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IMPACT OF PRODUCTION, CONSUMPTION, EXPORTS AND STOCKS ON THE PRICE OF NATURAL RUBBER IN SRI LANKA

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ABSTRACT

The relationship between price of Natural Rubber (NR) with factors such as; production, consumption, exports and stocks are important in identifying the nature of competetion and therefore reveals the market structure for NR. This paper examines these relationships and also the seasonal variation of these factors, using time series statistical tools, viz Cross Correlation Functions (CCF) and seasonal indices.

There is a marked seasonality in production with values below average during April to October (2nd and 3rd quarters). Prices tend to fall when the production rises. A similar phenomenon was observed between price and exports. However, the effect of production or exports on price is mild.

A similar pattern of seasonal variation was observed for consumption and stocks of NR. More rubber is consumed during the latter part of the year. An accumulation of stocks was observed towards the end of the year. However, price of NR was not significantly related to consumption or stocks. This is mainly due to the fact that only a few buyers influence prices through their purchase and by adjustments of stocks as in an oligopolistic market.

Key words: market, natural rubber, prices

INTRODUCTION

Rubber being a primary commodity, its price instability has been a common phenomenon observed in the long history of Sri Lankan economy. Fluctuations in Natural Rubber (NR) prices affect the economic stability of both producers and consumers. Natural Rubber prices persisted at a very attractive level in 1994 except the very early months of the year. The average export price of all grades recorded an increase of 17 % from Rs. 44.34 in 1993 to Rs.51.81 per kg in 1994 (Central Bank, 1994).

These trends in prices have encouraged the small holder farmers in particular, to expand the extent under rubber cultivation without diversifying into other crops. Moreover, the estate sector has also recorded good profits under the prevailing elevated prices of natural rubber (Rubber Research Institute, 1994).

The price increases have also created an interest among the producers of natural rubber. This necessitates a detailed investigation on the behaviour of NR prices and inter-relationships with other factors such as; production, consumption and stocks in the Sri Lankan rubber market.

The behaviour of NR prices of different grades have been discussed by Wijesuriya *et al.*, (1995). This paper illustrates the latter aspect.

Being an agricultural commodity, characterized by seasonality in production, prices of NR may also indicate between and within year variations. Further, the consumption and stocks of NR may also affect prices. The relationships of prices with the above variables may be of great importance to identify the nature of competition and hence the market structure for natural rubber. This paper examines the relationships if any, of prices to the variables such as production, consumption, exports and stocks of natural rubber.

METHODOLOGY

Collection and organization of data

Secondary data on quarterly and monthly figures of prices, production, consumption, exports and stocks of NR were used in this study. The data sources were various issues of; quarterly natural rubber statistics bulletin of the Association of Natural Rubber Producing Countries (ANRPC); rubber statistics bulletin of the International Rubber Study Group (IRSG) and bulletin of Central Bank of Sri Lanka.

Statistical analysis

The cross correlation functions which are generally used for examining the relationship between two time series in the same time domain were employed in identifying the nature and stregth of the relationship between price and other factors, *viz* production, consumption, exports and stocks of NR. The Census II decomposition method is used in isolating trend-cycle and seasonal factors and in computation of seasonal indices (Neiswanger, 1956; Makridakis *et al.*, 1983). The statistical analysis were conducted with the aid of the statistical package, SPSS version 4.0 (Frude, 1993).

RESULTS AND DISCUSSION

Price fluctuations in relation to production

Being a perennial crop, the yield of rubber varies within the year (Wijesuriya and Thattil, 1995). Hence, the rubber production may show marked seasonality and is expected to have a direct impact on prices.

An overall declining trend was observed for Sri Lanka's production as depicted in figure 1, during 1979 to 1993, except for the mere increase in production during 1983. Since then, there appeared a gradual decline in production around an annual figure of 382 metric tonnes.

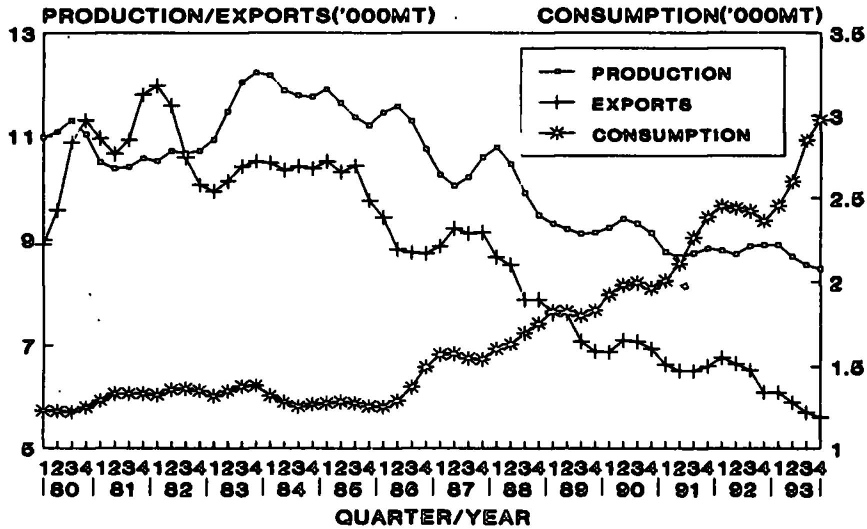

Fig. 1. Temporal variation of trend-cycle components of production, exports and consumption

The seasonal indices for average auction price and production are presented in figures 2a and 2b. The seasonal indices computed for production were highest during March (109.5) and first quarter (105) on monthly and quarterly basis respectively. NR production drops below the average during April to October (during 2nd and 3rd quarters). The seasonal indices for prices tend to fall when the production tend to rise, establishing a negative relationship (figures 2a and 2b). However, the analysis of cross correlations based on monthly figures confirmed that the impact of production on prices was mild. None of the coefficients exceeded the significance level (figure 3).

