IMPACT ANALYSIS ON DISCRIMINATORY FERTILISER APPLICATION

(Sample survey in rubber holdings of Kerala)

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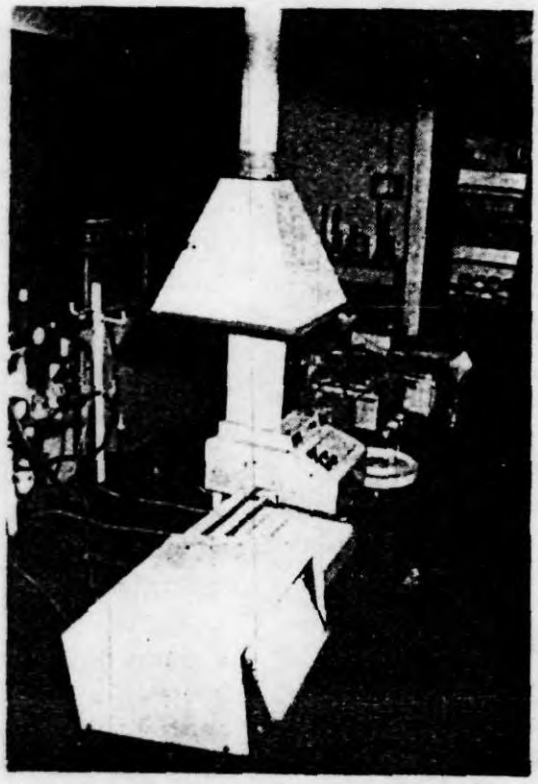
Introduction

Since the introduction of rubber (*Hevea brasiliensis)* in 1873 there has been rapid increase in the spread of this crop in Kerala, Tamilnadu, Karnataka and also to North Eastern region. During this century the technology of rubber cultivation has experienced many changes. Productivity of rubber has registered phenomenal increase from 300 to 1200 kg/ha/yr. Genetic improvement in planting materials and the use of better agrotechnology had a significant effect in achieving these levels although the yields are well below the potential of the tree. Proper soil management, establishment of legume covers and discriminatory use of fertilisers have been shown to have a considerable effect on productivity. Fertilisers are used in estate sector fairly regularly based mostly on soil and leaf analysis. In small holder sector indiscriminate methods of fertiliser application is practiced resulting in lesser yield compared to estate sector.

Fertiliser application on the basis of soil/leaf analysis is usually referred to as Discriminatory Fertiliser Application (DFA) This method of fertiliser usage has come to stay as the most efficient and economic one for rubber and it offers many advantages over the general fertiliser recommendation. By maintaining a proper balance in the ratio of different nutrients, it ensures optimum growth and yield of rubber. Besides this, it avoids or corrects problems like wind damage, panel coagulation, panel over flow, late dripping and tapping panel dryness. This method of fertiliser application improves the quality of the crop by preventing problems like pre-coagulation of field latex and the instability of preserved latex.



Rubber Research Institute of India (RRII) has been offering discriminatory fertiliser recommendations since 1964. Initially, estate sector was the main beneficiary of this service and only a limited number of small holders availed this facility. Thereafter, Rubber Board has strengthened the extension activities to popularize DFA among small growers. In 1979, the Agronomy Division of the RRII has pressed into service a mobile soil testing laboratory. In 1986, three laboratories were set up in Kozhikode, Thodupuzha (later shifted to Moovatupuzha) in Kerala and Nagercoil(Tamil Nadu) in addition to the facility at RRII, Kottayam. During 1990-91, laboratories were set up in Mangalore (Karnataka), Thaliparamba; Trissur, Palai and Punalur (shifted to Adoor in 1995)in Kerala. The laboratories in Kozhikode, Moovattupuzha, Kottayam and Adoor have Mobile Soil Testing Laboratory also. In 1996, a laboratory was started at Kanjirapally. In 1998, the laboratory at Nagercoil was shifted to Nedumangad where small holders are more concentrated.

