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THE CITRONELLA INDUSTRY IN THE HAMBANTOTA DISTRICT

Mahinda Perera
Fredrick Abeyratne

AGRARIAN RESEARCH AND TRAINING INSTITUTE

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IN THE HAMBANTOTA DISTRICT

MAHINDA PERERA
FREDRICK ABEYRATNE

Agrarian Research & Training Institute
114, Wijerama Mawatha, Colombo 7



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FOR E W O R D

Citronella is a crop that is widely grown in the Hambantota District. A survey conducted by the Department of Agriculture in 1969 showed that there were 15,390 acres of Citronella in the District.

At the instance of the Ministry of Agriculture and lands, the Agrarian Research and Training Institute undertook a study of the Citronella Industry in Hambantota District with a view to working out a suitable marketing strategy so that it would assist the producers to obtain a fair price for their Citronella Oil. A condensed version of this study was submitted to the Ministry of Agriculture and Lands in August 1976 for policy purposes. The present version in a more detailed form is being issued for wider circulation. It is hoped that the study would be of use for drawing up a development plan, particularly a marketing strategy for this Industry.

T.B.Subasinghe,
Director,
AGRARIAN RESEARCH AND TRAINING INSTITUTE

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Mahinda Perera

Frederick Abeyratne

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Chapter 1

INTRODUCTION

Citronella (*Cymbopogon Nardus*) is one of the oldest industrial crops in Sri Lanka. It was introduced to this country by Nichola Grim. Till 1890 Sri Lanka remained the sole supplier of citronella to the world. At that time there were 50,000 acres under citronella in the southern province of Sri Lanka. In 1890 the citronella plant was introduced to Java (from Sri Lanka). Subsequently Java replaced Sri Lanka as the major producer of citronella to the world. There was a gradual drop in demand for citronella and by late 1960's, nearly 20,000 acres of citronella were replaced by coconut etc.¹ According to a survey done in 1969 by the Department of Agriculture, the acreage under citronella in the Hambantota district was 15,390, Matara district had 1,160 acres and Matale district had only 260 acres. Some of the land under citronella has recently been intercropped. In the Hambantota district, with the introduction of the coconut subsidy scheme in 1958, a number of plantations have been interplanted with coconut.

It is estimated that altogether there are about 15,000 acres under citronella, in Sri Lanka. According to the 1977 Implementation Programme for the Hambantota district there are 14,000 acres under citronella and it was anticipated that 82,500 planting material at a cost of Rs.16,500/- would be distributed with a view to rehabilitating the Citronella industry.

The export income from citronella oil during the past few years is given below. This shows that the earnings have increased from Rs.1.8 million in 1969 to Rs.5.6 million in 1974 and then decreased to Rs. 2 million in 1975. It has again risen to Rs.3 million in 1976.

Year	- 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976,
Value	-
Rs.million	1.8 1.9 2.1 2.4 4.2 5.6 2.0 3.5
Source	- Customs Returns.

1.1 CITRONELLA AND ITS USES:

Citronella oil which falls into the category of essential oils is distilled from the leaves of the citronella plant. Citronella oil is a steam volatile aromatic product and contains the following major ingredients:

- i. Citronelal.
- ii. Citronellol.
- iii. Geraniol.

¹ Five Year Plan (1972-1976), Ministry of Planning and Employment, Government of Ceylon, November 1971.

Citronella oil is used mainly in the preparation of soaps, toiletries, polishes and aerosol sprays. It is also used in the manufacture of insecticides, alchoholic beverages, bitters, cordials and colognes. In the food industry it is used mainly in the preparation of flavouring foods. The higher percentage of citronelal and citronellol present in the Java type gives it an advantage over the Sri Lanka type in industrial application. Consequently, the Sri Lanka type is mostly used as 'whole' oil while the Java type is generally used for the isolation of the constituents.

I.2 CLIMATIC REQUIREMENTS:

Citronella thrives well up to 6,000 feet above mean sea level. It requires an annual rainfall of about 50-60" (heavy rainfall is detrimental to its growth). An abundant supply of sunlight is essential and a temperature of 80-90 F is considered ideal. It grows in a wide variety of soils. For example, citronella is grown in rich alluvial soils in Java and on sandy soil in Sri Lanka. However, well drained, deep, rich sandy loams are the best.

Hambantota district, where citronella is widely grown, comes under the low country agro-ecological region. The citronella growing areas in Hambantota district tend to be confined to the IL Regions, where it is partly in the dry zone and partly in the intermediate zone. It has a mean annual rainfall of about 50" and an average temperature of about 80°F. The terrain is mostly rolling, hilly or undulating.

I.3 OBJECTIVES OF THE STUDY:

Even though certain incentives have been offered for the production of citronella in this country, they do not appear to have had the desired result. On the contrary there has been a general neglect of this crop, and a consequent drop in production in recent years. The farmers have, in many instances, even put their land to other uses such as the cultivation of coconut. The most frequent complaints have been that prices paid to growers were 'unfair' and that marketing arrangements were 'unsatisfactory'. This study was undertaken (i) to assess more objectively the present state of the industry (ii) to identify the constraints that affect the production of good quality oil and (iii) to suggest ways and means of improving the industry.

I.4 METHODOLOGY:

(a) Selection of Area:

Data available on the cultivation and the distribution of citronella in Sri Lanka is very scanty. However, a survey conducted in 1969 showed that production was heavily concentrated in the Hambantota district, which had 15,390 acres. This accounted for about 92%

of total extent of citronella in the island.¹ The same report indicated that Kirama, Katuwana and Walasmulla areas in the Hambantota district were the most important locations of the citronella industry. The three Grama Sevaka Division of Kirama, Katuwana and Walasmulla in the Hambantota district were, therefore selected for the survey.

(b) Sampling Procedure:

The statistical date sheets (No.KAVI/SU/14) obtained from the office of the extension Officer/Minor Exports Crops at Walasmulla provided the frame for the selection of farmers for the survey. These date sheets were prepared by the District Agricultural Extension Officers of the Department of Agriculture with the assistance of the KVSS² in 1970/71. This frame had not been updated at any stage and therefore included farmers who had abandoned their cultivations and excluded those who started cultivation after the preparation of the data sheets. Another limitation of the frame was that the data sheets available were carbon copies and in most cases names and addresses of the farmers were illegible.

