

Producers' Response to Fertilizer Subsidies The Experience in the Coconut Industry

CYRIL PARANAVITANA

Abstract

The author examines the initial response and actual fertilizer consumption patterns of coconut growers under the government's Fertilizer Subsidy Schemes for the 1955-78 period and finds that the scheme failed to arrest the declining trend in fertilizer use during the 1970s. With the aid of several cross-section studies, the author identifies a number of reasons for low response to the scheme. They are namely: bad weather spells, increasing dominance of the small-holder in the industry, lagged response of the authorities to large price increases, poor distribution network, and the failure of government extension services.

The author argues that a comprehensive policy embracing subsidies, easy credit, efficient distribution of fertilizer and better extension services should have replaced the subsidy **only** policy.

Introduction

In the 1970s, the performance of the coconut industry in terms of output and exports was highly unsatisfactory compared to the 1960s (see Table 1). The total estimated production¹ reached a peak of nearly 3000 million nuts in 1964 which was never achieved again in the rest of the 60s or in the 70s. Coconut output is mainly determined by weather, fertilizer and cultural and management practices (DCCR, 1964). However, bad weather spells experienced in the early 1970s cannot explain the falling trend in production. Weather being an exogenous factor, we concentrate mainly on the effect of fertilizer input on coconut yield. The following table clearly demonstrates the relationship between declining fertilizer consumption and falling production.

TABLE 1: PRODUCTION, EXPORTS, FERTILIZER CONSUMPTION AND PRICES IN THE COCONUT INDUSTRY

(Annual Averages for 5-yearly periods +)

Period	Total Production (mn. nuts)	Exports (mn. nuts)	Fertilizer Consumption (Tons)	(Price (Rs. /1000 nuts)
1956-60	2,300	1,100	36,700	151
1961-65	2,700	1,400	45,800	132
1966-70	2,500	1,000	58,300	179
1971-75	2,400	800	41,800	264
1976-62	2,200	500	39,900**	666*

Source: CDA, 1974b; CDA, 1972, 73, 74, and 75; DCCR, 1964-71; CDA, 1983

+ except for the last period which covers 7 years

* estimate for the period 1976-79

** National Fertilizer Secretariat.

(1) Estimated production is obtained by adding exports to domestic consumption. Domestic consumption is estimated by multiplying per capita consumption of coconut and coconut products by mid-year population. It is important to note that per capita figures which are obtained from Survey of Consumer Finances are not sensitive to price changes and hence do not reflect actual consumption.

The declining trend in production and exports can be attributed to falling fertilizer consumption and to the ever-tightening grip of the small holder on the industry. Between 1962 and 1973, estates of 50 acres and over fell from 26.8% of the total extent under coconut to a mere 9.1%². This has a disastrous result because of the fact the estates carry out fertilizer applications and management and cultural practices more regularly and quite extensively as compared to small-holdings.

According to previous estimates (Abeywardana, 1978; DCCR, 1969), only 20-30% of the total extent under coconut has been subject to fertilizer applications. Thus there is room for improvement in the applications of fertilizer more intensively and extensively over a wide area.

Until 1973, the government's role in the coconut industry was confined only to subsidising the prices of fertilizer and seedlings. The government's main attention has been centered on the fertilizer subsidy scheme (FSS) which was introduced in 1956 by the Department of Coconut and Cocoa Rehabilitation in order to promote fertilizer usage among coconut cultivators by subsidising the price of fertilizers.

This paper attempts to examine systematically the varying rates of participation in the fertilizer subsidy scheme by different types of cultivators. Attention is also focused on the behaviour of consumption levels in the face of the rapidly increasing prices of fertilizer and the varying levels of subsidies: the response of fertilizer consumption to price movements.

Another objective is to examine why the response of the cultivators to increasing subsidies is very low. An attempt is made to put together the evidence scattered in several cross-section studies on coconut cultivation over the period considered.

An attempt is also made to find out whether the government's role should have been different in the face of changing circumstances experienced by the cultivator and to make some suggestions for improvements in order to arrest falling coconut production.

II: FERTILIZER SUBSIDY³ SCHEME

Although cultivators with different size holdings have participated in the fertilizer subsidy scheme (FSS), the department of Coconut Rehabilitation has classified these holdings broadly into two groups: small-holding (less than 20 acres) and estates (20 acres or more). During the 1956-68 period, these two groups were treated differently for the purpose of subsidy payments. Estate owners received a subsidy payment equivalent to one third of the price of fertilizer whereas small holders received a subsidy amounting to half of the price of fertilizer. From 1969 the discrimination of

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- (2) As a result of the 1972 Land Reforms which affected holdings of 50 acres or more, this ratio would have touched a very low ebb than otherwise.
- (3) The subsidy given is an outright grant rather than a loan from the government.

cultivators on the basis of the size of holdings has been abolished. During the 1969-77 period, the common subsidy was 50 per cent of the cost incurred in the purchase of fertilizer and since the beginning of 1978, it has been raised upto 75 per cent of the cost.

