning costs are currently estimated at Rs.37/cwt seed cotton, so that the total cost of producing 1 lb. lint at Colombo, assuming a 33.3% ginning outturn is:

$$Rs. \frac{360 + 37}{112} x = Rs.10.63$$

Before comparing this with international lint prices , we should deduct the value of saleable cotton seed, sold in 1978 by Wellawatte at Rs.800/ton, which, at 2 lbs. seed per lb. lint is equivalent to Rs.0.714. Thus the net cost of producing lint is:

| | |
|---|---|
| | Rs.10.630 |
| Less | Rs. 0.714 |
| | Rs. 9.916 |

Since local yarn is currently suitable for producing mainly 20s counts, its production appears at first sight to be subsidised at a level 15% higher than the price of an equivalent quality of imported lint.

**This analysis, however, is far from conclusive, and the following questions concerning the prices adopted for seed and lint can be raised:**

(i) Seed : The current price of Rs.800/ton of seed received by Wellawatte might appear unduly low: indeed, the firm seems to have made little seed-marketing efforts. Working back from a world market price in 1978 of US$ 600/ton for seed oil (World Bank,1978) at a 15% by weight oil content, we see that:

1 ton seed = 0.15 tons oil

6.67 ton seed = 1 ton oil

at local market prices, 6.67 ton seed is worth (6.67 x 800) = Rs.5,336 f.o.b. Colombo, whereas 1 ton oil is worth (US$ 600 x 15.32) = Rs. 9,192.

There is thus a large discrepancy, the price received by Wellawatte being less than 60% of the world market price. This calculation is by no means complete- on the one hand, the lower figure does not allow for the costs of oil extraction and weight by linters (7% approx. of raw cotton seed weight) both of which imply that these figures overestimate the difference between seed and oil-equivalent prices. On the other hand, the value of such by-products as cake (45% by weight) has been included in the local price paid to Wellawatte and causes the difference to be underestimated. There are thus additional factors on both sides of the equation, and without more detailed information it would be impossible to give a more precise estimate of the extent to which local seed prices received fall short of those payable on the world market.

For our purposes it is adequate to state with a high degree of probability that the price realised by Wellawatte for cotton seed is considerably below what should be possible, given world market prices.

However, even if we revise our calculations to allow for an arbitrary 50% increase in the price of seed achievable, the value of seed is such a small component in total cotton value that the cost of locally-produced lint is reduced by a mere Rs.0.357 to Rs.9.559/lb.

(ii) Lint: The imported price of lint quoted by Wellawatte represents the average of 2 purchases of lint suitable for 20s and 30s - 40s counts made in the first half of 1978. If, as the World Bank projects, we assume a rising trend in world lint prices, the overall 1978 average may be slightly higher than the prices quoted here. Taking the unit price paid for the second of Wellawatte's purchases as more representative of the likely 1978 average, the locally produced lint price (net of seed value) at Rs.9.559/lb. Compares with a c.i.f. Colombo price of Rs.9.10/lb. for 20s count and Rs.10.03 for 30s - 40s count lint.

Thus, the locally-produced lint price is broadly in line with 1978 world market prices. The implications of this analysis for <u>future</u> farm-gate pricing policy in Sri Lanka are clear: since the world market price of lint is expected to change little in real terms and by only slightly more than 10% in current values by 1980 (World Bank 1978) the scope for increasing producer cotton prices will be very narrow over the next two years, if local production costs are not to fall out of line with world prices, and assuming that there will be no major devaluation of the Rupee. The current price is, therefore, broadly what the producer can expect to receive over the next two seasons. By implication, the almost equally high farm gate price for seed cotton offered in 1978, 1977 and 1976 (Appendix 3) has represented an enormous over-pricing of local cotton at the exchange rate of some Rs. 8 = US$ 1 existing in 1977 and 1976, and this in spite of the fact that the world market price of lint in both real and current-value terms was higher then than in 1978.

The expansion of planted acreage and seed cotton output evident in Table A5 over the last 3 years has thus been achieved at the expense of a subsidy to cotton-growers equivalent to some 30% of world market lint price.

It is interesting to note that the results of this analysis are broadly in line with the conclusions reached by the NEDECO study group. Using a shadow exchange rate of Rs.18 = US$ 1 they calculated that the 1990 price of imported lint would be some 50% higher than its 1978 price. This implies that farm-gate prices can only be allowed to rise very slowly - i.e. by a total of not more than 50% above present levels in the next 11 years.