World Bank scheme for strengthening the soil and leaf testing facilities was launched during 1995. After the implementation of this scheme, the number of soil and leaf samples received for analysis and fertiliser recommendations increased considerably in all the laboratories. In this situation it is felt that an impact analysis on the use of discriminatory fertiliser application by small holders will be worthwhile. The impact analysis was undertaken to evaluate the benefit to small holders both in terms of savings in fertiliser and increase in yield. The methodology adopted and the results are mentioned in the ensuing sections.

Methodology

The data utilized for the study was obtained by conducting a sample survey in the rubber growing regions of Kerala. For this purpose services of the extension agents from various Rubber producers societies (RPS) were utilized. A detailed questionnaire was prepared (Annexure-1). For filling up the questionnaire training was given to the extension agents in various regional offices. About 300 holdings were selected for this study. Training was imparted by the staff attached to the project at RRII. It was ensured that the holdings selected have adopted DFA when the data was collected. These holdings had applied fertiliser in the previous year as per their norms. Tapping trees in the age group of 10-20 years only were taken for the study. Clone selected for the study was RRII 105. In a few cases RRIM 600 had also been included. The holdings were owned by members of various Rubber producers societies.

The questionnaires duly filled were obtained and the data generated were scrutinized and tabulated. For calculating the savings in fertiliser, the difference in cost before and after adoption of DFA was

calculated. In majority of cases the cost incurred was higher before the adoption of DFA. Only in very few cases the cost was comparable before and after DFA. For computing the cost of fertilisers, farm gate price of fertilisers (Urea, Rock phosphate, Muriate of potash, Complex fertilisers) was taken. For calculating the savings in yield, number of tapping days and tapping trees have been considered. Yield per tree per tap was calculated. Total number of tapping trees per hectare was taken as 400, which is the average number of trees in one hectare. Total number of tapping days was taken as 100, which is averaged from all the region, Annual yield was calculated before and after the DFA.

$$\text{Annual yield} = \frac{\text{Yield obtained per year (in given area)} * 400 * 100}{\text{No. of trees} * \text{Tapping days}} \quad \text{kg/ha/yr}$$

Difference in yield before and after DFA was taken as the yield due to DFA.

Results and discussions

Out of the 300 holdings selected in different parts of Kerala under the jurisdiction of various regional soil and leaf testing laboratories, data from 297 holdings only could be utilized for this study. Number of small holdings selected in each region are given in Table 1.

Maximum number of cases (74) were from Palai region. From Trissur region only 16 small holdings could be selected. In Trissur region small holdings are less compared to estates. In Kanjirapally the laboratory was established recently. Total area of the holdings selected from each region is also given in this table.

Table 2 reveals the percentage distribution of the size of the holdings in various regions. In Nedumangad and Adoor about 60% of the holdings selected for the survey have area between 0.20 to 0.50 ha In Kottayam, Palai, Moovattupuzha and Thaliparamba regions, about 50% of the holdings under study are between 0.51 to 1.0 ha. Small holdings with area between 2 to 2.5 ha can also be seen in Kanjirapally (12%), Trissur (12.5%) and Kozhikode (4.2%).

Table 3 reveals the practices followed by small holders before the adoption of DFA. In Nedumangad region 100% of the selected holdings have used chemical fertilisers alone. In all other regions organic manure are also applied along with chemical fertilisers. In Kanjirapally region, 88% of the small holdings received chemical fertilisers as well as organic manure.

In Palai and Kottayam regions, nearly 66% of the

Table 1. Number of small holdings selected for each region

Region	Area(ha)	No. of cases
Nedumangad	11.33	20
Adoor	19.39	36
Kottayam	19.26	30
Pala	50.49	74
Kanjirapally	23.43	25
Moovattupuzha	27.89	33
Trissur	23.74	16
Kozhikode	22.26	30
Thaliparamba	28.05	33
Total	222.81	297

Table 2. Distribution of area in different regions(%)