Price fluctuations in relation to consumption

The domestic consumption of NR in Sri Lanka showed a steady increase after 1985, around 175 MT per year as shown in figure 1. This increase was coincided with the declining behaviour observed in exports and production.

The seasonal demand usually fell below the average from February to July (1st and 2nd quarters). Seasonal indices varied in the range: 86 (Feb.) to 112 (Oct.) and 93 (2nd quarter) to 110 (4th quarter) on monthly and quarterly basis respectively. There is a tendency to consume more rubber during the latter part of the year, which depicts the link with seasonality in product manufacture towards the end of the year (Fig. 4a and 4b). However, a rise in seasonal demand evoked little response in respect of price as shown in figure 5. This may be due to the

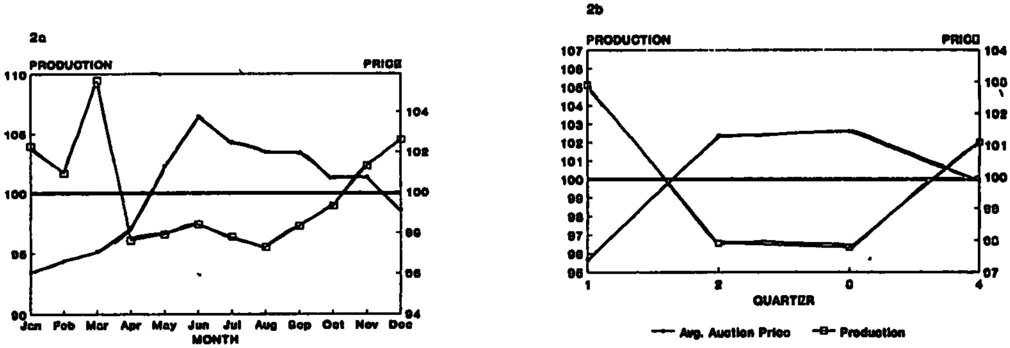

Fig. 2. Seasonal indices of NR production on monthly (2a) and quarterly (2b) basis

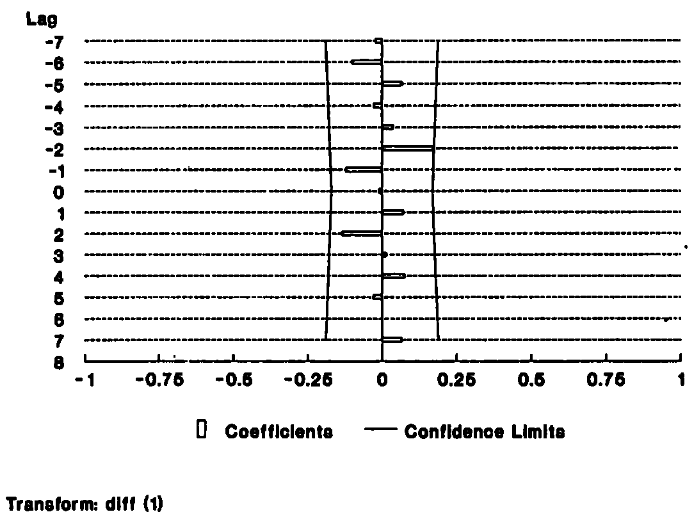

Fig. 3. Cross correlation functions of production with average auction price

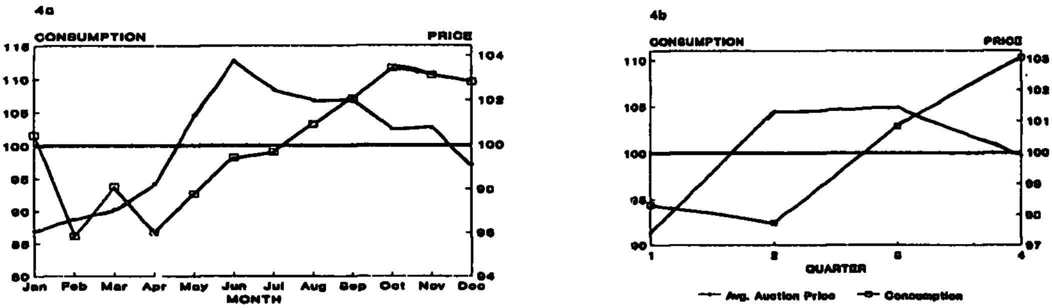

Fig. 4. Seasonal indices of NR consumption on monthly (4a) and quarterly (4b) basis

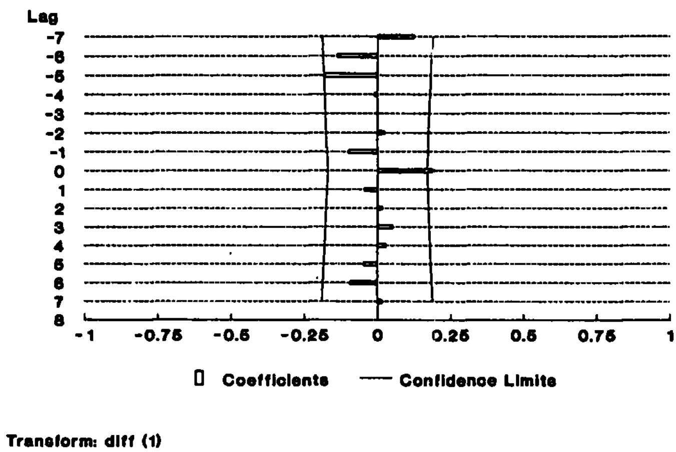

Fig. 5. Cross correlation functions of consumption with average auction price

oligopolistic structure of the Sri Lankan market where few buyers can influence prices through their purchase and by adjustments of stocks.

Price fluctuations in relation to exports

Sri Lanka's NR exports also declined after 1985 with a rate of 520 MT per year (Fig. 1). Monthly and quarterly export figures exhibit marked seasonality as shown in figures 6a and 6b. The pattern closely follow the pattern of variation of production (Fig. 2a and 2b). The highest index was observed for March (133) and dropped below the average during April and also during June to October. The exports were usually high during the first quarter (seasonal index = 119) of the year and drops below the average during second and third quarters. However, there appeared no significant relationship of monthly values at any time lag between average auction prices and exports (Fig. 7).