From each Grama Sevaka Division i.e., Kirama, Katuwana and Walasmulla the two villages having the largest extents of Citronella were selected. It was thought that about 30 randomly selected farmers in each village comprising about 15% of the total number of citronella farmers in the six villages would be a satisfactory sample for our purpose. A reserve list containing 15 randomly selected farmers for each village was also provided for, to overcome the limitations imposed by the sampling frame. The following table shows the exact breakdown of the sample by villages.

¹ Farm Management Report No.6 (preliminary) - The citronella Industry in Sri Lanka - Structure and Production Economics : D.J.McConnell, S.R.Attanayaka, G.K.Upawansa - (UNDP/SF-FAO-Agricultural Diversification Project 1972).

² Krushikarma Viyapthi Sevaka (Agricultural Extension Officer)

Table I :

G.S. Division	Villages.	No:of citr- onella farmers in the village	No: sele- cted for the sample	%of sample to total No. of farmers.
Walasmulla	Bowela	145	31	22
	Horewela	123	31	25
Kirama	Welandagoda	297	31	10
	Walgammuulla	320	30	9
Katuwana	Katuwana	268	30	11
	Talwatta	251	32	13
Total :		1,404	185	

The average sample size is about 13% of the population.

Due to the above mentioned limitations the location of farmers in the sample was difficult either because the names and addresses were inadequate or they no longer did citronella cultivation. For instance some farmers had abandoned citronella cultivation as the fields were submerged by the Muruthuwela reservoir at Bowela. In a few cases, the farmers in the sample were dead. In all such cases replacements were found from the reserve list.

(c) Tools of data collection.

Data at the producer level was obtained by administering a questionnaire.

The questionnaire broadly covered the following aspects:-

- (i) Information regarding the farm families i.e., employment of members, educational status, etc.,
- (ii) Information regarding the lands operated by the farmers.
- (iii) Income and expenditure of farm families and loans obtained by them.
- (iv) Marketing of citronella oil.
- (v) Cultural Practices.
- (vi) Processing of citronella and production costs of citronella oil.

The questionnaire was administered by 6 trained investigators under the supervision of the researchers. Data on the distillation of oil was gathered by interviewing a number of distillery owners while information on the marketing of oil was obtained by interviewing the dealers of citronella oil in the survey area and some of the exporting firms in Colombo.

1.5 LIMITATIONS:

Apart from the limitations in the sample frame, data with regard to production costs, labour inputs, the marketed surplus, incomes and expenditure may have been affected by recall lapses of the farmers. Further, the general tendency of farmers to inflate their costs and to understate their incomes will have to be borne in mind when analysing the data.

Chapter 2

SOCIO-ECONOMIC BACKGROUND

Citronella was the main crop grown in the survey areas, probably due to the soil and climatic conditions being more conducive for citronella. Other crops grown in these areas were paddy, coconut kitul, fruits and cinnamon. Of the total land in the survey area, 12% was lowland, and the balance was highland with 62% of the total land area under citronella.

2.1 DEMOGRAPHIC CHARACTERISTICS

The average size of a farm household was 6.9.¹ In 36.6% of the households the family size was 6 or less and in 46.5% it ranged from 7 to 9 members. 34.6% of the sample household members were below 14 years reflecting the general national trend of the predominance of the younger age group (39%). This group could be categorised as non-farming while about half (52.5%) was in the age group of 15 to 49. This is higher than the national figure of 48.4% in 1974,² and could be considered as capable of farming. The remaining sample household members were over 50 years of age.

The following table shows the distribution of the family members of the sample households whose ages were equal to or greater than 6 years,³ according to the level of education.

Table 2: Distribution of members of sample households (≥ 6 yrs) by Level of Education.

Level of Education	No:	%
No schooling	202	17.2
Up to Grade 5	489	41.8
6th Grade to G.C.E. (o/L)	352	30.0
Passed GCE (O/L) and above	117	10.0
Technical Education	II	1.0
Total:	1,339	100.0

¹The National Average is 6:

²Statistical pocket book of Sri Lanka 1975

³The minimum school going age became 5 yrs. from latter part of 1977

It could be observed that about 83% of the members of sample households had undergone some type of formal education - 10% having passed the GCE (O/L).

2.2 EMPLOYMENT:

In the 6 villages surveyed, 109 households (i.e., 58.9%) were engaged in agricultural work only and 41.1% were engaged in both agricultural and non-agricultural activities. The survey also showed that the majority (88%) worked on their own farm while only about 11.4% worked both on their own and outside farms. The percentage working exclusively on outside farms was negligible.

According to Table 3, nearly half the members of the sample households (48.4%) comprised of the unemployed, students, the disabled and young. (i.e) the dependent members.

Table 3: Distribution of population by Nature of Activity

Nature of Activity:	No:of persons:	%
Agricultural	491	36.7
Agri. and non-agricultural	87	6.5
Non-agricultural	114	8.5
Unemployed	40	3.0
Students	361	27.0
Disabled and young	246	18.4
Total :	1,339	100.0

2.3 TENURIAL AND OPERATIONAL STATUS

Table 4 shows the number of parcels and extents of citronella cultivated by a family member classified according to tenurial status.

Tenurial Status	Operational Status			
	Cultivated by Family Member.			
	Pure	Mixed		
	No. of Parcels	Extent (Acres)	No. of Parcels	Extent (Acres)
Solely owned	103 *	227.75	207	429.71
Jointly owned	1	1.00	16	69.38
Leased in	1	0.5	5	6.25

* Includes 2 parcels pure stand citronella (6 acres) which were solely owned but leased out and 1 parcel each of pure stand and, mixed citronella which were solely owned and rented out (3 and 1.5 acres respectively).

	Pure	Mixed		
	No: of Parcels	Extent (acres)	No: of Parcels	Extent (acres)
Rented in	1	2.00	-	-
Encroachments	13	21.10	8	10.75
Others	-	-	1	2.0
Total	119	252.25	237	518.09

The table shows that citronella is cultivated more as a mixed crop than as pure stand (almost double the extent). About 85% of the land under citronella cultivation was solely owned and farmed by a family member. Altogether about 96% of the land under citronella cultivation in the total sample was owner-operated i.e., solely owned and jointly owned land. A large proportion of mixed farms were intercropped with coconut.

The following table shows the relationship between the size of the holding and the number of farm households under each holding size.

Table 5: Distribution of citronella holdings¹ according to land size Classes.