## Conclusions

The following 3 conclusions can be drawn from our analysis.

(i) The costs of producing lint locally are closely equivalent to world market prices in 1978 for the quality of lint produced.

(ii) Given the expected stagnation of world market prices, there appears little justification for an increase in farm gate prices between now and 1980.

(iii) The recent expansion of cotton acreage seems to have been achieved by pricing local lint and seed cotton at some 30% higher than world market prices in 1976 and 1977.

## APPENDIX 3

### SEED COTTON PRICES PAID TO GROWERS (Rs./CWT)[1]

| | Grade 1 | Inter-Grade | Grade 11 | Grade 111 |
|---|---|---|---|---|
| 1977 - 8[2] | 340 | - | 310 | 280 |
| 1976 - 7 | 335 | - | 290 | 275 |
| 1975 - 6 | 325 | - | 280 | 260 |
| 1974 - 5 | 191.25 | - | 170 | 120 |
| 1973 - 4 | 165 | 150 | 135 | 120 |
| 1972 - 3[3] | 95 | 80 | 65 | 50 |
| 1971 - 2 | 75 | 60 | 45 | 30 |
| 1970 - 1 | 64 | 50 | 40 | 23.50 |
| 1969 - 70 | 64 | 50 | 40 | 23.5' |
| 1968 - 9 | 64 | 50 | 40 | 23.50 |
| 1967 - 8 | 64 | 50 | 40 | 23.50 |
| 1966 - 7 | 60 | 50 | 45 | 36 |
| 1965 - 6 | 56 | 50 | 45 | 36 |
| 1964 - 5 | 56 | 50 | 45 | 36 |
| 1963 - 4 | 56 | 50 | 45 | 36 |
| 1962 - 3 | 56 | 50 | 45 | 36 |
| 1961 - 2 | 56 | 50 | 45 | 36 |
| 1960 - 1 | 56 | 50 | 45 | 36 |
| 1959 - 60[4] | ng | ng | ng | ng |
| 1958 - 9 | ng | ng | ng | ng |
| 1957 - 8 | 56 | — | 38.50 | 28 |
| 1956 - 7 | 56 | - | 38.50 | 28 |
| 1947 | 32.50 | - | 16.25 | - |
| 1936 | 12 | - | - | - |

Notes :

1. This table is compiled from several , occasionally conflicting, sources. Although it indicates the broad price trend, the accuracy of individual data cannot be guaranteed.

2. Prices relate to the production years given.

3. Up to mid-1973 prices were Rs.75 , 60 , 45 and 30 respectively. The Yala 1973 crop at Uda Walawe was purchased at Rs.125 for Grade 1.

4. n.g. means that cotton was not purchased under the guaranteed purchase scheme in these years.

## APPENDIX 4

### COTTON IN PUTTALAM

After Hambantota, Puttalam contains the largest acreage of rainfed cotton. The status of the crop there is summarised below, on the basis of information provided by the DAEO, Puttalam.

The crop is grown on chena, some 50 - 60 acres being planted in Maha 1976 - 7, 450 acres in 1977 - 8 and an expected 50 acres in Maha 1978 - 9. Yields are claimed to be between 4 and 5 cwt/acre, with an average of about 3 spray applications per farmer. Insecticide is purchased from private traders, and sprayers borrowed or hired locally. Cultivation credit from official sources is generally not used. There are no extension personnel with specific cotton training, although one Agricultural Instructor has been trained in grading.

The chief problem lies in disposal of the crop, the NTC having purchased the 1977 - 8 crop, after considerable delay. Marketing was reported still to be in progress in November 1978. Additionally, there was much dissatisfaction among farmers with the grading out turn. The NTC had introduced a fourth grade in 1978 at Rs.50/cwt, into which some 25% of the crop fell.

Seed quality was reported to be extremely low, with only 30-40% germination and poor lint characteristics. All seed was obtained from previous seasons' production, ginned at Wellawatte.

Given improved organisation of the industry, some 2,000 acres of well-drained soils with an annual rainfall of 35 - 40" could be brought under cotton at Vanativillu.