Price fluctuations in relation to stocks

Stock adjustment and speculation are important sources of profit in the trading of durable commodities. The seasonal indices of stocks declined from February and remained below average until August with the lowest value observed in March (87.5). From August onwards there was an increase until it reached the peak index (108) in October (Fig. 8a and 8b).

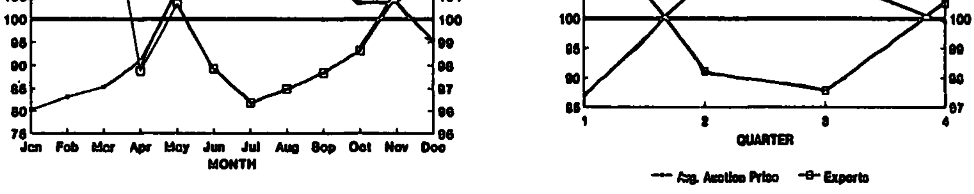

Fig. 6. Seasonal indices of NR exports on monthly (6a) and qarterly (6b) basis

This suggests there is an accumulation of stocks towards the end of the year. Moreover, the seasonal variation in consumption (Fig. 4a and 4b) closely follows the sequence observed for stocks. This shows adjustments in the stock inventories according to the seasonal demand of rubber. However, no relationship was found between average auction prices and stocks of NR (Fig. 9). This is due to stock manipulation being carried out for different needs and not necessarily related to variation of prices.

