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# Fertilizer & Agricultural Productivity*

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## Predominance of Agriculture in the Economy

Sri Lanka is predominantly an agricultural country. During the year 1978, the contribution of agriculture to the Gross National Product was 28·4% whereas the relevant figures for services, wholesale and retail trade, and manufacture amounted to only 13·8%, 13·6% and 12·6% respectively.[1] Moreover, agriculture and its related activities account for over 70% of the working population of the country. The agricultural activities of the island could be broadly classified into two sectors. The export Cash Crop Sector consists of the three main tree crops, tea, rubber and coconut as well as minor exports such as coffee, cardamons, pepper etc., while in the domestic sector production comprises mainly of food items for local consumption.

No significant progress has been achieved in the Export Cash Crop Sector over the last 10 years either in total output, area under cultivation or productivity. This could be clearly observed from the data in Table I where the key indicators of the principal agricultural crops over the years 1969 to 1978 are given. In the case of paddy, output has increased considerably from 65·8 million bushels in 1969 to 90·6 million bushels by 1978. However, this improvement has been realised exclusively by an increase in the area under cultivation rather than by an improvement in the yield per acre. Paddy yield has been more or less stagnant over the last decade with the figures for 1969 and 1978 being 50·33 bushels and 50·70 bushels per acre respectively. Actually during the years 1973, 1975 and 1976 the yield per acre has been even less than 45 bushels.

With the rapid improvement in educational facilities since attainment of political independence in 1948, the country has witnessed a revolution of rising expectations among the population at large, especially among the ranks of the younger generation. These expectations have by far outstripped the growth of the overall economy over the last three decades.

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1. Annual Report of the Central Bank of Ceylon (1978) P 11.

TABLE 1

## Key Indicators of Principal Agricultural Crops 1969 - 1978

| Category | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 (Provisional) |
|---|---|---|---|---|---|---|---|---|---|---|
| **1. TEA** | | | | | | | | | | |
| Production (Mn. lbs.) | 484 | 468 | 480 | 471 | 466 | 450 | 471 | 433 | 460 | 439 |
| Total acreage | 556,514 | 597,499 | 597,171 | 597,645 | 598,740 | 598,466 | 597,691 | 594,481 | 598,024 | 603,464 |
| Yield per acre (lbs.) | 811 | 811 | 833 | 816 | 805 | 882 | 920 | 839 | 899 | 838 |
| **2. RUBBER** | | | | | | | | | | |
| Production (Mn. lbs.) | 333 | 351 | 312 | 309 | 341 | 291 | 328 | 335 | 322 | 343 |
| Total acreage | 563,633 | 568,900 | 567,994 | 567,060 | 565,000 | 563,406 | 562,464 | 560,872 | 559,850 | 559,257 |
| Yield per acre (lbs.) | 674 | 707 | 657 | 658 | 694 | 634 | 691 | 705 | 690 | 753 |
| **3. COCONUT** | | | | | | | | | | |
| Production (Mn. nuts) | 2,440 | 2,510 | 2,610 | 2,963 | 1,935 | 2,031 | 2,398 | 2,330 | 1,821 | 2,207 |
| **4. PADDY** | | | | | | | | | | |
| Production (Mn. bushels) | 65·8 | 77·5 | 66·9 | 62·9 | 62·9 | 76·8 | 55·3 | 60·0 | 80·4 | 90·6 |
| Acreage-harvested ('000) | 1,539 | 1,776 | 1,714 | 1,579 | 1,660 | 1,969 | 1,476 | 1,570 | 1,933 | 2,074 |
| Yield per acre (bushels) | 50.33 | 51·30 | 45·91 | 46·87 | 44·58 | 45·65 | 44·04 | 44·91 | 48·92 | 50·70 |

*Source:* – Annual Report of Central Bank of Ceylon, 1978 — page 21.