Under the scheme, the distribution was done in the following manner. Small holders were given the option of either ordering fertilizer through the co-operatives or obtaining their requirements directly from the Central Stores in Colombo, whereas estates had to purchase their requirements directly from Colombo. This arrangement would have enabled the small holder to save a certain amount of costs involved in transporting his requirements.

Until the formation of the Fertilizer Corporation in 1964, the supply of fertilizer at subsidised rates was handled mainly by private firms. During the 1964-72 period, the Corporation operated from Colombo through its central stores. Since 1972, however, the Corporation has decentralised the distribution network and established several regional stores to cater for small holders of 5 acres or more.

A. INITIAL RESPONSE TO THE FSS

It is possible to carry out a study of initial response of cultivators to the fertilizer subsidy scheme by utilising figures⁴ on the distribution of participants by size holdings given in Administrative Reports of the Department of Coconut Rehabilitation (DCCR 1970 and 71). Table 2 gives a summary of this information for the major-coconut-growing areas (coconut triangle⁵) and for the whole island.

(4) One has to be cautious about the reliability of these figures obtained from the Department of Coconut and Cocoa Rehabilitation. For example, the 1962 Census of Agriculture figure for the total extent of estates (50 acres or more) was about 308,792 acres whereas the total acreage of the same class holdings given in the report was 309,554 acres. This discrepancy would have resulted from either an increase in the acreage under coconut between 1962 and 1970 which is rather unlikely or 'double counting' resulting from 2 or more applications being received for the same estate. Similar problems also arose in the case of 10-20 acre group and that of 20-30 acre group. Given these discrepancies, one can still draw valid inferences with regard to the percentage of holdings in each size group that applied for the subsidy.

(5) The coconut triangle comprises of Colombo, Kurussegala and Pattalam districts.

TABLE 2: Distribution of Participants under the Fertilizer Subsidy Scheme:

	Holdings Size (acres)			Total
	Below 20	20 - 50	50 or more	
Coconut Triangle:				
Extent under FSS	322,120	72,948	266,966*	662,033
%	(49)	(11)	(50)	(100)
Total Extent	500,936		251,667	752,604
Participation rate (%)	78.9		100	88
All Island:				
Extent under FSS	417,181	86,406	308,554*	812,141
%	(51)	(11)	(38)	(100)
Total Extent	843,726		308,792	1,152,418
Participation rate (%)	59.6		100	70.5
Share of the coconut triangle under FSS(%)				
	77.4	84.4	86.2	81.5

Sources; DCCR 1970 and 1871
1862 Census of Agriculture (DCS, 1976)
* see note (4)

For the whole island 51 per cent of the extent registered under the FSS is in the small holdings sector (below 20 acres). Moreover, coconut holdings below 50 acres constituted 62 per cent of the total extent registered under the FSS. However, those holdings (below 50 acres) registered with the FSS include only 60 per cent of the total extent under coconut thus showing a moderate initial response by small holders to the scheme. It can also be shown that only 42 per cent of small holdings below 10 acres were registered under the FSS even though 50 per cent of the total extent under coconut falls into this category. This clearly demonstrates the limited response of the small holder. Nevertheless, it is interesting to note that the participation rate is reasonably high for the less than 50 acre category in the coconut triangle which comprises 65 per cent of the total acreage under coconut. It is clear from table 2 that all estates of 50 acres or more have participated in the FSS.

The share of the coconut triangle in the FSS increased from 77 per cent in the small-holdings (less than 20-acre) category to 86 per cent in the 50 acre or more category. These figures provide clear evidence to support the view that the response of the cultivator to incentives increases with the size of the holding.

B. ACTUAL PERFORMANCE UNDER THE FSS

In this section, an attempt is made to examine how different cultivators respond to the FSS over the 1956-80 period. Because of differing response levels between estates and small holdings, fertilizer purchases are presented in table 3, by 5-yearly intervals.

TABLE 3: Fertilizer Purchases by Type of Cultivator (Annual Averages) For 5-yearly Periods + "

Period	Estates		Small Holdings		Total Purchases (Tons)
	(Tons)	% of Total	(Tons)	% of Total	
1956-60	19,595	53.5	17,059	46.05	36,653
1961-65	22,478	49.1	23,318	50.9	45,797
1966-70	30,362	52.0	27,981	48.0	58,343
1971-75	21,003	50.2	20,816	49.8	41,819
1976-80	21,60*	52.0*	19,947*	48.0*	41,557,"
1981-82	—	—	—	—	35,682 "

Source CDA, 19/2-; CDA, 1974b; People's Bank (1979a, b)

+ except for the last period.