Cross Correlations: Average Auction Price/Exports
Transformations: difference (1)

```
     Cross  Stand.
Lag  Corr.    Err. -1   -.75   -.5 -.25   0   .25  .5   .75   1
                    +-------+-------+-------+-------+-------+-------+-------+-------+
 -7  -.002   .077                       .  *  .
 -6  -.042   .077                       . *|  .
 -5   .054   .077                       .  |* .
 -4  -.010   .076                       .  *  .
 -3   .010   .076                       .  *  .
 -2   .051   .076                       .  |* .
 -1  -.016   .076                       .  *  .
  0  -.040   .076                       . *|  .
  1  -.014   .076                       .  *  .
  2  -.033   .076                       . *|  .
  3   .003   .076                       .  *  .
  4   .014   .076                       .  *  .
  5   .011   .077                       .  *  .
  6   .023   .077                       .  *  .
  7   .006   .077                       .  *  .
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Fig. 7. Cross correlation functions of exports with average auction price

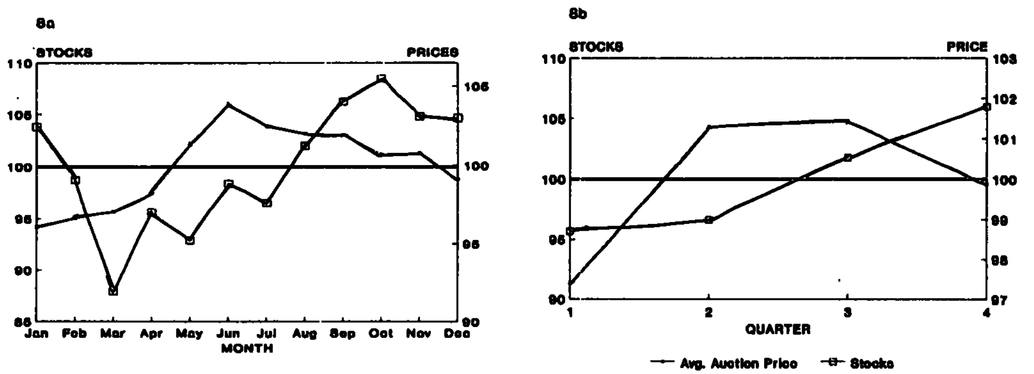

Fig. 8. Seasonal indices of NR stocks on monthly (8a) and quarterly (8b) basis

Cross Correlations: Avg. Auction Price/Stocks

Transformations: difference (1)

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     Cross  Stand.
Lag  Corr.   Err. -1   -.75   -.5 -.25    0    .25  .5   .75   1
                    |----|----|----|----|----|----|----|----|
 -7  -.007   .077                      .  *  .
 -6   .010   .077                      .  *  .
 -5  -.018   .077                      .  *  .
 -4  -.017   .076                      .  *  .
 -3  -.033   .076                      . *|  .
 -2  -.033   .076                      . *|  .
 -1  -.050   .076                      . *|  .
  0  -.008   .076                      .  *  .
  1   .023   .076                      .  *  .
  2   .014   .076                      .  *  .
  3   .038   .076                      .  |* .
  4   .028   .076                      .  |* .
  5   .014   .077                      .  *  .
  6  -.019   .077                      .  *  .
  7   .002   .077                      .  *  .
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Fig. 9. Cross correlation functions of stocks with average auction price

CONCLUSION

A negative relationship was found in the seasonal behaviour of prices and production. Similar pattern of seasonal variation was observed for exports and prices. However, the strength of relationship between prices to production and stocks were comparable. An accumulation of stocks was observed towards the end of the year. Nevertheless, there was a tendency to consume more rubber during the latter part of the year. No significant relationships were found between consumption or stocks with auction prices. These variations clearly illustrate the seasonality in rubber product manufacture and oligopolistic nature of Sri Lanka's NR market.

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SEED PRODUCTION OF CLONES PB 86, RRIC 100 AND RRIC 121 IN THREE RUBBER GROWING AREAS OF SRI LANKA.

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ABSTRACT

The rubber seed production in wet rubber growing areas in Sri Lanka has gone down to very low levels, in the recent past, affecting the culling process that should be adopted in establishing rootstock nurseries. From the three rubber growing areas studied, satisfactory seed production, irrespective of the clone, was observed only in Kegalle region. Regional differences may be due to direct or indirect influences of the climate and weather during flowering and pod set. Clonal differences seems to be existing in regions where climate or the weather is favourable for spread of diseases. Further, RRIC 100, being a resistant clone for Oidium and Phytopthora, produced a higher percentage of good quality seeds compared with the other two clones, PB 86 and RRIC 121 which have below average tolerance to these two diseases. However, currently, country as a whole produces enough seeds to fulfill country's annual seed requirement for the production of rootstocks, provided the seeds are collected and transported without delay.

Key words: *Hevea*, rubber, seed production, climate & weather, disease incidence.

INTRODUCTION

Seed production is a necessity in *Hevea* plantations as the production of planting material requires grafting of seedlings. Seeds of all clones recommended for comercial planting are recommended to be used for production of rootstock and no shortage of seeds have been reported until recently. In fact, attempts had been made to use the enormous amount of rubber seeds that were allowed go waste on rubber estates in the past. The main commercial products obtained from the rubber seed are its oil and animal feed. The annual production of seeds can be as high as thousands of metric tons. Nevertheless, areas where leaf diseases are prevalent appears unsuitable for seed production. *Oidium haveae* attacks immature leaves and flowers causing premature leaf and flower fall that result in a marked reduction in the quantity of seeds produced per hectare. *Phytophthora palmivora*, by attacking the pods, causes widespread pod rot. Therefore, areas where there is rain during seed development would also be unsuitable for seed production.