Area (ha)	Nedmd*	Adoor	Ktym*	Kanjply*	Pala	Mvpa*	Tsr*	Kkd*	Tlpmba*
0.20-0.50	60.0	63.9	36.7	40.0	38.4	18.7	6.3	33.3	35.10
0.51-1.00	30.0	33.3	56.7	40.0	48.0	53.1	43.8	37.5	48.60
1.10-1.50	10.0	2.8	3.3	0.0	5.5	21.9	12.5	12.5	10.80
1.51-2.00	0.0	0.0	3.3	8.0	6.9	6.3	25.0	12.5	5.40
2.10-2.50	0.0	0.0	0.0	12.0	1.4	0.0	12.5	4.2	0.00

Nedmd-Nedumangad; Ktym-Kottayam; Kanjply-Kanjirapally; Mvpa-Moovattupuzha; Tsr-Tissur, Kkd-Kozhikode; Tlpba-Taliparamba.

small holders used chemical fertilisers alone. In Adoor, Trissur, Kozhikode and Thaliparamba about 50% of the small hoders have used organic manure along with chemical fertilisers.

The presence of more number of organic manure manufacturing units in Kanjirapally can be cited as the reason for the higher number (88%) of the holdings applying organic manure along with chemical fertilisers. The survey revealed that there is a general trend among rubber small growers to apply organic manure, though Rubber Board is not recommending the same. Common organic manures used by small holders are cowdung, bone meal, poultry manure and other proprietary products. These manure are applied with out any criteria.

Table 4 reveals the type of fertilisers applied in different regions. In Nedumangad region, 100%

Table-3. Systems of fertiliser application followed before DFA (% of holdings)

Region	Organic manure &Chemical fertiliser	Chemical fertiliser alone
Nedumangad	0.0	100.0
Adoor	58.3	41.7
Kottayam	33.3	66.7
Pala	33.8	66.2
Kanjirapally	88.0	12.0
Moovattupuzha	45.0	55.0
Trissur	50.0	50.0
Kozhikode	56.6	43.4
Thaliparamba	51.4	48.6

of the holdings under study have applied straight fertilisers. In Adoor, Palai and Thaliparamba regions, 25% of the selected holdings have used complex fertilisers only. In Kottayam 56% of the holdings in the study group applied straight fertilisers. In Kanjirapally only 8% of the holdings selected have used straight fertilisers.

Table 5 reveals that before the adoption of DFA the cost incurred for fertiliser application was higher in all the regions. Annual manuring cost incurred varied from Rs. 1042 to Rs. 1947 per ha. Higher cost incurred in Trissur and Adoor can be attributed to the use of complex fertilisers for which the unit cost is more. Annual manuring cost incurred due to DFA varied from Rs. 738 to Rs. 972 per ha.

For DFA, maximum fertiliser cost (Rs. 972/ha/yr) was noticed in Adoor region. This may be due to the poor nutrient status of the already exhausted soil by cultivation of crops like tapioca, coconut etc. which have been subsequently converted to rubber plantation. Exempting Trissur, the cost incurred before DFA comes to Rs. 1227 per ha/yr. and the cost due to DFA Rs. 824 per ha/yr. The table reveals that there is ample saving due to the adoption of DFA in all the regions. Maximum saving is obtained in Trissur region, the reason being the practice of applying complex fertilisers in this region. The average annual savings in fertiliser cost due to DFA comes to Rs 397 per ha. (The figure for Trissur was omitted while calculating the average savings per hectare).

Table 6 reveals the percentage distribution of savings due to DFA in fertiliser cost. In Nedumangad region, 30% of the growers obtained saving in the range of Rs. 201 to Rs 300 per ha. In other regions 22 to 40% of the small holders obtained savings less than Rs. 100 per ha. About 50% of the growers in Thrissur and 33% of the growers in Adoor and Kozhikode obtained savings above Rs. 900 per ha. The reason for the high savings observed in these regions can be attributed to the enormous quantity of complex fertilisers applied before the adoption of DFA.

Table 7 depicts the yield of rubber in various regions before and after adopting DFA. The table also reveals the increase in yield and percentage increase due to adoption of DFA. Before DFA the yield varied from 1210kg/ha. at Nedumangad to 1980 kg/ha. at Kanjirapally. After DFA the same trend was observed.