* author's estimates

" National Fertilizer Secretariat

With the introduction of the FSS in 1956, the average annual aggregate consumption of fertilizer increased sharply from a level of 10,000-12,000 tons in 1955 (DCCR, 1964) to an annual average of 37,000 over the 1956-60 period (see table 3). This three-fold increase within 6 years clearly demonstrates the initial impact of the FSS on the cultivator's production decision.

The underlying feature of the consumption figures given in table 3 is that aggregate consumption as well as its components increased rapidly during the first 15 years of the inception of the FSS. In contrast, however, the gain realised over 15 years since the inception of the subsidy programme had been almost wiped out in the next 5 years, 1971-75. The consumption in both the estate sector and small holdings sector declined during this period.

One can also point out that during the first 10 years of the FSS, the share of small holdings increased from 46 per cent of total purchases to 51 per cent thus revealing early enthusiasm of small holders to the FSS. However, the estate sector regained its share over the 1966-70 period.

It was observed that with the introduction of higher subsidies, the demand for fertilizer would go up immediately from the previous level and continue to increase for 3 years and then begin to decline rapidly. This adjustment pattern has repeated in 1968 with the increase of subsidy for estates from 33 1/3% to 50% and with the increase of subsidy from 50 to 75% in 1978 for both sectors. In the case of the 1978 subsidy, the total fertilizer consumption increased from 29,000 tons in 1977 to 50,000 in 1980, an increase of 93% within 3 years. However, it fell back to 30,000 tons in 1982, thus bringing eventual fall in consumption, as expected. This clearly indicates that subsidised price alone could not sustain fertilizer consumption at a higher level.

Considering individual components, it is reasonable to assume that both sectors, estates as well as small-holdings, would have increased their fertilizer consumption immediately at varying rates depending on their adjustment patterns. Estates being more price elastic compared to small-holdings, their share in total fertilizer purchase would have gone up immediately but within a short span of time, this would have come back to its trend level.

Although under the FSS, small-holders are allowed to obtain their fertilizer requirements through co-operatives, the proportion of small-holders who participated in the FSS through co-operatives decreased very rapidly from an initial high of 52 per cent of total small holders' purchases to 27 per cent within 20 years.

Since small holdings constituted about 60 per cent of the total acreage, the above consumption figures should be translated into fertilized acreage in order to get a better picture of the actual situation. Fortunately, the Administrative Report of the Department of Coconut and Cocoa Rehabilitation and those of the Coconut Development Authority throw some light on the extent of coconut lands that had been fertilized and on per palm applications of fertilizer. Table 4 gives the proportion of the total extent that had been fertilized and per palm consumption:

TABLE 4 Fertilizer Consumption Patterns

Period	Proportion of Acreage Fertilized (per cent)			Per palm Consumption (lbs)	
	Estates	Small holdings	Total	Estate	Small holdings
1972-65	43	20	29	4.0	6.4
1966-70	46	21	31	5.0	7.0
1971-75	36	15	23	4.3	7.1

source: DCCR, 1964-71; CDA, 1972-75

Figures in table 4 clearly demonstrate the proportion of total acreage fertilized was around 30 per cent during the 1960s but declined rapidly in 1970s. Also, the Proportion of acreage fertilized in the estate sector varies around at much higher level than that of the small holdings sector. In the small holdings sector only 15-20% of the acreage was fertilized. Thus the figures provide enough evidence to support the argument that the response of small holdings to the FSS is very low.

Data on the consumption of fertilizer per palm are also presented in table 4. These figures show that the dosage applied per palm by estate-owners is much lower than that applied by small holders. The level of fertilizer consumption per palm had been in the range of 4-5lbs. for the estate category and 6-7lbs. for small holdings respectively. Another feature emerging from these figures is that the dosage per palm was increasing in the small holdings sector.

In summarising the actual performance of the FSS, one can conclude that the subsidy programme had not been successful in arresting the adverse trend in fertilizer consumption observed in the 1970s. In the first part of the 1970s, it can be seen that both sectors neglected regular application of fertilizer. The drop-out rate from the FSS for each sector was alarmingly high. Moreover, the limited effectiveness of the FSS is obvious since the maximum proportion of coconut lands fertilized did not exceed 31 per cent of the whole 1956-75 period even though 70 per cent of the total extent under coconut had been registered with the Department of Coconut and Cocoa Rehabilitation for the purpose of obtaining fertilizer issues under the FSS.