Until early 1980's, there were recommended clones such as Tjir 1 to collect seeds for rootstock nurseries. However, as the clones recommended for plantations changed, the older ones recommended to collect seeds gradually disappeared from our plantations and smallholdings.Therefore, the availability of seeds of clones recommended for seed collection also reduced gradually. To solve the problem of seed shortage, seeds of all clones were tested for their performance as rootstocks and seeds of clones recommended for plantations were approved to establish rootstock nurseries. The rootstock clone may affect the sprouting time as studied by Samaranayake *et al* (1980) and the growth of the scion (Combe and Gerner, 1977). However, selection of vigorously growing seedlings has always been emphasized as an important factor than selecting seeds from a particular clone (Samaranayake, 1975).

Also, there can be one or two clones, the seeds of which perform better than other clones as rootstocks (Combe and Gerner, 1977). Growing such clones to collect seeds for establishment of rootstock nurseries may not be practical or economically viable, if the other characteristics such as yield, resistance to diseases, are not favourable to recommend them for commercial planting. Nevertheless, forest plantings in blocks would be a practical and economical approach to the problem provided that suitable lands are available for this.

Nevertheless, forest plantings in blocks would be a practical and economical approach to the problem provided that suitable lands are available for this.

Though the current recommendation is to collect seeds from all recommended clones for commercial planting, the production of seeds in some rubber growing areas, has been very poor in the recent past. The aim of the present study was to evaluate clones for seed production and if possible to find out reasons related to poor seed production in some rubber growing areas.

MATERIALS AND METHODS

Three main rubber growing areas, Kegalle, Kalutara and Ratnapura were chosen to conduct the trial. In Kalutara region, two experimental sites were chosen, one at Dartonfield, close to the research station, and the second one at Perth estate, about 40 km North-West of Dartonfield. Three commonly planted clones, PB 86, RRIC 100 and RRIC 121 were selected. Details of all experimental blocks are summarized in Table 1.

In the clearings selected, an area of 50' x 50' (2500 f^2) was marked approximately in the middle of each clearing and cleaned of all immature pods and old seeds left from the previous year's seed fall. All the new seeds fallen onto the marked area were collected weekly, throughout the seed fall, i.e., from late July to early November. They were brought to the Institute and sown on germination beds with a minimum delay in most of the cases that day it self. The time required for the germination was not monitored, but they were given enough time for germination.

The daily germination percentage was also tested using two batches of seeds collected and transported from Kegalle and Matale areas during the same seed fall. This was tested by sowing one thousand seeds from each batch and examining daily for any germinated seeds.

The total number of seeds collected, number of good seeds by appearance, the percentage of germination etc., were recorded for each batch of seeds. Information on general upkeep of the clearings, general seed production in each estate (this year and last year), disease incidences were also gathered by sending a questionnaire.

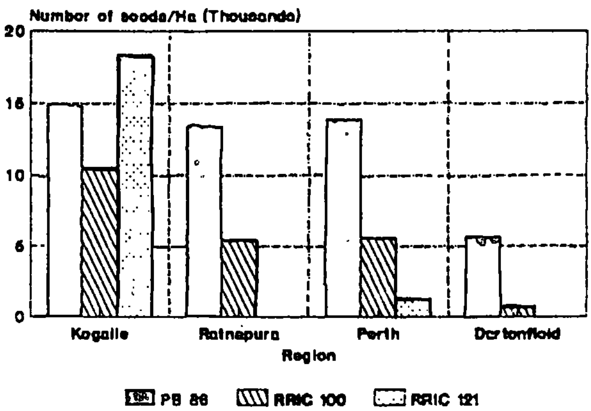
Table 1. *Information about the experimental blocks used for the study*

Region	Estate	Clone	Age (Y)	Tapping panel	Planting distance	Total extent(Ha)
Kalutara	Dartonfield	PB 86	17	B	12 x 20	9.82
		RRIC 100	9	A	10 x 24	6.58
		RRIC 121	9	A	10 x 24	10.42
	Perth	PB 86	13	A	8 x 30'	5.26
		RRIC 100	8	A	15 x 16'	12.26
		RRIC 121	9	A	8 x 30'	10.21
Kegalle	Pallegama	PB 86	12	B	15 x 16'	8.73
		RRIC 100	7	A	15 x 116'	11.51
		RRIC 121	8	A	15 x 16'	10.33
Ratnapura	Rambukkanda	PB 86	11	A	15 x 16'	8.23
		RRIC 100	9	A	15 x 16'	10.12
	Palmgarden	RRIC 121	10	A	15 x 16'	2.47

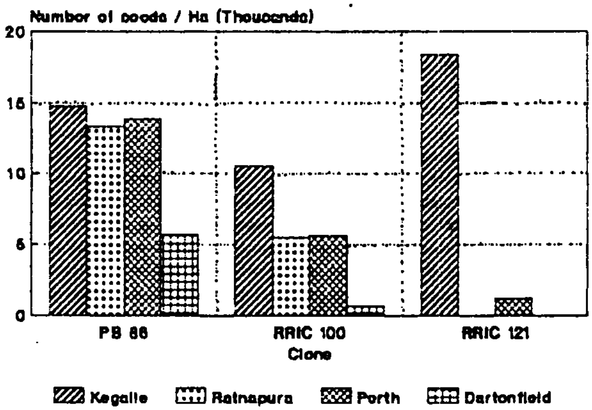
RESULTS

The production of seeds

The quantity of seed production varied in the three regions. However, satisfactory seed production was observed only in Kegalle region. The total number of seeds per hectare per clone is given in Fig. 1.



1(a)



1(b)

Fig. 1 The total number of seeds per hectare. (a) for the four experimental blocks in three regions and, (b) for three clones.