Land size (acres)	No: of households	%
<1.0	40	21.6
1 <2	50	27.0
2 <3	31	16.7
3 <4	15	8.1
4 <5	19	10.2
5 <10	14	7.5
≥10	15	8.9

Nearly half the holdings (48.6%) were less than 2 acres in extent, while about 84% were below 5 acres. This shows that the industry consists essentially of small farmers. Under pure stand the average size of holding was 2.12 acres while under mixed conditions it was 2.19 acres.

2.4 INCOME AND EXPENDITURE:

An attempt was made to determine the income-expenditure pattern of farm households in order to get a broad idea of their standard of living. The average annual income per household

¹ Both pure and mixed stands together.

¹ amounted to Rs.2,571. A break-down of this income is given in Table 6. Nearly 25% of the total income was derived from citronella farming, which was larger than the income earned from other crops grown and second only to the income earned through non-farm employment which was 34.6% of the total farm income.

Table 6 : The major break-up of income sources

From Agriculture		
Citronella	25%)	41%
Other crops	16%)	
From Agricultural employment		8%
From non-agricultural employment		35%
From others (e.g., pensions, rents, donations etc.,)		16%

An attempt was also made to get the average expenditure incurred by a household on food, clothing, travel, education and health. This was no easy task as the farmers had not maintained any records and therefore had to depend very much on their memory. Furthermore, there was also a tendency among farmers to inflate their costs and underestimate their incomes in the hope of getting state help. The average annual expenditure per farm household was Rs.4085 of which 69% was spent on food. The least expenditure was on education - (7.7%).

2.5 CREDIT :

Four sources of credit were identified in these areas. They were from

- (a) Banks
- (b) Co-operatives
- (c) Professional money lenders who charge an interest (produce buyers and merchants)
- (d) Private money lenders who do not charge an interest (friends and relatives)

The following table shows details of loans taken and the amount repaid during the period January, 1975 to April, 1976.

Table 7 :

Purpose of Loan.	No. of Loans taken.	No. of borrowers	Amount borrowed (Rs.)	Amount repaid (Rs.)
Citronella cultivation	10	10	2725	1350
Cultivation of other crops	15	14	8445	3970
Business activities	8	7	10950	5942
Consumption	50	44	19565	4500
Total	83	75	41685	15762

¹ Consumer Finance Survey 1973. For the Rural Sector, the income is about Rs.2,800/- per annum.

Only 10 loans or 12% of the total number of loans taken were for citronella cultivation. The majority of such loans (6) had been borrowed from private sources like friends and relatives who did not charge any interest. Only in two instances did they resort to institutional sources for borrowing. The uncertainty of the price of oil which discouraged any investment on this crop had led to this situation. The majority of loans were for consumption purposes (50 loans) and had been obtained from non-institutional sources. The interest rate charged by professional money lenders in the area, which ranged from 100% to 240% per annum was always higher than that of the institutional sources which varied from 10% to 12% per annum.

Of the loans taken for citronella cultivation (including for harvesting and processing) almost 50% had been repaid. But the rate of repayment of loans taken for consumption purposes had been very low amounting to only 23%. Farmers found it difficult to repay these loans because they did not get enough income from farm produce.

MANAGEMENT PRACTICES

When working out a suitable marketing strategy for the citronella growers, an important factor that emerges is the quality of the product i.e., the oil, which determines the price of the product. On the other hand, since the bulk of the oil is for the export market, the prices will have to be competitive in the world markets. This means the cost of production will have to be kept to a minimum. The adoption of proper management practices is essential if a steady market for the oil is to be maintained. This chapter examines the level of management practices in relation to the following aspects.

1. Nature of plantation.
2. Weeding.
3. Pests and disease control.
4. Application of fertilizer.
5. Extension services.

3.1 NATURE OF PLANTATION

(a) Varieties grown:

Three types of citronella are found in Sri Lanka -

- (1) Wild type ('Mana' grass). This grass is considered a weed and is found in abundance in the upcountry areas. The oil content of this type is very poor, and it has no commercial value.
- (2) Two major types are grown for citronella oil extraction. Viz., i. *Heen pangiri* or *lenabatu* (*cymbopogon nardus* (L.Rendle)).
ii. *Maha pangiri* or *Java type* (*cymbopogon winterianus*) (Jowitt).

The bulk of the Sri Lanka oil is distilled from 'lenabatu', and none of the households surveyed cultivated the Java type. The quantity and the quality of the oil derived from Maha Pangiri is higher. It has recently been pointed out that certain Java type varieties could be cultivated in tea estates as a fallow crop between pruning cycles. This gives the added advantage of soil renovation in the uneconomic tea lands because they can act as an organic mulch.

'Heen Pangiri' or 'lenabatu' is widely grown in Sri Lanka due to its drought resistant and hardy qualities which makes it ideal for the climate in the Hambantota District.

However, a private company (Lever Brothers (Ceylon) Ltd) after conducting some trials in the Walasmulla area has identified some higher yielding strains of both Java & Lena batu types.

(b) Age of Plantation :

According to available literature, under estate conditions, the production capacity or the oil distillation recovery rate of a citronella stand starts declining after 6-8 years. But in Sri Lanka this important aspect is neglected and in most instances citronella is regarded as a permanent crop. Our survey revealed that about 70% of the plantations were above 10 years, while about 24% were above 30 years, of which the majority was over 50 years. (Table No. 8). The farmers are not seriously concerned with periodical rehabilitation or replanting. 29.6% of the plantation is below 10 years and is relatively new. This is partly due to the fact that some farmers who enjoyed the benefits of high prices in 1974, went into new cultivation expecting further price increases.

Table 8. Age of plantation :

Age of Plantation	All villages	
	No:	%
1 - 10	59	29.6
11 - 20	59	29.6
21 - 30	34	17.2
Over 30	47	23.6
Total :	199	100.0

(c) Replanting :

Replanting in citronella fields is rarely done. Only about 7% of the respondents (14 out of 184 interviewed) have done any sort of replanting. Here too, the total acreage replanted is very small. Though, theoretically, the variety *Heen Pangiri* which is widely grown takes 8 to 9 months for the first harvest, the survey revealed that almost 80% harvested their first crop in 5 - 6 months.