What has actually taken place under the FSS can be put in a nutshell as follows: On one hand, the maximum acreage fertilized has been going down rapidly and on the other hand, the dosage applied per palm has been increasing especially in the small holdings sector. To a large extent, this situation defeats the purpose of the FSS which was designed to encourage more and more small holdings to take part in the FSS so that application of fertilizer will be carried out over a wide area. Thus, it can be concluded that even with progressive subsidies, the FSS has not achieved its objectives in the long-run except for a very short period at the beginning. This suggests that certain other factors have been mainly responsible for lack of response.

III. REASONS FOR LOW RESPONSE:

A. WEATHER AND YIELD -

One of the very important aspects that should be looked into is yield variations caused by weather. It is generally agreed that weather conditions have a marked influence on coconut yield. The most important climatic factor which affects yield is rainfall and distribution of rainfall over the year. There is empirical evidence to suggest that drought conditions that prevail in a certain year would be reflected in the next year's yield. The effect of continuing drought conditions for several years would result in a very low yield. Whatever the levels of controllable inputs, there is no way of avoiding disastrous effects caused by weather. Thus it is argued that weather more than anything else has been the main determinant of coconut production. However, the serious aspect of a bad weather spell is that it tends to influence also the controllable factors which determine yield. Since most of the coconut growers are small holders, it is very likely that they tend to neglect the practice of fertilizer application during bad weather spells. In prolonged drought periods, the available data on yield indicate that both small holders as well as estates do neglect, the practice. Since the formation of habits is a long-term phenomenon, it is very likely that once a cultivator neglects the practice of fertilizer application he will not resume it immediately. Thus the neglect of fertilizer application will have long-term consequences which will be observable after 1½ - 3 years.

Under controllable conditions, the results observed are given in table 5.

TABLE 5: Influence of Weather and Fertilizer Usage on Yield

Fertilizer	Climate	Weather	Yield (Nuts/Acre/Annum)
Without	Poor	Poor	1180
With	Poor	Poor	2640
Without	Good	Poor	1500
With	Good	Poor	3790

Source: Abeywardana (1978)

The seriousness of the negligence is clearly demonstrated by the above figures. Under very poor climatic and weather conditions, it is possible to obtain higher yields with regular manuring than without it. Similarly, under poor weather conditions but in a climatically suitable area, the yield can be doubled by the use of fertilizer. Coupled with bad weather conditions, it is not incorrect to assume that other cultural practices, would also be neglected. It appears that this weather fertilizer cycle takes place in every drought. This pattern can be checked by giving substantial aid to cultivators during unfavourable weather spells so that they could overcome their short-term difficulties. However, in the long run, a remedy can be found only by educating the cultivators about the benefits of the consistent adherence to better cultural and management practices.

B. INCREASING DOMINANCE OF THE SMALL-HOLDER:

One of the main reasons for low response is the dominant position occupied by the small holder in the coconut industry. Figures in Table 6 clearly demonstrate that the majority of small holdings are in an economic sense very small.

TABLE 6: Area under Coconut by Size of Holdings (Cumulative Distribution)

Category	Percent of total extent	
	1962	1973*
Less than 1 acre	5.8	-
Less than 5 acres	35.0	-
Less than 10 acres	50.3	-
Less than 25 acres	64.3	-
Less than 50 acres	73.2	91
50 acres or more	26.8	9

Source: Census of Agriculture 1962 & 1973 (DCS 1966 & 1973)

* Comparative figures are not available for 1973, except for the last two categories.

As a matter of fact, 50 per cent of them belonged to the less than 10 - acre category. Moreover, more and more lands under coconut cultivation will be fragmented with increasing population coupled with existing laws of inheritance. As a result, the share of small holdings of the total acreage will increase with the average size of holding becoming extremely small.

Increasing dominance of the small holder can be clearly illustrated by comparing the results of the Censuses of Agriculture for 1962 and 1973

TABLE 7: Coconut Acreage by Type of Cultivator

Census Year	Extent of estates +		Extent of small - holdings*		Total Extent (acres)
		% ++	%	++	
1962	308,792	27	843,626	73	1,152,418
1983	101,131	9	1,014,479	91	1,115,610
% change between 1962 & 1973	67%		+20%		-3%

Source: Census of Agriculture, 1962 & 1973 (DCS, 1966 & 1973)

+ 50 acres or more

* less than 50 acres

++ per cent of row-totals

It is apparent from the above figures that the share of estates shrank from 27 per cent of the total extent in 1962 to a mere 9 per cent in 1973. Since the total extent had been shrunk only by 3 per cent, the share of the small holdings sector had increased considerably at the expense of the estate sector between 1962 and 1973.