Kegalle Region shows the best production of seeds irrespective of the clone (Fig.1a). However, clonal differences exist in all regions. PB 86 and RRIC 100 have produced seeds in all regions but, RRIC 121 has not produced seeds either in Ratnapura or at Dartonfield (Fig.1b). But, this clone has yielded the highest number of seeds at Kegalle. Nevertheless, a PB 86 shows the highest and RRIC 121 the lowest total production of all four experimental blocks.

The quality of seeds

Some seeds collected from each experimental block of all regions were bad or inferior in quality as determined by their appearence: seed coats were light brown or pale yellow and usually lacked endosperm or had infected endosperm or were devoid of it (Fig.2). Pods too were collected in all experimental blocks, and they always contained inferior quality seeds as described.

Fig.2. The types of seeds collected (a). Good quality and (b). Inferior quality.

When the seeds were collected, first they were grouped by their external appearance and only good seeds were sown in germination beds. The percentage of good and inferior quality seeds are shown in Fig.3.

The quality of the seeds may be related to the clone. PB 86 having the highest percentage of inferior quality seeds. RRIC 100, shows the least number of infected or inferior quality seeds.

The number of good quality seeds that can be collected from one hectare is shown in Fig.4.

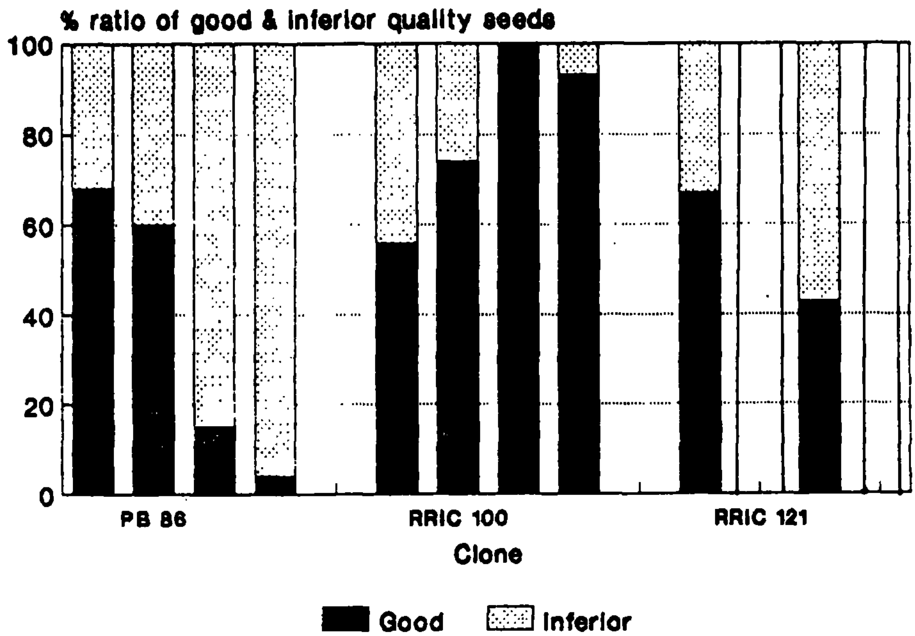


Fig.3. The percentage of good and inferior quality seeds of three clones for four experimental sites. (The four bars for each clone represent the areas Kegalle, Ratnapura, Perth and Dartonfield, in that order, from the left. No seed production was observed in RRIC 121 either in Ratnapura or in Dartonfield).

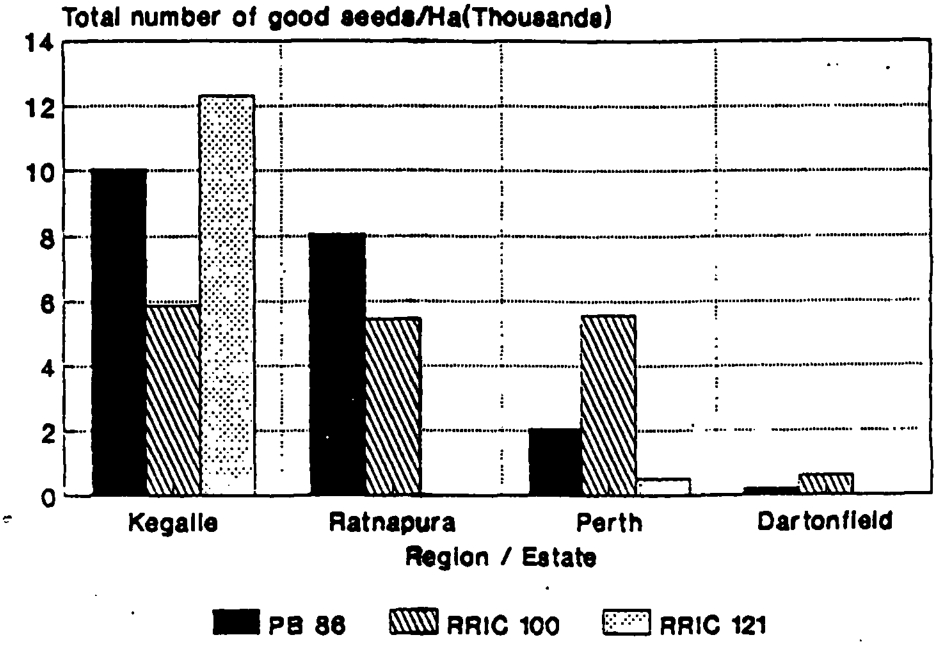


Fig.4. The total number of good quality seeds that can be collected per hectare from each clone in each region.

As Figure 4 shows, the regional effect is much higher than the effect of clones. RRIC 121 has produced the highest number of seeds in Kegalle where as this clone has not produced a single seed either in Ratnapura or in Dartonfield.

Seed germination

Though only good quality seeds, selected by their external appearance, were sown in germination beds, the germination percentages were different and sometimes low. Anyhow, the seed germination was calculated as a percentage of the amount of good quality seeds and also as a percentage of the total number of seeds collected, and are shown in Fig.5.

Though it was planned to collect seeds at weekly intervals, there were instances of delays for 2-3 weeks. In such cases, all germinated seeds were also collected. Further, the number of seeds in some experimental blocks was very small and therefore the germination percentage may not be representative. However, in general practice, the inferior quality seeds, as explained earlier, are not even collected. Therefore, the germination expressed as the percentage of the number of good quality seeds gives us an idea of the germination percentage of the seeds.

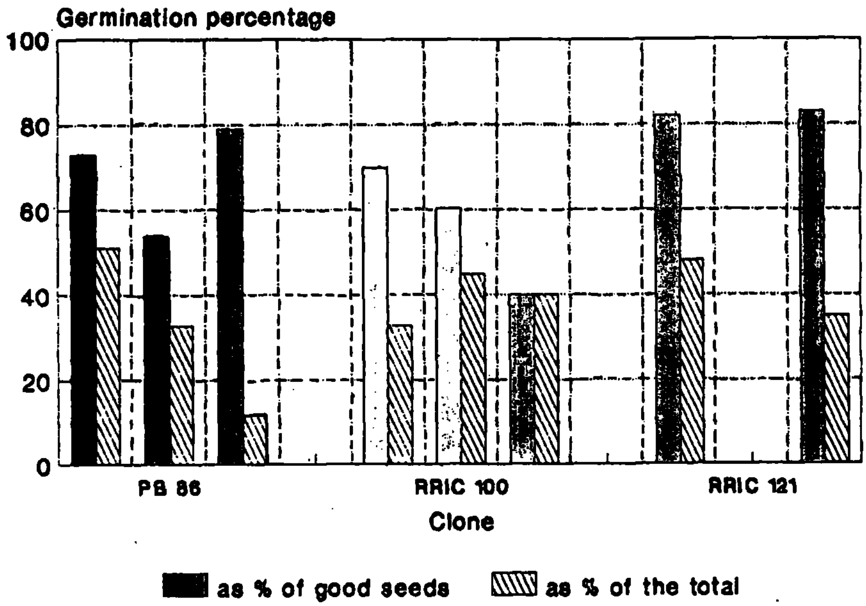


Fig.5. The germination percentage of the seeds expressed as the percentage of good quality seeds and as the percentage of total seed production. The three paired bars for each clone represent three experimental blocks. Kegalle. Ratnapura and Perth in that order from the left.

The germination pattern of mixed clonal seeds collected and transported from Kegalle and Matale areas during the same seed fall is shown in Fig.6.

Germination percentage of the seeds from Kegalle and Matale areas were 55% and 50.3% respectively. Nevertheless. the time taken for the two batches to complete germination was different. Also. the percentage of seeds germinated during the recommended period. i.e.. within the second week of the seed saw. was different. 10% and 40% for seeds from Kegalle and Matale respectively. This difference is mainly attributable to the long delay in the germination time of the seeds from Kegalle. However. if the crop of the first four harvests collected on alternate days is considered. the germination percentages were 42.2% and 48.8% for seeds from Kegalle and Matale respectively. When this was given as a percentage of the total number that germinated. 78% and 97% were obtained for the seeds of Kegalle and Matale respectively.

In the present study. the germination time was not monitored for the seeds collected from experimental blocks. Nevertheless. they were kept on germination beds for about one month. therefore. even the very late germinates were given a chance.

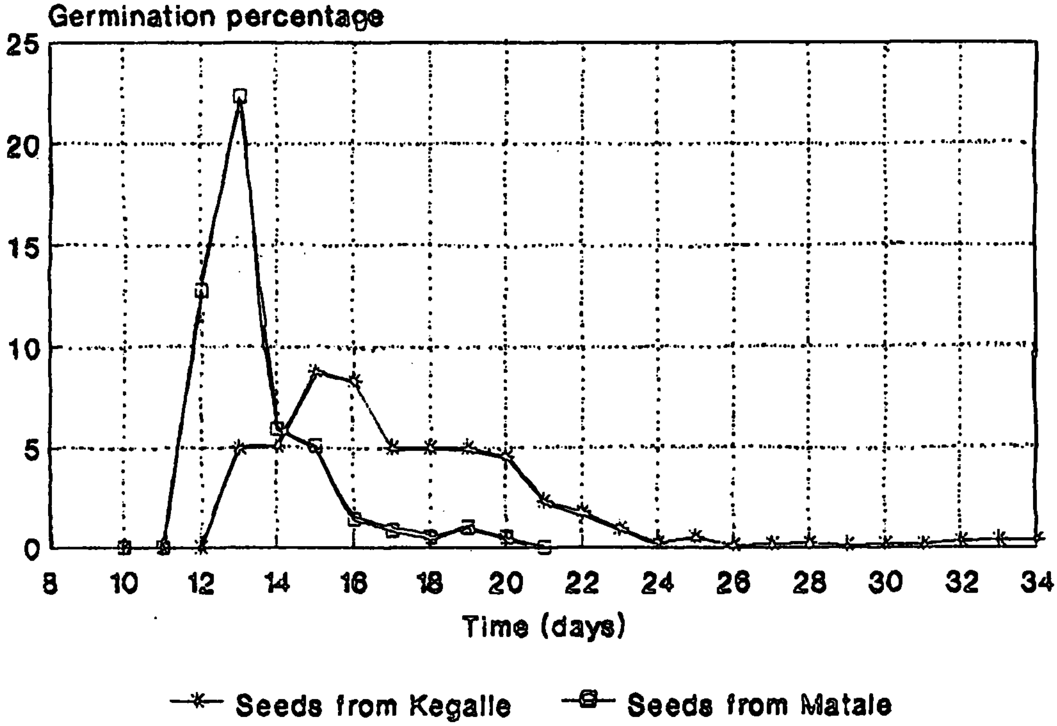
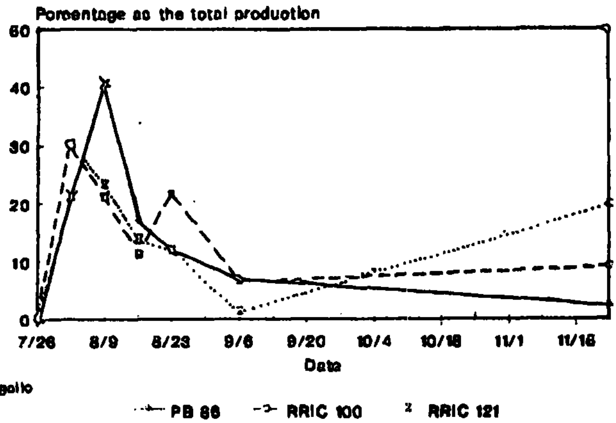


Fig.6. The daily germination percentage for the two batches of seeds collected from Kegalle and Matale areas.

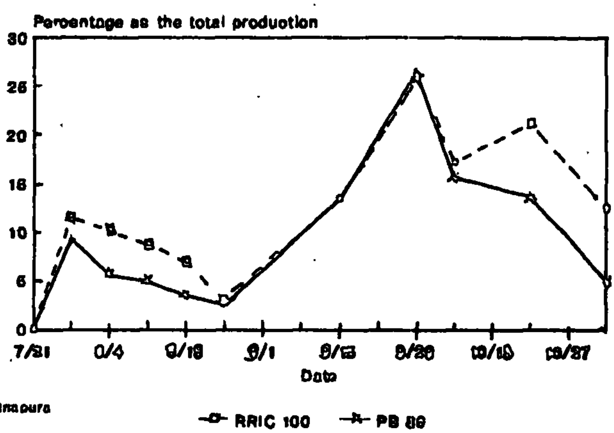
The spread of the seed fall