(d) Pure and Mixed Stands :

Though earlier citronella plantations consisted of pure stands the farmers have now taken to inter-planting on a large scale due to the low and erratic price fluctuations of citronella oil. Only 1/3 (33.5%) of the holdings comprised of pure citronella cultivation. Citronella was generally inter-planted with another single crop (44.5%), Coconut and Cinnamon being the more popular. Inter-cropping with other perennials like Jak, Mango and kitul was not common. Citronella under pure and mixed stands give varying yields. According to an earlier survey,¹ yield differences were as follows :-

Pure stand	23.6 bottles/AC/Yr
With immature coconut	20.4 " "
With mature coconut	14.8 " "

¹ The citronella industry in Sri Lanka (Ceylon). Farm Management Report No. 6 (Preliminary).

According to the recommended spacing (2' x 2') an acre of citronella should consist of 10,890 bushes per acre. In the course of the survey, several measurements were taken to find out the existing density in the citronella plantations. In sample sizes of 20' x 20' the density ranged from 6,534 bushes to 11,979 bushes per acre.

The average density in a pure stand was 8,702 bushes per acre. It is obvious that the recommended density had not been adhered to. Therefore, when replanting of citronella is proposed in these areas the density of the plantation should be looked into, because this is one of the factors that determines the yield and also influences the adoption of other management practices.

Nearly all the farmers in the study sample believed that intercropping retarded the growth of the citronella plant and about 80% said that intercropping reduced the oil content.

(e) Planting Material:

The Department of Minor Export Crops started a scheme about 5 years ago to distribute planting material free of charge but only one farmer had availed himself of this opportunity. The majority, amounting to 70%, had used planting material from their own plots, mainly due to the fact that they were not aware of this facility. Nearly 30% had obtained their planting material from neighbours, friends and relations. Farmers had been using low yielding unselected strains over and over again, which had resulted in a decline of the yields in the area.

3.2 WEEDING

Weeding, perhaps, is the only important management practice adopted in the citronella farms. Weeds compete with the citronella plant for light, nutrients, water etc., causing low yields. It is also known that when some ocimum family weeds (e.g. Maduruthala) which have the property of producing essential oils contaminate the citronella leaves, the quality of citronella oil is affected.

The survey revealed that almost all the farmers weeded their fields (though irregularly) using the mammoty for this operation. None had used chemicals or any other method. More than half of them (55.3%) had done weeding once in about 6 months. Financial difficulties was the more common reason for adopting this particular interval instead of shorter intervals. About 22% weeded once in 3 to 4 months, usually at harvesting times. 72% of the farmers who weeded once in 6 months owned lands below 3 acres. This factor reveals the financially distressed situation of the small holders.

3.3 PEST AND DISEASE CONTROL

Through the citronella cultivation is subject to sporadic rust damage and a few other insect pest damages, the incidence of these attacks in Sri Lanka is very minimal. Out of the 185 farmers interviewed, 146 (78.9%) reported that they had not come across any pest attacks or diseases. However, of the 21.1% who claimed pest attacks and diseases, most have misjudged a physiological condition as a disease. Even those who had observed pest attacks and disease had not taken any control measures, because they said that these diseases were overcome, naturally. It would thus appear that in these areas, where citronella is grown widely, pests and disease did not impede in a major way the growth of this crop.

3.4 APPLICATION OF FERTILIZER

Citronella is highly responsive to fertilizer, Experimental¹ data shows a marked increase in yields with the use of fertilizer.

Table 9. YIELDS AND FERTILIZER

	Mahapangiril Ibs.	Lenabatu Ibs.	Mean of both types Ibs.
No fertilizers	125.7	144.1	134.9
N+P+K (at relatively low levels)	503.5	458.0	480.7

According to this survey 6 farmers (3.2%) had practiced some form of manuring while only one farmer had used chemical fertilizer. Only four farmers had used citronella ash as fertilizer, because they were not aware that citronella ash was a good source of fertilizer. A chemical fertilizer mixture for citronella was sold at a subsidised rate but only 10.8% of the farmers interviewed were aware of this scheme.

The low rate of fertilizer use clearly showed the farmers' unawareness of the value of fertilizer in raising yields. Chemical fertilizer use could be kept to a minimum by using organic manure. Fertilizer application would have benefitted the citronella plantations in the areas surveyed as these lands had been under citronella for a long period of time. Where replanting is done, organic manure would be very helpful to rehabilitate these lands.

With manuring, soil and water conservation follows. In hilly areas the farmers had paid no heed to soil conservation, and this had resulted in soil erosion, which contributed to a further decline in yields.

¹ Farm Management Report No.8 - Planning notes for some perennial tropical crop - Estate diversification in Sri Lanka: D.J.McCornell (UNDP/SF-FAO-Agricultural diversification project:1974).

3.5 EXTENSION SERVICES

Citronella is a crop that had received very little attention by way of better cultivation practices. An Extension Officer was attached to the Minor Export Crops Department in the Hambantota District, but only 26 (14.1%) farmers interviewed were aware of his presence. Of these 26 farmers, only 3 had consulted him for advice on citronella cultivation in the 6 villages surveyed. According to the records, the extension authorities had received only 9 applications requesting for help to rehabilitate their farms. It is obvious that the farmers in this main citronella growing district in the island are not adequately exposed to the extension services available.

Chapter 4

PRODUCTION

Citronella is harvested in 3-4 months. Generally the three main harvesting seasons can be identified as May/June, August/September and December/January. This pattern has somewhat changed in the district according to the financial requirements of the growers, particularly before festive Seasons. For instance, many farmers harvested their crop during March/April in order to have some money for the Sinhala New Year. The usual pattern of harvesting now prevalent in the area broadly falls into March/April, June/July and October/November periods.

The yield of citronella oil is affected by many factors including the age of the plant, the variety, management practices adopted, interval between two cuts and the rainfall, among others. The Hambantota district enjoys its maximum rainfall during the North-East monsoon, which coincide with the Maha season. During this season, the citronella plant tends to flower resulting in lower yields. Therefore, the yield in October/November period tends to be less than during the other two harvesting seasons, viz. March/April and June/July. It is evident that 30 - 50% more oil per wadi¹ is recovered in Yala than in Maha season. Over and under-maturity reduces oil yields by about 30%. Oil yield decreases with storage time too. Though the rate of decrease is not known, by local rule of thumb, one month of storage decreases oil yield by 10 - 15 per cent. The following results were obtained from the survey data for the March/April cut.

The average yield of citronella grass per acre per cut	1.3 wadis
The number of bottles of oil per wadi	5 (approx.)
∴ The average yield of citronella oil per cut	$1.3 \times 5 = 6.5$ bottles
Average No. of cuts per year	3

1.