It is reasonable to assume that the rapid drop in the estate (50 acres or more) category partly resulted from the initial response to land reforms and partly resulted from the demand for land for alternative uses and fragmentation of land through inheritance.

The problem with the increasing dominance of the small holder is that as a producer, he pays little attention to government incentives, technical know-how, better cultural and management practices etc. As a result, productivity per acre is low in the small-holdings sector. Several survey findings show that the practice of fertilizer usage among small holders is not widespread (CRI/FAO, 1969: DCS, 1971). According to the findings of the Survey on Coconut Cultivation conducted by the Department of Census and Statistics (DCS, 1971), it appears that the proportion of small-holders (less than 50 acres) who applied fertilizer regularly in 7 major coconut growing districts⁶ was only 14 per cent whereas the corresponding proportion of estates was 66 per cent.

(6) These coconut growing districts include Colombo, Kurunegala, Puttalam, Matara, Hambantota, Kegalle, and Kalutara

Table 8 indicates how the practice of fertilizer usage varies with the size of holding.

TABLE 8: Fertilizer Users as Per Cent of Total Cultivators in the Kurunegala District

Size-group (acres)	1976	1977
0 - 1	-	-
1 - 3	1.5	0.8
3 - 10	1.7	-
10 - 25	12.0	13.2
25 & Over	32.6	24.2
All groups	6.8	4.9

Source: The Survey of Coconut Lands in the Kurunegala District (1977)

These figures reveal that there is hardly any practice of fertilizer application among small holders cultivating less than 10 acres. The data indicate a steady increase in fertilizer application with increasing size of holdings. Thus the apathy of small holders to the incentive scheme is clearly shown.

SECONDARY NATURE

The fact that a large proportion of coconut cultivators have been small - holders brings out another important reason for low response. A large number of small holders grow both coconut and paddy and treat coconut cultivation as a secondary occupation giving more attention to paddy cultivation.

Table 9 identifies the main source of income of the coconut land holders:

TABLE 9: MAIN SOURCE OF INCOME OF COCONUT LAND HOLDERS

Size-group (acres)	Coconut cultivation	Paddy cultivation	Others	Total
0 - 1	57 (31)	67 (36)	60 (33)	184 (100)
1 - 10	430 (37)	422 (36)	307 (27)	1159 (100)
10 - 25	115 (39)	88 (30)	94 (32)	297 (100)
25 & over	87 (41)	49 (23)	77 (36)	213 (100)
All groups	689 (37)	626 (34)	538 (29)	1853 (100)

SOURCE: Survey of Coconut Lands in the Kurunegala District (1977)
Figures in parentheses show % of row totals.

According to this data only 30 to 40 per cent of coconut land holders (irrespective of size of their holdings) derive their main income from coconut cultivation. It is also found that another 35 per cent of coconut land holders obtain their main income from paddy. However, as the size of holding increases, more and more coconut land holders earn their income from coconut cultivation.

Considering the production cycle of paddy, it can be reasonably argued that small holders give priority to paddy over coconut when it comes to the allocation of their limited funds on the purchase of inputs. This situation arises because paddy demands urgent attention, fetches better prices and yields its returns in a short period of time. Hence amounts to be spent on coconut would be small.

It could also be argued that since a large proportion of coconut land holders derive incomes from sources other than coconut cultivation these incomes would increase their resource base which in turn could enhance their capacity to increase fertilizer use. This is particularly relevant as their lesser dependence on income from coconut production could enhance them to withstand the gestation period of fertilizer investment in coconut.

OTHER FACTORS

As argued earlier, falling consumption has been due to severe weather conditions especially during 1970's and to unsatisfactory cultural practices. However, there have been other reasons for not applying fertilizer for coconut.

Table 10 brings out some important reasons for not applying fertilizer.

TABLE 10: REASONS FOR NOT APPLYING FERTILIZER¹ ON COCONUT LANDS

Reason	Size-Group		10 -25		25 & over		Total
	(acres)	%		%		%	
Financial	444	36	46	29	15	20	505
Availability	303	24	38	24	19	25	360
Lack of interest	159	13	32	20	19	25	210
Not necessary	61	5	7	4	4	5	72
Lack of transport facilities	71	6	11	7	11	14	93
Others	201	16	24	15	9	11	233
Total	1239	100	158	100	76	100	1473

SOURCE: The Survey of Coconut Lands in the Kurunegala District (1977)

(7) The sample consists of those cultivators who did not apply fertilizer.