The spread of the seed fall was different for the regions and for the clones. The number of seeds collected at each interval. is given in Fig.7. Data are expressed as a percentage of the total number of seeds collected during the entire seed fall.

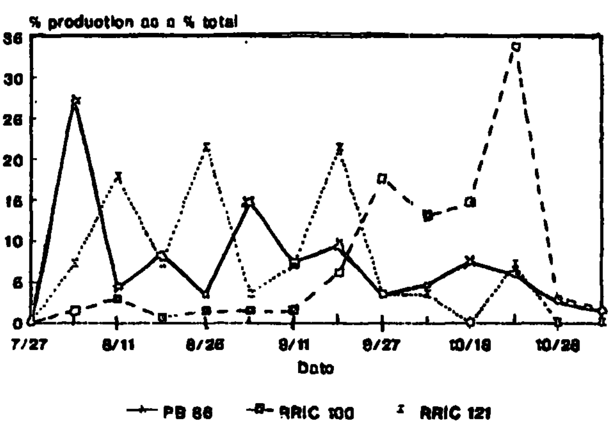
As it can be seen from Fig.7 also. seed fall has started during the last week of July in all three regions. However. the quantity of seeds produced during seed fall period show differences. For Kegalle region. more than 80% of the total production was collected during the first 5-6 weeks and the pattern was similar for all three clones. For Ratnapura region. higher production was observed during the latter half of the seed fall. i.e.. within 6-11 weeks and this is similar for the two clones. At Perth. the production was uniformly distributed during the seed fall for PB 86 and for RRIC 121. But. RRIC 100 shows higher seed fall during the latter half of the seed fall period.



Kogalla



Ratnapura



Perth

DISCUSSION

Results of the trial conducted show clear differences in the production of seeds among regions. This regional difference can mainly be attributed to the direct and indirect influences of climatic differences. Among the many climatic conditions, rainfall, the pattern of rainfall distribution, sunshine hours, relative humidity, temperature etc. may influence the production of seeds.

Climatic regions of rubber growing areas are characterized by the occurrence of rainfall and uniform temperature conditions. Generally, the rubber growing areas can be grouped as, wet, in Kalutara, very wet, in Ratnapura, semi dry, in Kegalle and dry, in Moneragala.

Sunshine is a basic need of the plant to synthesize its carbohydrates that will then be used for its growth. Further, sunshine and dry weather plays a vital role in flowering, pod set and in case of rubber for the mechanism of seed fall, i.e., dehisce explosion in dry weather.

Moreover, leaf diseases such as *Oidium* and *Phytopthora* spread rapidly in wet and humid weather. Apart from the leaf fall, *Oidium* attack flowers, which can severely influence the number of seeds produced. This is followed by *Phytophthora* attaking young pods resulting in loss of pods.

Clonal differences may exist in the production of seeds. High latex yielding trees may produce fewer number of seeds. Nevertheless, results of this study does not support this hypothesis. Highest yielding clone selected for this study, i.e.,RRIC 121 has produced the highest number of seeds in Kegalle area. However, in Ratnapura or in Dartonfield, RRIC 121 have not produced any seeds though RRIC 100 and PB 86 have produced seeds. The clonal differences in susceptibility to diseases, in particular to *Oidium* and *Phytopthora*, directly affect seed production. Susceptibility to diseases is highly related to the clone and the weather. From the three clones used for this study, RRIC 100 is resistant to both Oidium and Phytopthora. However, both PB 86 and RRIC 121 have below average tolarance to these diseases (Plant Pathology Department, personel communication). The RRIC 100 clearing selected for this study in Kegalle area was mixed with PB 86 and this may be the reason for fairly higher percentage of inferior quality seeds in this experimental block compared with RRIC 100 blocks in other regions. In fact, all seeds collected from Perth were good and 96% of that collected from Dartonfield were also good though the total number of seeds per hectare at Dartonfield was only 645 which is far below the quantity produced in Kegalle. Further, the RRIC 121 clearing of Kegalle region was mixed with RRIC 100 and this may be the reason for the higher percentage of good seeds in that clearing. In general, in Kegalle area about 30-45% of seeds were of inferior quality, found as seeds or in pods. Generally, inferior seeds are empty and the seed coat is light brown or pale yellow. As *Phytopthora* infected pods generally consisted of rotten endosperm, these seeds may inferior due to other reasons, i.e., under developed. This can happen because of excess production of seeds. However, as the experimental areas were cleaned, prior to collecting seeds, all seeds though they looked premature, had fallen within the period of the main seed fall i.e.,in July-August.

The planting distance of trees may affect the production of seeds. The planting distances adopted of the experimental areas were different. However, the density was around 450 trees per hectare and different spacing systems such as 15' x 16 and 8' x 30 had been adopted. Wycherley (1971), reported the correlation between the planting density and the seeds per trees to be negative and highly significant. However, in his trial, the number of seeds per hectare has not been significantly different because the boundary plots yielding equal number of seeds in all densities (ranging from 116 to 1045 trees per hectare). In the present trial all plots were selected in centers of the clearings. Therefore, the density effect should be minimum.