Wadi - Number of bundles of citronella grass that can be packed into a still boiler. A Bundle of grass usually weighs between 2 - 3 lbs.

4.1 COST OF PRODUCTION PER ACRE PER CUT

(a) Labour and Transport

The daily wage rate varied from Rs.3 to Rs.8 for men while for women it ranged from Rs.1.75 to Rs.5/- . The average wage rate for a man was Rs.4.81 per day and for a woman it was Rs.2.87 per day. On the basis of these two wage rates, 1 woman day is equivalent to 0.6 man days. This conversion ratio is used in the following calculations. The nature of operations where labour was used included (i) weeding and clearing the fields (ii) cutting, bundling and carrying the grass to the boiler or to the closest road, and (iii) work at the boiler including the drying of boiled grass to be used as the fuel, for boiling the water etc. The price of oil at the time of the survey was Rs.12 per bottle.

Weeding and clearing	- 19.6 man days	Rs. 94,28
Cutting, bundling and carrying the grass) - 8.0 man to the boiler or to the closest road	38.48
Transporting grass by cart/tractor to the boiler from the farm or the road) - per wadi	1.91
Boiler labour charges including drying the boiled grass to be used as the fuel) - per wadi	6.11
(b) Distillation		
Boiler Fee	¹	9.75
(c) Total Costs		Rs.150.53
		=====

Total cost is approximately Rs.150 per acre per cut.

Note : About 23% of the labour used was family labour which was given an imputed cost.

¹ Boiler Fee - The distillery owners charge for the use of their facilities by taking a fraction of the oil production from each wadi. The range was from 1/6 - 1/8 while the fraction most common (mode) was 1/8 of production.

4.2 INCOME PER ACRE PER CUT

Average No. of bottles per acre per cut	6.5
Average price of bottle of oil (at the time of survey) ¹	Rs. 12.00
Income per acre per cut = 6.5×12	Rs. <u>78.00</u>

4.3 NET RETURN PER ACRE PER CUT

The net return per acre per cut	= Rs. (78.00 - Rs. 150.00)
	= Rs. - 72.00
(i.e) the net LOSS per acre per cut	= Rs. + <u>72.00</u>

If the imputed cost for family labour is removed, the net return per acre per cut = Rs. (78.00 - Rs. 120.00)
= Rs. - 42.00
(i.e) the net LOSS per acre per cut = Rs. 42.00

Annex (1) shows the break-even charts (with and without imputed cost for family labour) for different yields (No. of bottles of oil/acre/cut) at different prices of oil, assuming that the same cost structure as above remains.

The following table gives the break even prices of oil for different yields.

Table 10 :

Yield	break-even price (Rs/bottle)	
	No. of bottles of oil/acre/cut	With imputed cost for family labour
6.5 (1.3 wadis)	24.70	19.34
9.0 (1.8 wadis)	20.09	15.79
12.5 (2.5 wadis)	16.80	13.26
17.5 (3.5 wadis)	14.32	11.35

The survey showed that the 'fair price' as suggested by the farmers themselves for their oil, averaged to Rs. 24.23 per bottle (mode Rs. 25/-). According to them, this was the minimum price that would cover their cost and give them a small margin of profit. This price is about the same as the break even price of Rs. 24.70

¹ The average price at the time of survey was taken for the purpose of calculating the net returns as the prices of citronella oil fluctuated widely during the past 16 months.

per bottle (with imputed cost for family labour) for the average yield obtained from the survey (6.5 bottles/acre/cut). Field observations indicate that the number of labour days reported was slightly excessive.

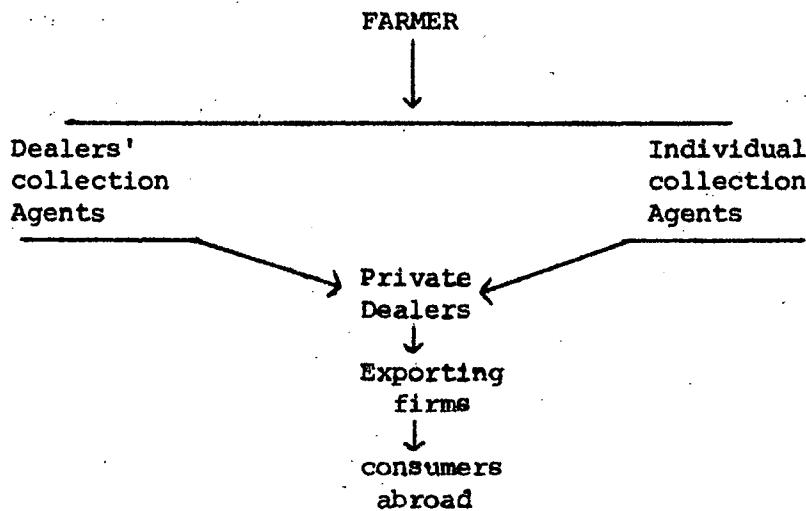
According to an advisory leaflet issued by the Ministry of Plantation Industries, the potential yield of a citronella field in the Hambantota district with recommended spacing of bushes and the application of fertilisers is 60 lbs. of oil/acre/year. This corresponds to about 13 - 14 bottles of oil/acre/cut. The survey revealed that about 40% of farmers had a yield of only up to 5 bottles of oil per acre per cut while another 30% had a yield of only up to 8.5 bottles of oil per acre per cut. Only about 29% had yields of 9 bottles and over. This is an indication of the very low level of management practices adopted by the farmers at present. Hence, if by proper management practices, the farmers are able to increase their yields to at least between 9 and 12.5 bottles per acre per cut or to an annual yield of 27 - 37.5 bottles per acre, then the break even price would vary between Rs.20.90 and Rs. 16.80 per bottle (with imputed cost for family labour) and between Rs.15.79 and Rs.13.26 per bottle (without imputed cost for family labour). About 20% of the farmers in the sample fell into this category.

The biggest cost component of production costs was the labour charge, which accounted for about 92% of the total cost. The survey revealed that wage rates were greatly dependent on the price of oil. If the price of oil is too low, then an important management practice like, for instance, weeding of fields, will not be carried out. Therefore, it is clear that the price of oil to the farmer has a big bearing on the economic and social life of the people in the citronella growing areas.

Chapter 5

MARKETING.