## APPENDIX 5

### EXPECTED COTTON PRODUCTION IN THE HAMBANTOTA DISTRICT 1978/79 MAHA

| | Centre | Expected production cwts |
|---|---|---|
| 1. | Gonnoruwa | 1,000 |
| 2. | Migahajandura | 500 |
| 3. | Mahagalawewa | 1,000 |
| 4. | Mattala | 2,000 |
| 5. | Padaugama | 450 |
| 6. | Badagiriya | 2,800 |
| 7. | Weliwewa | 200 |
| 8. | Hambantota | 2,400 |
| 9. | Dehigahalanda | 700 |
| 10. | Suriyawewa | 100 |
| 11. | Tissa Aluthgoda | 1,500 |
| 12. | Debokkawa | 500 |
| 13. | Dambarella | 600 |
| 14. | Hungama | 150 |
| 15. | Koodagoda | 200 |
| 16. | Middeniya | 300 |
| 17. | Labuhengoda | 300 |
| | | 16,300 |

Source : The Hambantota District Kachcheri

## APPENDIX 6

### ISSUE OF CHENA PERMITS

| Cultivation season | | Grama Sevaka Division | No. of chena permits | Acres |
|---|---|---|---|---|
| Maha 75/76 | + | Koholangala | 221 | 430 |
| " | | Ihalakubukwewa | 231 | 556 |
| " | | Gonnoruwa | 175 | 380 |
| " | * | Mattala | 868 | 3,232 |
| Maha 76/77 | | Koholangala | 498 | 1,587 |
| " | | Ihalakubukwewa | 296 | 812 |
| " | | Gonnoruwa | 333 | 634 |
| " | | Mattala | 425 | 1,013 |
| Maha 77/78 | | Koholangala | 783 | 2,465 |
| " | | Ihalakubukwewa | 288 | 770 |
| " | | Gonnoruwa | 168 | 622 |
| " | | Mattala | 633 | 1,665 |

+ Badagiriya is under Koholangala Grama Sevaka Division

* Padaugama is under Mattala Grama Sevaka Division

Source: Hambantota and Tissa AGA's Office

## APPENDIX 7

### FREQUENCY DISTRIBUTION OF DISTANCE BETWEEN CHENA PLOTS & HOMESTEAD

| | Miles | | | | |
|---|---|---|---|---|---|
| | 0-0.9 | 1-1.9 | 2-2.9 | 3-3.9 | 4+ |
| Badagiriya | 2 | 4 | 1 | 7 | 19 |
| Gonnoruwa | 21 | 10 | 2 | 1 | 0 |
| Mahagalawewa | 7 | 11 | 10 | 7 | 1 |
| Mattala | 9 | 15 | 11 | 1 | 0 |
| Migahajandura | 11 | 12 | 4 | 2 | 5 |
| Padaugama | 13 | 4 | 1 | 1 | 0 |
| Total | 63 | 56 | 29 | 19 | 25 |
| % | 33 | 29 | 15 | 10 | 13 |

## APPENDIX 8

### FREQUENCY DISTRIBUTION OF NUMBER OF YEARS FOR WHICH CHENA PLOTS ARE CULTIVATED

| | Years | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Badagiriya | 3 | 27 | 3 |
| Gonnoruwa | 25 | 9 | 0 |
| Mahagalawewa | 32 | 4 | 0 |
| Mattala | 22 | 13 | 1 |
| Migahajandura | 28 | 5 | 1 |
| Padaugama | 10 | 9 | 0 |
| Total | 120 | 67 | 5 |
| % | 62 | 35 | 3 |

## APPENDIX 9

### COST OF PRODUCTION PER ACRE OF COTTON
(Estimate by Cotton Growers Association, Gonnoruwa)

| | | Rs.Cts. |
|---|---|---|
| (i) | Jungle clearing | 400.00 |
| (ii) | Fencing | 75.00 |
| (iii) | To put up a hut | 75.00 |
| (iv) | Planting | 40.00 |
| (v) | Fencing | 30.00 |
| (vi) | Weeding (twice) | 300.00 |
| (vii) | Insecticides | 200.00 |
| (viii) | Maintenance and aftercare operations | 1,200.00 |
| (ix) | Other expenses | 100.00 |
| (x) | Harvesting | 280.00 |
| | Total | 2,700.00 |