Table 4. Type of fertilisers applied at different region (%) before DFA.

Region	OM+Comp.Fert:	OM+Str.Fert:	Comp.Fert:	Str.Fert:
Nedumangad	0.0	0.0	0.0	100.0
Adoor	16.7	41.7	25.0	16.7
Kottayam	3.3	30.3	10.0	56.3
Pala	10.8	23.0	27.0	39.2
Kanjirapally	40.0	48.0	4.0	8.0
Moovattupuzha	12.1	32.9	9.1	45.9
Trissur	43.8	6.3	18.8	31.3
Kozhikode	25.0	29.8	16.7	29.2
Thaliparamba	21.6	29.7	24.3	24.3

Comp. Fert-Complex fertiliser, Str. Fert-Straight fertilisers, OM-Organic manure.

Table 5. Fertiliser savings(Rs/ha/yr) due to adoption of DFA

Region	Cost of fertiliser (Rs/ha)		
	Before DFA	After DFA	Savings (Rs /ha/yr)
Nedumangad	1119	845	274
Adoor	1617	982	635
Kottayam	1135	809	326
Pala	1326	802	524
Kanjirapally	1042	815	227
Moovattupuzha	1193	772	421
Trissur	1947	789	1158
Kozhikode	1212	738	474
Thaliparamba	1169	869	300
Average	*1227	824	*397

(*Average annual savings (Rs/ha/) exempting Trissur region)

Yield varied from 1343 kg/ha in Nedumangad to 2121 kg/ha at Kanjirapally. The average annual yield of rubber before DFA was 1565 kg/ha and after DFA 1696 kg/ha. Savings ranged from 82 kg/ha at Adoor to 207 kg/ha at Kottayam. Average increase in yield comes to 132 kg/ha. Percentage yield increase varies from 4.7%(at Adoor) to 14.2% (at Trissur).

Table-8 shows the percentage distribution of yield increase due to DFA in various regions. In Kozhikode (63%) and Kanjirapally (52%) of the growers got a yield increase in the range 0-50 kg/ha/yr. In Trissur 44% of the small holders got an increase in the range of 51-100 kg/ha/yr. In Kottayam 27% of the growers got yield increase in the range 201-250 kg/ha/yr. In Adoor, Kottayam, Kanjirapally, Palai and Kozhikode, about 10% of the growers got an increase above 250 kg/ha/yr. In general, majority of the holdings received an increase in yield due to DFA in the range of 50-100 kg/ha/yr. In general, increase in yield was noticed in all the regions. However, decrease in yield was also obtained in few cases; the reason for which needs further investigation.

Table 9 Highlights the total savings from fertiliser and yield increase. Average savings per ha comes to

Table 6. Distribution of savings in fertiliser cost in different regions on adoption of DFA (%)

Fertiliser savings due to DFA (Rs/ha)	Nedmd	Adoor	Ktym	Kanjply	Pala	Mvpa	Tsr	Kkd	Tlpmba
below 100	15.00	22.22	26.67	40.00	32.88	30.30	25.00	29.17	29.73
101-200	15.00	8.33	23.33	12.00	6.85	3.03	18.75	12.50	13.51
201-300	30.00	2.94	16.67	8.00	4.11	0.00	0.00	4.17	10.81
301-400	10.00	5.55	13.33	4.00	5.48	9.09	0.00	0.00	5.41
401-500	15.00	2.94	0.00	0.00	10.96	9.09	0.00	0.00	2.70
501-600	10.00	2.94	3.33	0.00	6.85	6.06	0.00	8.33	8.11
601-700	0.00	5.56	3.33	4.00	2.74	9.09	0.00	4.17	8.11
701-800	0.00	11.11	0.00	12.00	6.85	6.06	6.25	4.17	5.41
801-900	5.00	5.55	6.66	4.00	2.74	12.12	0.00	4.17	0.00
901-above	0.00	33.33	6.66	16.00	20.55	15.15	50.00	33.33	16.22

Table 7. Rubber yield before and after DFA (kg/ha/yr)