From table 10, three clear - cut reasons for not applying fertilizer emerge. They are mainly financial reasons, unavailability of fertilizer and lack of interest. In another survey on development of coconut lands in the Colombo district (ARTI, 1975), it was found that 59% of coconut growers did not use fertilizer because of the financial reasons and 26 per cent did not use it due to unavailability, thus confirming the above findings.

C. PRICE OF FERTILIZER:

Figures given in Table 10 indicate that financial difficulties fall more heavily on the level of fertilizer consumption of the 0 - 10 acre category than that of the 25 acre and over category. For instance 36 per cent of the cultivators in the former category complained of this difficulty whereas the corresponding figure for the latter was 20 per cent. Financial difficulties were mainly caused by rapidly increasing price of fertilizer. Although coconut cultivators are assured of a generous subsidy, they have not been able to make use of it because of high prices of fertilizer experienced especially since September, 1973.

TABLE 11: Price Index⁸ of CRI Fertilizer Mixtures and Subsidy Rates

Period	Price Index (1965-67 100)	Subsidy Rates small holdings	(% of Price) Estates
1964 Oct - Dec.	100.3	50.0	33 $\frac{1}{2}$
1965 Jan - 1967 Dec.	100.0	50.0	33 $\frac{1}{2}$
1968 Jan - April	106.7	50.0	33 $\frac{1}{2}$
1968 May - Dec.	128.0	50.0	33 $\frac{1}{2}$
1969 Jan - 1973 Sept.	128.0	50.0	50
1973 Oct - 1974 Mid July	163.2	50.0	50
1974 Mid July - Aug.	274.9	50.0	50
1974 Sep - 1975 Dec.	335.0	50.0	50
1976 Jan - Dec.	301.6	50.0	50
1977		50.0	50
1978 - 80		75.0	75

SOURCE: DCCR 1964-71; CDA 1972-75

As can be observed from Table 11 the index of fertilizer prices rose steeply from 128 in September 1973 to 335 in September 1974. At the beginning of 1974 the prices of all standard mixtures (CRI mixtures A, B, C, & Y. P. M.) varied between Rs. 600-650 per ton whereas they were in the range of Rs. 1240 - 1340 per ton by the end of the year, an increase in the range of 100 per cent (CDA, 1974). Along with sharp price increases, levels of fertilizer consumption fell in both small holdings and estate sectors. Even after 1974, these higher prices have remained in operation thereby making the reduced consumption of

(8) The fertilizer price index used here is the arithmetic average of the prices of standard fertilizer mixers (CRI, A, B, C & Y. P. M.) recommended by the Coconut Research Institute (CRI)

fertilizer almost inevitable. Thus it is reasonable to assume that the small - holder cannot afford the practice of regular fertilizer application even at a subsidized price,

In another study (Paranavitana, 1983) it was found that the estimated price elasticity of demand for fertilizer was -0.41 for small - holders and - 0.67 for estates respectively, for the 1960 - 75 period. These results clearly indicate that increasing prices had discouraged fertilizer consumption in both sectors.

An attempt was made to evaluate the impact of fertilizer price increases on the cultivator's decisions and the results obtained are presented in table 12.

TABLE 12: Cost of Fertilizer and Value of Output⁹

Year	Cost of Fertilizer (Rs.)		Farm Price (Rs./Nut)	Value of Produce ⁹ (Rs./acre)	Fertilizer Cost/Value %
	0-1 acre	1-10 acre			
1965	74	543	0.17	289	21
1970	95	693	0.24	408	19
1974 I & II qrts	122	896	0.51	867	12
1974 III	203	1498	0.51	867	20
1974 IV	249	1835	0.51	867	24
1976	224	1648	0.43	731	26

* 1700 nuts per acre

Table 12 shows the high cost of fertilization as well as its rapid increase over time. In view of the high cost of fertilization in relation to the average value of the produce, it stands to reason that the financial burden on the small-holder is heavy. These figures indicate that the potential cost of fertilizer application (allowing for 50 per cent government subsidy) was in the range of 20-25 per cent of the value of total produce. Furthermore, an allowance has to be made for own consumption of small-holders, which will constitute a fairly large

(9) The following figures were used in computing cost of fertilizer and value of produce.