5.1 MARKETING CHANNELS



The survey revealed that the citronella oil sold by the farmers during the period January 1975 to April 1976 fetched an average price of Rs.10.30 per bottle. Local consumption of oil is insignificant and it can be said that nearly the entire production of oil was for the export market. Except for two established private dealers for the purchase of oil produced in the district, there was no state agency for this purpose. The survey showed that all farmers were unanimous in their demand for a government institution to purchase their oil, mainly in the hope of getting a fair and an uniform price for their produce.

5.2 MARKETING PROBLEMS

About 68% of farmers reported problems in the marketing of their produce, of which 42% felt that there were numerous malpractices in the testing and grading of oil at the dealers' collection centres whereby good quality oil was sometimes declared as inferior and a lower price paid. The farmers were not satisfied with the testing methods. 25% of the farmers said that the traders took undue advantage of farmers' ignorance of the testing methods. At times, the oil was rejected so that the farmers were compelled to sell it back to them at a much lower price-particularly because the market was dominated by two traders. Another marketing problem experienced mainly by the small farmers, was the method of measurement of oil by the dealers. The unit of payment to the farmer was on a "PER BOTTLE - CONTAINING 24 OUNCES OF OIL" basis. In case of farmers and private

Collectors having substantial quantities of oil, the oil was first weighed and this weight was converted into bottles of 24 ounces for making payments. In the case of small farmers, the oil was measured into a bottle and paid according to the number of bottles i.e by volume. About 58% of the total sample farmers were subjected to the latter method. This method of measurement had two disadvantages for the small farmer. (a) the dealers' bottles sometimes held more than 24 ounces even though payment to the farmer was for a bottle containing 24 ounces of oil, (b) the dealers sometimes refused to accept quantities of oil less than a bottle. The farmer, therefore, had no alternative but to sell it back to the dealer at any price quoted by him. This would not be the case if the farmers had the option of selling by weight.

5.3 PRICES AND PRICE INFORMATION

Price instability was the main problem associated with citronella oil. During the period for which data was gathered (January 1975 to April 1976) the price received by a farmer fluctuated between Rs.3/- to Rs.16/- per bottle. The average price for the 16 months was Rs.10.30 per bottle whereas the price at the time of the survey was Rs.12.00 per bottle. Nearly all the farmers felt that the price they got was too low to cover their costs. This fact and the frequent price changes in the market were constraining factors for the adoption of sound management practices. Annex¹ (2) shows the fluctuation of dealers' prices of estate quality oil ex. Galle from January 1975 to July 1976. It is evident that during this period prices have fluctuated between Rs.9.25 to Rs. 21.00 per bottle. (Source: Market report of Forbes & Walker Ltd.)

More than half (51.3%) of the farmers were unaware of the market price of oil at the time of selling. Of those who were aware nearly 77% had got this information from the dealers themselves or other farmers or the boiler owners. The price information has not trickled down to the farmers satisfactorily. This has resulted in farmers losing their bargaining power with the buyers.

As mentioned earlier, the whole marketing structure is dominated by a few private dealers in the absence of government institutions for purchasing citronella oil. All the farmers preferred to have a government establishment for this purpose, in order to ensure a stable and a better price for their produce. They were also of the view that such a course of action would minimize the malpractices, now being committed at private dealers' collection centres.

¹There are two qualities of oil - Estate and ordinary. The price of the former is usually 35 - 75 cts per bottle (24 ounces) higher than the latter. The quality is determined by the Geraniol content in the oil - 60% and above for Estate quality and 55% ; 60% for ordinary.

Chapter 6

THE PROCESSING (DISTILLING) SECTOR

Nearly all distilling units in the area were very old ranging from 20 to 50 years. No new units were being constructed due to the exorbitant costs and the very poor return on investment. According to the distillery owners, establishing a new unit today will cost about Rs.20,000/- to Rs.25,000/-¹. They even found it very difficult to renovate or repair their units due to high cost of spare parts. For instance copper pipes used for distillation were hard to come by and even if they were available they were priced high. Hence galvanised pipes were used. This reduced the efficiency of the still causing a decrease in the output of oil. Besides, the galvanised pipes break frequently, and in most cases they are repaired locally by plastering with cement. It was quite evident that with this kind of repair, a significant amount of steam containing citronella oil vapour leaked out, resulting in a drop in the yield.

Most units had 2 stills. The capacity of a still was not uniform. It ranged from 200 - 400 bundles of citronella grass per still. A 2- still unit facilitated distilling 3-4 wadis per day under normal near-peak conditions. The time taken for distilling each wadi of grass was 4-6 hours, depending on the availability of labour. A distilling unit designed and built by the CISIR had a still capacity of 400 bundles of grass. Here, the tubes were air-cooled whereas in other units they were water cooled. This unit had to be closed down for want of raw material. The farmers were reluctant to give their grass to this unit because they believed that the output of oil was less than in other units.

Nearly 60% of the total farmers interviewed, were of the opinion that they had sufficient distilling units in their villages. However, at Bowela about 60% of the farmers found the number of distilling units insufficient while about 80% at Walgamulla said they had sufficient units. In Bowela it was found that a number of citronella fields were submerged by the Muruthuwela reservoir scheme and since some of the distillery owners found it uneconomic to run their units, these units were closed down.

¹ Prior to the floating of the Rupee on 16th November 1977.

During some months of the year, particularly before the Sinhalese New Year Season, there was a rush for stills, but they were not being used to full capacity round the year due to the following reasons:-

1. Citronella is not harvested during rainy seasons.
2. A drop in the price of oil results in the cultivation being neglected.
3. Tendency to rush harvests prior to festive seasons, (e.g. Sinhala New Year) to get quick cash.

The bundles of citronella grass were usually carried to the distilling unit or transported by cart or tractor, depending on the situation of the field. The survey showed that the average distance from a field to the distilling unit was a little over half a mile, with most fields (Mode) being only a 1/4 mile away - the furthest was 3 miles. Therefore, the distance to the distilling unit does not seem to be problem to the farmers in the area.

Distillery owners charged the farmers for the use of their facilities by taking a fraction of the oil production from each wadi of grass distilled. This fraction varied from $1/8$ - $1/6$, with the most common proportion (Mode) being $1/8$ of the total production.

In most boilers, two labourers were employed by the boiler owner. These labourers were expected to do all the work involved in the distillation process i.e., filling the boilers with water, loading and unloading the grass into and out of the boilers etc. They were paid by the farmers on a "per wadi" basis. If the farmer himself wanted to work or employ a person he wanted, he had the discretion to do so.

Apart from the labour charges, the farmer had to pay a fuel charge too.