Source : The Hambantota District Kachcheri

## APPENDIX 10

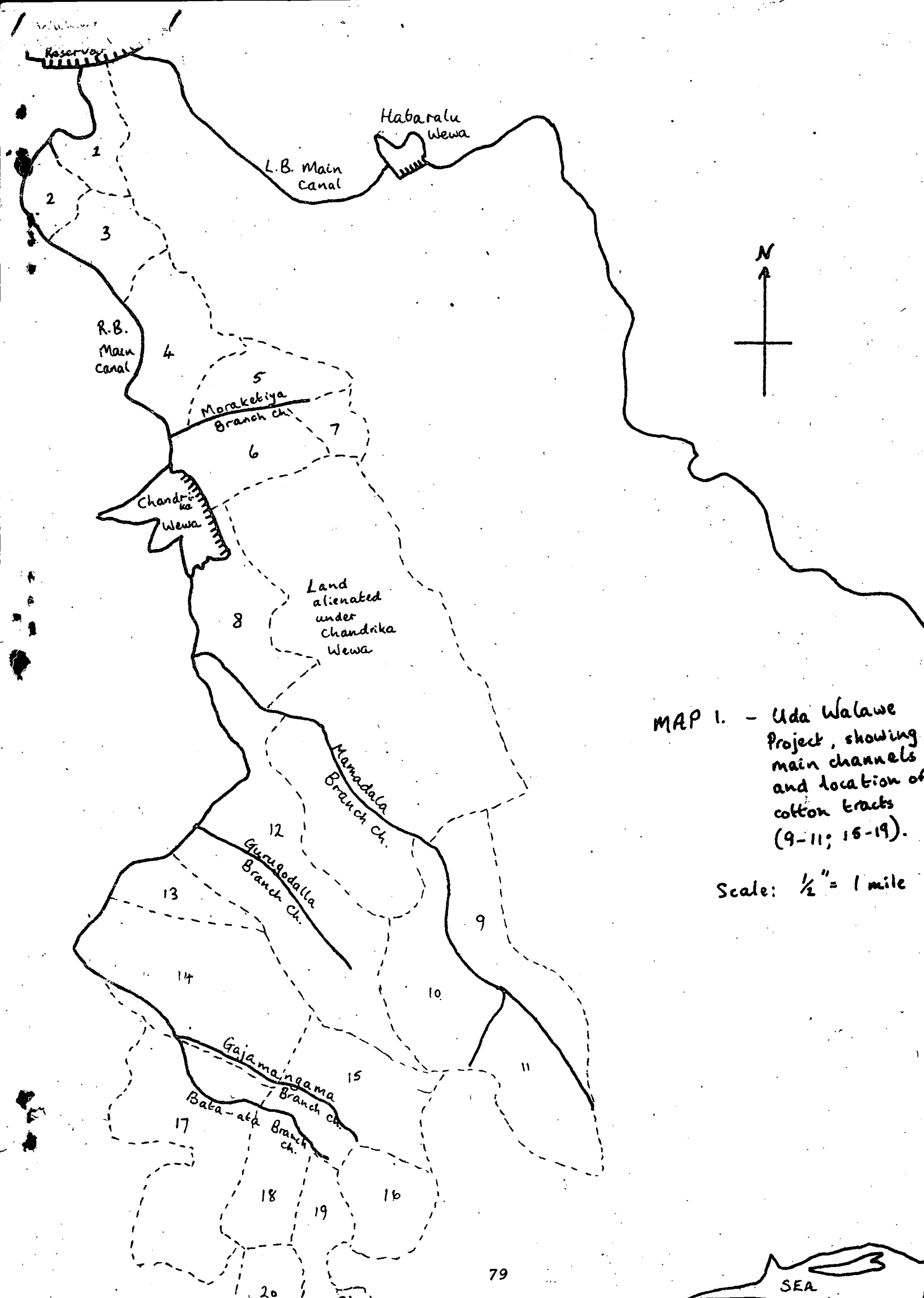
### FREQUENCY DISTRIBUTION OF TYPES OF INSECTICIDES USED AT RAINFED COTTON SITES

| | No: of Farmers using | | | | | | |
|---|---|---|---|---|---|---|---|
| | Tamaron (Methamidophos 60% EC) | Endrex | Sumithion | Azodrine (Monocrotophos 60% EC) | Malathion | Meerex | Other (unidentifiable) |
| Badagiriya | 18 | 1 | 4 | 7 | - | - | - |
| Gonnoruwa | 14 | - | - | 6 | - | 2 | 2 |
| Mahagalawewa | 10 | 4 | 4 | - | 1 | - | 4 |
| Mattala | 5 | 14 | 1 | - | - | - | 1 |
| Migahajandura | 4 | 17 | 2 | 1 | 1 | - | - |
| Padaugama | 5 | - | - | 3 | 6 | - | 1 |