Consequently, there is social instability and disequilibrium that could give rise to explosive situations. In these circumstances, the need of the hour is the rapid expansion of the overall economy to provide expanding employment opportunities to raise the levels of income to satisfy at least partially the genuine aspirations of a comparatively educated population. In a predominantly agricultural country, it is imperative that this sector should play a leading role in realising an accelerated level of economic progress. The rapid growth of the export agricultural sector would raise the volume of foreign exchange earnings, while in the domestic sector considerable savings could be effected in external resources. Moreover, the expansion of output in these two sectors would contribute to increased employment opportunities both directly as well as in related activities.

## A Strategy for Rapid Agricultural Development

Thus, it is absolutely necessary to substantially raise agricultural output in the shortest possible time by resorting to import substitution in the domestic sector and the expansion of agricultural exports in the cash crop sector. There are two possible means to realise these twin objectives: an extension of the area under cultivation and the intensification of production. In view of the limitation of suitable land resources a significant extension of the area under export crops is not feasible. It would be possible to double the present cultivated extent in the domestic sector; but such extension is medium to long term in character and requires heavy capital investments.

On the other hand, there is much scope for intensifying agricultural production on existing land under cultivation. A comparison of the actual average production in the cultivated land with potential in respect of the four major agricultural crops of the country, tea, rubber, coconut and paddy (rough rice), as given in Table II amply illustrates this point.

TABLE II

**Agricultural & Potential Annual Yields of Major Crops**

| | YIELD | |
|---|---|---|
| | Actual | Potential |
| Made tea, upcountry .. | 1,500 kg | 2,500 kg. |
| Made tea, low country .. | 1,500 kg. | 4,500 kg. |
| Rubber .. | 700 kg. | 2,000 kg. |
| Coconut .. | 4,000 nuts | 16,000 nuts |
| Rice (Rough) .. | 2·5 tons | 5 tons |

*Source:* Masterplan on Promotion of Fertilizer Distribution and Consumption — Main Report, Table I, p. 3.

The adoption of a package of measures such as the use of high yielding varieties; proper weed, pest and disease control; soil and water conservation with appropriate drainage facilities; and the applieation of fertilizer conforming to the dosages recommended by the relevant Research Institutes is the answer to the problem of low agricultural productivity of the country. Of these measures, fertilizer application is one of the most important; the present consumption of this commodity in the agricultural sector is far from satisfactory, as indicated in the data in Table III, where the current fertilizer use in relation to the quantities recommended by the appropriate research organizations are given.

TABLE III

**Current Fertilizer Use***

| | Current Fertilizer use in relation to reecommended dosage (%) |
|---|---|
| Tea | 75 |
| Rubber | 35 |
| Coconut | 20 |
| Rice | 37 |

*Source:* Master Plan, Main Report, Table II – page 3

* These figures are based on the overall consumption of fertilizer for the year 1976 which was low being around 264,000 tons whereas in 1978 it was 380,000 tons.

It will be observed from this data that especially in coconut, and also in rubber and paddy, there is much scope for higher levels of fertilizer application and these would invariably lead to an improvement in productivity. In fact, an increase in the consumption of fertilizer appears to be the only effective short term solution to the low levels of agricultural productivity in Sri Lanka. Such an approach, while raising agricultural productivity would also contribute substantially to the expansion of the economy and thereby relieve the despair and frustration amongst a large section of the people that is threatening the social fabric of the nation.

## Consumption of Fertilizer

In non-technical terms, fertilizer is the food for plants. There are three main ingredients of plant food required for the successful cultivation of crops and they are nitrogen, phosphorous and potassium; other nutrients such as sulphur, magnesium, copper and iron are considered less important since they are required in relatively smaller quantities. The food for plants is supplied as chemical fertilizer and organic manures such as green leaf, cattle manure and compost. A large quantity of organic manure amounting to around 5 – 10 tons is needed to obtain a nutrient content of approximately 100 lbs. The inconvenience and high cost of collecting, transporting

and spreading such a quantity of organic fertilizer is such that in most instances, the only feasible way to provide food for plants is the application of chemical fertilizer. This has been emphsised in recent decades with the need for higher volume of fertilizer on account of the adoption of better yielding varieties of plants.