The fuel used was the spent citronella leaves and this charge was usually levied by the boiler owner to pay the labourers who dried the spent leaves. The fuel charge varied from Rs.1.25 - 2.00 per wadi and the labour charges ranged from Rs.4.00 to Rs.5.00 per wadi and was paid direct to the labourers. When the price of oil increased, labour charges too increased. When the farmer dried his own spent leaves there was no need for him to pay the fuel charge.

The burnt citronella leaf is a very good source of potassium. The boiler owners claimed that when fertilizer prices were high, they used to sell the ash at the rate of Rs.100/- per lorry load. At the time of the survey there was no demand for the citronella ash. Even though farmers did not use ash for their citronella plantations, they used the ash for their paddy cultivation. But here too it was not widespread. In most of the cases ash goes waste.

Chapter 7

SUMMARY AND CONCLUSIONS

(1) a. The average size of a farm household was 7 members with 46% of the households having 7 to 9 members.

b. The average holding size was 2 acres, and nearly half the households had less than 2 acres. Citronella under mixed cultivation nearly doubled the extent under pure stand. Nearly all the citronella farms were owner operated.

c. The income per household averaged Rs. 2,500/- per annum approximately. (Consumer finance survey 1973 : Rs. 2,800/- per annum for the Rural Sector).

Income from citronella alone constituted 25% of the total income.

(2) a. An average of 3 cuts per year was taken.

b. The price of oil to the producer at the time of the survey (June 1976) fluctuated between Rs.11.50 to Rs.12.00 per bottle. It varied between Rs.3/- to Rs.15/- per bottle during the period for which data was gathered i.e. January, 1975 to April, 1976. The average price to the producer during this period was Rs.10.30 per bottle. The dealers were very reluctant to divulge the prices they received for the oil. However, the market reports of Forbes & Walker Co, Ltd., showed that the dealers' prices of estate quality oil ex Galle varied from Rs.9.25 per bottle to about Rs. 21.00 per bottle during the above period.

(3) a. The management practices adopted were of a poor standard. The annual yield of citronella oil was 19.5 BOTTLES PER ACRE whereas the potential yield, in the Hambantota district with recommended management practices amounted to about 41 bottles. 40% of farmers had an annual yield of only up to 15 bottles while another 30% had only up to 25 bottles. Most of the citronella plantations comprised the "HEEN PANGIRI" variety. With replanting rarely practised, 40% of the plantations were above 20 years. Most of the citronella fields were interplanted with other crops like coconut.

Weeding was the only cultivation practice that was practised. Even that had not been properly done due to the low and erratic prices received by the growers, which aggravated their financial problems.

Pests or diseases had not seriously attacked the citronella plantations in these areas. Fertilizer usage was minimal.

Only a very few (14.1%) of the farmers were aware of the presence of the minor export crops extension officer. This indicates that the extension effort has not been very effective in the area and that only a few persons had benefitted from the subsidy scheme sponsored by the Department of Minor Export Crops.

- (4) The cost of production per acre per cut was approximately Rs.150/-. The labour cost constituted 92% of total cost, of which about 23% was family labour.
- (5) The break-even price of oil at the present annual yield of 19.5 bottles per acre was:-
 - Rs.24.70 per bottle (with imputed cost for family labour) and
 - Rs.19.34 per bottle (without imputed cost for family labour).

If the annual yield was increased to AT LEAST BETWEEN 27.0 TO 37.5 BOTTLES PER ACRE, the break-even price would vary between:

Rs.16.80 and Rs.20.09 per bottle (with imputed cost for family labour) and
 Rs.13.26 and Rs.15.79 per bottle (with out imputed cost for family labour).

About 20% of the farmers had yields within this range.

- (6) Two dealers formed the only marketing outlet for citronella oil in the Hambantota District. No state marketing organisation existed.
- (7) Dissemination of price information was very unsatisfactory.
- (8) The purchase of small producers' oil by volume and not by weight was disadvantageous to them.
- (9) High costs of copper tubing, spares etc., and the poor return on investment had prevented the distillery owners from effecting improvements to their units to make the distillation process more efficient - hence the yield of oil was affected.
- (10) Nearly 60% of the farmers claimed that the distilling units in their villages were sufficient. The average distance to a distilling unit was a little over half a mile from the field, with most fields being only a quarter mile away. This was not a problem to the producer.

Chapter 8

RECOMMENDATIONS.

It is necessary to perceive the marketing activities of citronella oil from a point of view of systems approach. The first point of analysis is to identify problems in market demand, both existing and potential. Citronella oil is essentially an export-oriented product in Sri Lanka. Almost the entire production is for the export market. The export figures for the years 1971 to 1976 are shown below.

Table 11:

Year	*Quantity (lbs)	Quantity Index	*Value(Rs)	Unit Price (Rs./lb).	Unit Price Index
1971	417,558	100	2,114,844	5.06	100
1972	390,499	94	2,437,682	6.24	123
1973	462,025	111	4,177,334	9.04	179
1974	297,786	71	5,616,938	18.86	373
1975	225,571	54	2,022,826	8.97	177
1976	500,929	120	3,543,227	7.07	140

*Source: Customs Returns.

It is seen from above that the demand has been very erratic. When the export figures for different years are compared with the 1971 figure, the quantities exported in 1973 and 1976 have increased by 11% and 20% respectively, while in 1972, 1974 and 1975, it has decreased by 6%, 29%, and 46% respectively. It is therefore, difficult to forecast the potential demand abroad for the product in the coming years. In 1974, despite the drop in exports by 29% over the 1971 figures, the unit price has increased by 273% and is higher than that of the other years. This shows that the benefits of a higher price have not been realised for want of a sufficient production.