## APPENDIX 11

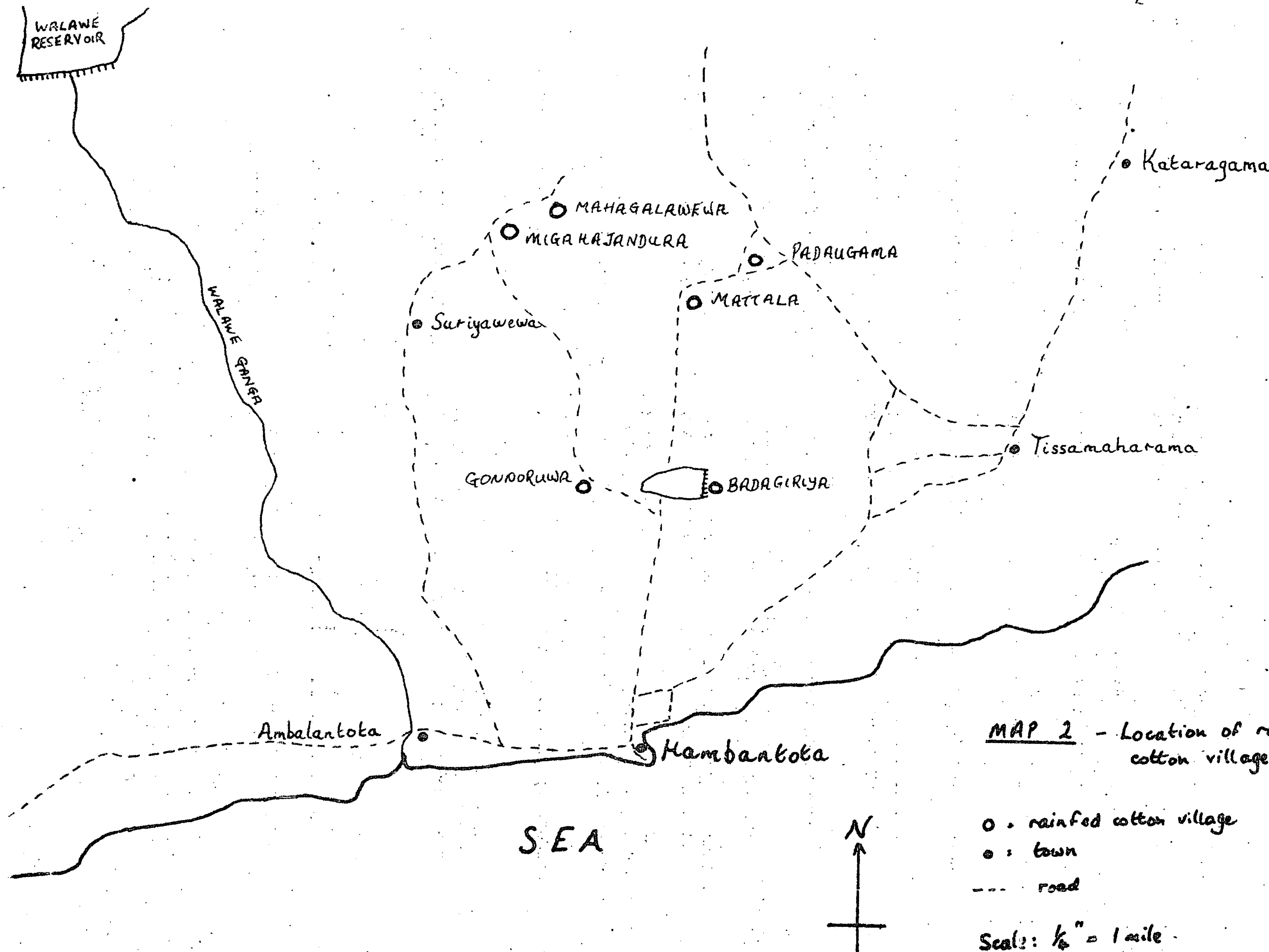
### AVERAGE DISTANCE PER SPRAYING FARMER TRAVELLED IN ORDER TO PURCHASE INSECTICIDES

| | Distance (Mls) |
|---|---|
| Badagiriya | 0.1 |
| Gonnoruwa | 12.5 |
| Mahagalawewa | 10.6 |
| Mattala | 11.3 |
| Migahajandura | 15.3 |
| Padaugama | 12.8 |
| Uda Walawe (Maha) | 1.6 |
| Uda Walawe (Yala) | 2.0 |




MAP 1. - Uda Walawe Project, showing main channels and location of cotton tracts (9-11; 15-19).

Scale: ½" = 1 mile




MAP 2 - Location of rainfed cotton villages.

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