The application of fertilizer to the three main plantation crops, tea, rubber and coconut, commenced well over 50 years ago. However, among subsidiary food crops and fruit crops, the practice of the application of chemical fertilizer began only in the post-independence years. Even today, apart from the estates belonging to State organizations and the large private sector plantations, the importance of fertilizer application to obtain satifactory levels of output is not adequately realised. Actually during periods of poor prices for agricultural commodities or when there is a sharp increase in the cost of production, the first item of expenditure to be curtailed or totally abandoned is fertilizer application.

Until recently, all the fertilizer required for agriculture was obtained from abroad. However, a few years back a large deposit of apatite was discovered at Eppawela in the North Central Province. Consequently, in recent years ground apatite is being progressively used as a substitute for imported rock phosphate in tea plantations at higher elevations.[2] Apart from rock phosphate, the important fertilizers that are imported and used in Sri Lanka are sulphate of ammonia (S. A.) and urea for nitrogen requirements and triple super phosphate and muriate of potash for phosphorus and potassium requirements respectively. The actual quantities of fertilizer consumed during the year 1978 on a cropwise basis is given in Table IV. It is clear from this data that the highest amount of fertilizer at

TABLE IV

**Estimated Fertilizer Consumption 1978**

| | S.A. | Urea | R.P. | T.S.P. | M.P. | N.P.K. | Others | Total |
|---|---|---|---|---|---|---|---|---|
| Paddy | 4,757 | 81,446 | 2,146 | 14,415 | 11,780 | 21,583 | | 136,127 |
| Tea | 55,774 | 23,367 | 15,074 | 26 | 19,751 | — | 1,514 | 115,506 |
| Rubber | 6,122 | 1,273 | 7,480 | 54 | 4,129 | — | 1,886 | 20,944 |
| Coconut | 15,841 | 1,032 | 9,589 | — | 12,965 | — | 3,126 | 42,553 |
| Others | 29,999 | 12,450 | 9,826 | 9,989 | 1,917 | — | 2,275 | 64,456 |
| Total | 112,493 | 119,568 | 44,115 | 24,484 | 50,542 | 21,583 | 8,801 | 381,586 |

*Source:* Ceylon Fertilizer Corporation

S.A. = Sulphate of Ammonia
R.P. = Rock Phosphate
N.P.K. = Nitrogen, Phosphorus and Potassium
T.S.P. = Triple Super Phosphate
M.P. = Muriate of Potash

2. It cannot be used at lower levels due to the inferior solubility of that mineral.

present is consumed in the production of paddy while tea has accounted for a substantial quantity. The quantum of fertilizer utilized in rubber and coconut production is comparatively small.

In recent years, a conscious attempt has been made by the Government to increase the consumption of urea as nitrogen fertilizer both on account of the local urea factory that is now nearing completion at Sapugaskanda as well as the economies in storage and transport arising from the use of that high analysis fertilizer.[3] In 1978, urea accounted for 119,568 tons whereas the corresponding figure for S.A. is 112,493 tons. In terms of nutrient content, the consumption of urea and S. A. in 1978 has been around 62,000 and 24,000 tons respectively[4].

## An Analysis of Fertilizer Consumption

A crop-wise consumption of fertilizer in terms of weight over the years 1961 to 1978 is given in Table V. Information in this table indicates that there has been no significant increase in the overall utilization of