The next point of analysis is the possibility of reducing marketing risks in the existing marketing systems. Even if the potential demand is foreseen, farmers will not be motivated to increase production, unless they have a reasonable guarantee and a stability in price and demand. It is observed that both these risks are very much in evidence in the citronella industry. In fact, during the period for which data was gathered (January 1975 to April 1976), the price of oil fluctuated between Rs.3/- and Rs.16/- per bottle. The problems faced by the farmers on account of these risks can be gauged when one considers the fact that the average income of the citronella farmer in the Hambantota district was approximately Rs.2,300/- per annum (of which 25% was from citronella) as compared to the national average of Rs.2,800/- per annum for the rural sector (Consumer Finance Survey 1973). Hence, in order to save the citronella industry as well as to ensure a reasonable

living standard to the citronella farmer, possibilities should be explored to increase the demand for the product abroad by producing high quality oil at competitive prices and in sufficient quantities. A substantial local market for the product should also be rapidly developed by setting up citronella-based industries. Increased production can be achieved by expanding the extent of cultivation and improving the yields in existing farms. The following steps are therefore recommended:

- (a) A replanting scheme be launched by distributing strains of high yielding planting material.
- (b) i. The importance of weeding and fertilization be emphasised through the extension service. The difficult terrain in the district and also the large extents of citronella in this area necessitates an increase in the number of extension personnel. Extension efforts should cover the whole area on a strict time schedule and adequate publicity should be given through the communication media, regarding improved cultural practices, the availability of extension services for this crop, and the nature of subsidy schemes available.
- ii. The extension personnel should be exposed to frequent inservice training to update their knowledge.
r/
- (c) A more concerted effort should be made to promote intercropping i.e., suitable intercrops that will not affect the yield of citronella should be identified. The survey revealed that interplanting of coconut in citronella fields resulted in low yields both for coconut and citronella.
- (d) It is imperative that good soil and water conservation methods be adopted since citronella is grown in eroded hilly areas where no such measures are adopted. This situation affects the yield adversely and is further aggravated due to poor nutrient content in the soils. A subsidy scheme similar to that of coconut replanting should be implemented for this crop as well.

The existing marketing, price information, and processing system have been examined and it is recommended:

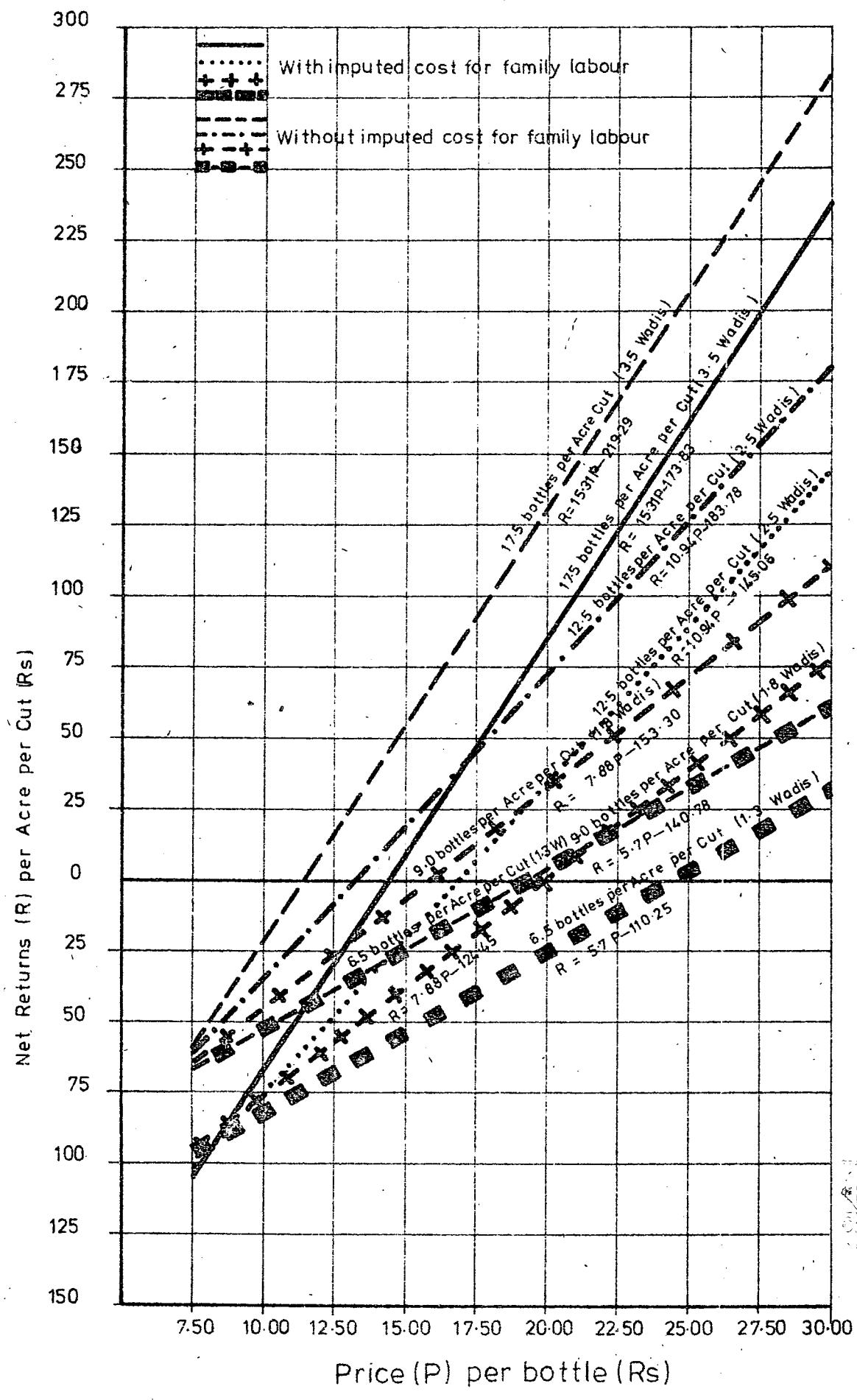
- (a) That arrangements be made to collect the oil through a separate State Marketing Organisation or through the Multi-purpose Co-operative Societies. It could be further facilitated by motivating growers to form themselves into an organization.
- (b) Oil should be bought from the farmer on a weight basis

after testing with recommended standardised quality tests. This will minimise the malpractices now prevalent when purchases are made on a volume-basis.

- (c) Price information should be communicated through the national communication network at least once a week.
- (d) Better processing facilities should be made as the quality of the oil and the yield are affected due to the poor quality of processing plants. Spare parts for the existing plants should be made readily available at reasonable prices. The distillery owners should be given credit facilities to modernise their plants

Finally, since there are no price support or regulating systems, the question of a floor price for the oil could be considered after the marketing risks in the existing marketing structure are eliminated or greatly minimised. In a scheme of this nature, the farmers may have to be subsidised if the market price falls below the floor price.

CITRONELLA OIL BREAK-EVEN CHARTS



1 Wadi of Citronella Grass = 5 bottle of Citronella oil

Number of cuts per year = 3

ANNEX (2)

DEALERS PRICES OF CITRONELLA OIL
(Estate quality)