Age of trees or the clearing may be another important aspect that influence seed production. Flowering is a mature characteristic, and, in case of rubber, trees start flowering at 5-6 years of age. During the initial years trees may be producing a smaller quantity of seeds (Personel communication, Plant Breeding Department). From the clearings selected for the present study, the four experimental blocks of RRIC 121 were 8, 9, 9 and 10 years old. For the clone RRIC 100, the clearing were 7-9 years old. PB 86 clearings could not be found at panel A' as it is rarely planted now in plantations, and the ages of the clearings used were between 11-17 years. However, it can be said that the differences shown in the present data are less likely to be related to the age of the clearings.

According to Wycherley (1971), the maximum number of seeds per hectare per year is about 160,000 from a seed garden of prolific clones with continuous flower protection throughout the year. This could go down to zero in monoclonal areas of poor seed bearers without flower protection. However it seems that many factors influence seed production, i.e., climate, weather, resistance to diseases, clone, age of trees, nutrient condition of trees, tapping frequency, etc.

One aim of the present study was to see whether we could find any distinguish reason for the differences in seed production in different regions. From the results obtained the following can be said about seed production.

1. Production of seeds is highly correlated to the region. This may be due to direct or indirect influences of the climate and the weather during flowering and pod set.
2. Clonal difference may not be existing under favorable climatic conditions for seed production.
3. In regions where climate or weather is favourable for spread of diseases, i.e., overcast and humid weather, clonal differences seem to exist specially for the number of good quality seeds.
4. The spread of the seed fall also vary in different regions, again, perhaps relating to the climate or the weather.

However, the most important information is that all clearings of Kegalle region produced an acceptable amount of seeds that can be expected from ordinary plantations consisting of mixed clons. However, the condition of low production of seeds in wet areas is experienced only during the recent past, i.e., during last 5-8 years and, it seems to have maintained almost unchanged since then. The planters' view on this is also the same.

There was no marked change in the clones grown in wet areas, but PB 86 is losing its hectarage gradually, yet a substantial mature area remains under PB 86.

Therefore, the actual causes seem to be rather complicated, but farmers, in particular nurserymen in wet regions, are affected severely.

However, up to now, the country as a whole is producing enough seeds to fulfill the country's requirement.

The current recommendation for harvesting germinated seeds from germination beds is to use only those germinated within the second week of the seed date. The reason for this is that it has been well established that those germinate early grow into vigorous plants (Jayasekara & Senanayake, 1971, Senanayake, *et al.*, 1975). Also, it has been experienced that when the seeds were stored even for a few days the time required for germination is increased. This often occurs when large quantities of seeds were to be transported long distances. However, as discussed in the results section, though the germination is little delayed, use of the early germinates (those germinate within the first week from the starting date of germination) makes it possible to select the vigoruosly growing seeds.

However, it is in fact worth studying the actual factors contributing to this low production of seeds in wet regions. Though the present study suggests a high relationship with the production of seeds and the region, it could well be the interaction of different factors, i.e., climate, disease tolerance etc.

The weather data for Dartonfield are available at the RRISL, but unfortunately, Metereology Department does not have weather data for Kegalle region. However, the weather data for Dartonfield for the last 60 years have showed no significant changes. It has been suggested a possible cyclic variation with alternate wet and dry periods of 15 years.

Anyhow, the recurrence intervals has suggested that runs of 2 wet or dry years to be expected only once in a decade, runs of three wet or dry years, once in every 30 years and four wet or dry years, once in every 60 years (Annual Review, 1992). Therefore, the poor seed production during the recent past may not be due to changes in the annual rainfall, but due to cumulative factors which are difficult to distinguish at this phase.

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