Data on fertilizer and output for small-holdings

Recommended dosage per palm (CRI 'A', 'B', 'C') *	... 8-10 lbs
Average number of palms per acre **	... 70
Average size of holding (0-1 acre group) ***	... 0.6 acre
Average size of holding (1-10 acre group) ***	... 4.42 acres
Total annual fertilizer requirements:	
0-1 acre group	420 lbs. = 0.19 tons
1-10 acre group	3100 lbs. = 1.40 tons
Average annual production per acre **	... 1700 nuts

Source :

- * DCCR, 1964-71
- ** Survey on Coconut Cultivation (1970)
- *** Census of Agriculture (1962)

proportion of the produce. According to the findings of 1961-63 survey of coconut cultivation (CRI/FAO, 1969) the ratio of own-consumption to production was about 25 per cent for the 1-10 acre category. In periods of low production, this ratio had even gone up to about 80 per cent for the 0-1 acre category. Thus the size of marketable surplus clearly show that fertilizer application is economical only for very large farms. This line of argument favours a scheme of easy loans to small-holders so that they can overcome temporary difficulties caused by financial reasons.

A scheme was initiated in 1968 to provide credit facilities to the owners of coconut lands to buy fertilizer at subsidised rates. This scheme operated by commercial banks failed largely as a result of the inadequate response shown by coconut cultivators. In 1979, a new credit scheme for coconut fertilizer was introduced with the assistance of commercial banks. Under the scheme credit is provided at a low interest and recoveries would be made after two years.

D. AVAILABILITY:

Another important factor which reduces regular consumption of fertilizer is the unavailability of fertilizer in sufficient quantities at times when it is required. The findings of both surveys mentioned earlier (CRI/FAO, 1969; DCS, 1971) indicate that the proportion of non-users who experienced the unavailability problem is very high. Figures in Table 10 suggest that the problem is more acute for small-holders.

Under the fertilizer subsidy scheme (FSS), small-holders (who owned 20 acres or less) had been allowed to obtain fertilizer requirements either directly or through the local co-operatives. However, there had been a decrease in the purchase of fertilizer requirements through co-operatives over the 1960-75 period. The shift of small-holders preferences from co-operatives towards various direct sources might have been brought about by the inefficiency of co-operatives in satisfying consumers needs in time.

On the question of availability of fertilizer, the findings of the 1977 survey of Coconut Lands in the Kurunegala District show that of 637 respondents, 55 per cent complained about the unavailability and another 36 per cent complained about the poor availability.

E. LACK OF INTEREST:

Data in Table 10 also show that lack of interest is another important factor for low response among cultivators. Some respondents have even stated that application of fertilizer to coconut lands was not necessary. Contrary to expectations, this lack of interest is widespread among estate owners (25 acres or more category) as well as among small-holders.

F. TRANSPORT PROBLEMS:

The lack of transport facilities has been more of a problem for estate-owners rather than that for small-holders. In fact 14 per cent of the estate-owners complained about this facility compared to only 6 per

cent of small-holders (0-10 acre group). It may be argued that this situation is a direct result of the method of distribution of fertilizer through co-operatives, which encouraged the small-holder by providing his fertilizer needs with minimum inconvenience. Moreover, since 1971 Coconut Development Officers have been authorised to issue permits to enable owners of less than 5 acres to draw their fertilizer requirements from the regional fertilizer store.

Considering the sources of supply of fertilizer to small-holders, the findings of the ARTI survey on small-holdings in the coconut triangle (ARTI, 1973) indicate that the majority of respondents (about 64 per cent of the total) obtain their requirements directly from the central stores in Colombo while a mere 18 per cent of them obtain theirs through the co-operatives. The reluctance of cultivators to obtain their fertilizer requirements through the co-operatives might stem from the reason that it is unavailable when it is required.

G. LAGGED BENEFITS OF FERTILIZER INPUT

There has been a declining trend in the application of fertilizer since the 1968 peak level. The period since 1970, in fact, coincides with the spells of unfavourable weather conditions. During periods of severe weather conditions the net benefit obtained from the application of fertilizer is very low. The following table gives annual average yield per bearing palm (in nuts) in relation to manurial practices during the preceding two years (1968/69).

TABLE 13: AVERAGE ANNUAL YIELD PER BEARING PALM FOR SMALL - HOLDINGS*

District	Manured	Unmanured
Kurunegala	43.9	29.8
Puttalam	47.5	46.8
Colombo	39.2	27.9
Kalutara	41.7	41.9
Kegalle	40.6	40.7
Hambantota	31.2	31.8
All Districts	42.5	35.1

SOURCE: Sample Survey on Coconut Cultivation. 1970.

* less than 50 acre category.

The above figures show that except for the Kurunegala and Colombo Districts, net benefit obtained from fertilizer application is almost negligible. Comparing the average yields of coconut lands which have been manured and unmanured, one can conclude that additional expenses incurred on fertilizer cannot be recovered since the net benefit associated with the practice of fertilizer usage is minimal. However, it has to be pointed out that the average yield figures for 1968/69 were affected by bad weather conditions.