Region	Yield			
	Before DFA	After DFA	Yield increase	(%)
Nedumangad	1210.0	1343.0	133.0	(11.0)
Adoor	1736.0	1818.0	82.0	(4.7)
Kottayam	1741.0	1948.0	207.0	(11.9)
Pala	1637.0	1728.0	91.0	(5.6)
Kanjirapally	1980.0	2121.0	141.0	(7.1)
Moovattupuzha	1793.0	1958.0	165.0	(9.2)
Trissur	1274.0	1455.0	181.0	(14.2)
Kozhikode	1381.0	1468.0	87.0	(6.3)
Thaliparamba	1331.0	1428.0	97.0	(7.3)
Average	1564.8	1696.3	131.6	(8.6)

Rs. 3771/-. This is in addition to the health of the trees achieved through balanced nutrition. The survey was conducted in an area by 225.84 hectare. The total profit for the whole area comes to Rs. 851642/- which is a significant amount.

Table 10 indicates the over all savings from all the regions in fertilizer as well as increased yield during the year 1997-98. Total savings of Rs. 74 lakhs is in addition to the benefits obtained by adopting a balanced fertilizer schedule. In general the survey indicates that enormous amount of money can be saved by adoption of DFA. With all our efforts we are now covering only less than

Table 8. % Distribution of yield increase (kg/ha/yr) in different regions following the adoption of DFA

Yield increase (Kg/ha) due to DFR:	Nedmd	Adoor	Ktym	Kanjply	Pala	Mvpa	Trissur	Kkd	Talpba
below 50	35.00	44.40	13.30	52.00	37.80	34.30	18.75	62.50	43.20
51-100	20.00	11.10	23.30	12.00	12.16	14.30	43.75	4.20	24.30
101-150	10.00	2.80	10.00	8.00	5.40	17.10	12.50	4.20	10.80
151-200	15.00	8.30	13.30	16.00	12.10	2.86	0.00	4.20	10.80
201-250	15.00	22.20	26.70	0.00	18.90	14.30	12.50	12.50	8.10
251-above	1.00	11.10	10.00	12.00	13.50	17.14	6.25	12.50	2.70

Table 9 Total Savings (Rs/ha/yr.) due to adoption of DFA

Region	Fertiliser cost savings (Rs)	Income from yield increase (Rs)	Total savings (Rs)
Nedumangad	274	3325	3599
Adoor	635	2050	2685
Kottayam	326	5175	5501
Pala	524	2275	2799
Kanjirapally	227	3525	3752
Moovattupuzha	421	4125	4546
Trissur	1158	4525	5683
Kozhikode	474	2175	2649
Thaliparamba	300	2425	2725
Average			3771

Table 10 Total savings due to DFA for all the regions during 1997-98

Number of holdings covered	:	5500
Average size of holdings	:	1 acre
Area covered	:	2000 ha
Fertilizer savings per ha	:	Rs 397
Savings due to fertilizer (2000 ha)	:	7.94 lakhs
Savings from yield increase per ha	:	Rs. 3289
Savings in yield (2000 ha)	:	Rs. 65.78 lakhs
Total savings due to DFA	:	Rs. 73.72 lakhs

one percent of the total 8 lakhs holdings every year.

Conclusions.

A positive approach was obtained from small holders while conducting this survey. Most of them have kept records about the fertiliser applied, yield obtained etc. in their holdings. The survey can be accepted as a general trend regarding fertiliser application in small holdings. The salient features emerged from the study are summarized below :

1. Size of the holdings selected for the study varied from 0.20 to 2.50 ha. Majority of the holdings (80%) are in the area group 0.20 to 1.00 ha
2. Small holders have a tendency to apply organic manure along with chemical fertilisers. Commonly used organic manure are cowdung, bonemeal, poultry manure and other proprietary products.
3. An average annual saving in fertiliser cost of Rs. 397 per ha was obtained due to adoption of DFA.
4. Annual yield increase of 132 kg/ha was obtained due to the adoption of DFA.
5. Total savings for 1997-98 due to fertilizer and yield increase comes to Rs. 74 lakhs.

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