It is generally agreed that there is a time lag of 1½ - 3 years between application and increase in yield or non-application and decrease in yield. As compared with paddy where the length of lagged response is 3 months,

the time lag for coconut is considerably longer. Thus, it stands to reason that small-holders used to a limited time horizon would not be keen on applying fertilizer to coconut lands.

UNAWARENESS AND LACK OF COMMUNICATIONS:

A considerable proportion of small holders are unaware of the facilities available under the FSS and therefore, the existing facilities are not adequately utilized. Unlike in paddy, the extension and advisory services have had a minimal impact on the habits of owners of small-holdings. According to the findings of the ARTI survey on small-holdings (1973) virtually 90 per cent of small-holders in the sample had not been visited in past 3 years and 72 per cent did not recall a visit at any time by extension officers. These figures clearly indicate the serious problem in the existing machinery of communications.

The low participation rate in the FSS could be directly attributed to the failure of extension services. All the coconut growing areas of the island are divided into Coconut Development Officer's ranges. Each of them is manned by a Coconut Development officer whose task is to advise on fertilizer usage and other cultural and management practices. The total number of Coconut Development Officers to look after 1 million acres was 59 in 1973, 87 in 1974, 100 in 1978 and 200 in 1980. Even in 1980, one Coconut Development Officer was expected to look after 5,000 acres approximately. It has been found that these officers have hardly any time to provide advisory services as their time is taken up by the implementation of the subsidy schemes under the Coconut Cultivation Board.

VI. CONCLUSIONS:

In summarising, it can be concluded that the FSS had failed during the 1970s in reversing the tendency of coconut cultivators to reduce fertilizer consumption, in the face of unfavourable weather spells and rising price of fertilizer. As discussed earlier, the failure of the FSS can be attributed to the following reasons:

Firstly, the FSS had been operating in isolation instead of it being a part of a comprehensive package which embraces all aspects of coconut cultivation.

Secondly, the government has failed to communicate effectively with small-holders on the need for continuing application of cultural and management practices.

Thirdly, price explosions observed in the 1970s were so large that even the subsidised price was not affordable to the small-holder. Besides, subsidies had been lagging behind large price increases thus making it inevitable for large number of participants to drop - out from the FSS.

Fourthly, there exists a hard-core of small-holders who do not apply fertilizer even with generous subsidies because of the fact that their holdings are very small and hence uneconomical.

Considering the above facts, one can argue that the government should have not pursued a policy on price incentives only, since these incentives worked satisfactorily during the periods of stable prices and good weather conditions but failed miserably when conditions were unfavourable. Instead, it should have pursued a comprehensive policy promoting all aspects of management and cultural practices.

V SUGGESTIONS FOR IMPROVEMENT:

As shown earlier, the maximum proportion of acreage fertilized over the period considered did not exceed 21 per cent for small-holdings and 46 per cent for estates. These figures clearly show that there is more room for improvement especially among small-holders whose share in the total extent under coconut increased from 73 per cent in 1962 to 91 per cent in 1973. With ever-increasing dominance of small-holders in the industry, it is important to introduce a programme promoting all aspects of fertilizer use. The programme should aim at encouraging more small-holders to apply fertilizer regularly. The scheme should reward small-holders for regular application of fertilizer in order to sustain fertilizer consumption above a certain critical level. In addition, it is vital to introduce a credit scheme for cultivators especially for small-holders, to cushion the impact of very large price increases.

Secondly, there should be an efficient system for distribution of fertilizer among coconut cultivators. The existing distribution network should be expanded to include local co-operatives, village shops and other local distributing agents in addition to regional stores. Existing fertilizer storage facilities should be expanded so that fertilizer can be made available to the cultivator in time. In fact, the establishment of supply sources at highly decentralised level will encourage the small-holder to use more fertilizer because of least cost and minimum inconvenience. Fertilizer should be made easily available to the cultivator without any restriction on the type of buyer. It is self-evident that wider application of fertilizer depends to a large extent on the level of efficiency of the distribution network.

It was argued earlier that the high non-participation rate in the FSS could be directly attributed to the limited effectiveness in extension services. At present, government extension services are understaffed and overstretched. With the appointment of cultivation officers to look after all crops at G. S. division level, it is reasonable to assume that extension services will be able to bridge the gap between the extension officer and the cultivator. However, lack of technical knowledge on the part of cultivation officers will be a hindrance to this decentralised system. Since the group concerned here is mainly small-holders, the need for an efficient and decentralised system of extension services which is geared to communicate effectively with them cannot be overemphasised.

Finally, it can be concluded that along with fertilizer subsidies, a package of easy credit, a decentralised system of fertilizer distribution, better extension services should be introduced as in the paddy sector so that a higher level of productivity could be attained in the coconut sector.

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