TABLE V

**Fertilizer Consumption 1961 (crop-wise analysis) in 1,000 tons**

| Year | Tea | Rubber | Coconut | Paddy | Others | Total |
|---|---|---|---|---|---|---|
| 1961 | 143 | 29 | 43 | 29 | 34 | 278 |
| 1962 | 148 | 28 | 43 | 38 | 35 | 291 |
| 1963 | 161 | 27 | 45 | 47 | 30 | 311 |
| 1964 | 172 | 27 | 48 | 60 | 32 | 336 |
| 1965 | 157 | 23 | 48 | 42 | 46 | 316 |
| 1966 | 157 | 22 | 52 | 44 | 54 | 330 |
| 1967 | 142 | 22 | 49 | 73 | 49 | 336 |
| 1968 | 133 | 18 | 63 | 85 | 64 | 363 |
| 1969 | 111 | 20 | 59 | 84 | 64 | 338 |
| 1970 | 107 | 20 | 64 | 87 | 56 | 334 |
| 1971 | 111 | 17 | 58 | 95 | 60 | 342 |
| 1972 | 97 | 11 | 48 | 88 | 49 | 294 |
| 1973 | 92 | 15 | 39 | 126 | 54 | 325 |
| 1974 | 97 | 12 | 40 | 96 | 46 | 291 |
| 1975 | 100 | 9 | 27 | 49 | 26 | 210 |
| 1976 | 95 | 13 | 31 | 72 | 53 | 264 |
| 1977 | 80 | 12 | 29 | 122 | 53 | 298 |
| 1978 | 115 | 21 | 43 | 136 | 65 | 380 |

*Source*: Ceylon Fertilizer Corporation

3. The Urea factory of the State Fertilizer Manufacturing Corporation, which falls within the purview of the Ministry of Industries & Scientific Affairs, is located at Sapugaskanda adjacent to the Oil Refinery of the Ceylon Petroleum Corporation. The feedstock for the manufacture of urea is naphtha which is a by-product in the refining of crude oil. Naphtha for the urea factory will be obtained direct by pipe line from the oil refinery. The estimated capital cost of the urea project is Rs. 2,400 million and it is the largest single industrial project to be undertaken by this country in terms of cost.

4. The nutrient content of urea is 46% whereas the figure for S.A. is only 21%.

fertilizer during the period under analysis except in the final year–1978, when total consumption recorded an unprecedented figure of 380,000 tons. The average consumption of fertilizer in the production of tea has actually declined from around 143,000 tons in 1961 to 115,000 tons in 1978 when the total consumption in the island reached the highest level. Moreover, during the years 1976 and 1977, fertilizer use in tea was as low as 95,000 tons and 80,000 tons respectively.

There has also been a similar decline in the use of fertilizer in the production of rubber where consumption has fallen from 29,000 tons in 1961 to 21,000 tons in 1978. In the coconut sector, fertilizer use has remained more or less constant being 43,000 tons in both 1961 and 1978, though in certain years such as 1968 and 1970 utilization has been as high as 63,000 tons and 64,000 tons respectively.

The only major agricultural crop that has recorded substantial increases in fertilizer use is paddy. From 29,000 tons in 1961, the use of fertilizer for this crop has reached a record figure of 136,000 tons by 1978. In this connection however, it should be noted that as stated earlier, unlike in the case of tea, rubber and coconut, there has been a considerable increase in the area under paddy cultivation over the past several years.[5] Even after making allowance for this factor there has been substantial progress in fertilizer usage in this crop over the period under consideration.

Progress in the use of fertilizer over the period under analysis is not as negative as indicated in the data in Table V for the reason that urea came to be applied in appreciable quantities only in the latter part of the period. Actually in 1978, the consumption of urea has been in the region of 120,000 tons and if this was consumed in the form of S.A. the quantum of fertilizer used in terms of weight would be around 263,000. Thus, for a proper evaluation of the progress in the use of fertilizer in the country over the period 1961 to 1978, another 143,000 tons should be added to the total consumption figure of 380,000 tons for the year 1978.

Even when this factor is taken into account, however, the performance in the utilization of fertilizer over the last 18 years has not been satisfactory, especially since in several countries of the world substantial increases in output have been realised by the greater application of fertilizer.

From the data in Table III, which indicates the current fertilizer use in relation to quantities recommended by the relevant research institutions, it will be seen that fertilizer consumption is high among those crops where

5. The area harvested has increased from 1,539,000 acres in 1969 to 2,074,000 acres by 1978 – Annual Report of the Central Bank of Ceylon 1978 – page 21.

the bulk of the cultivation is undertaken on a large scale and the time taken for fertilizer application to yield beneficial results is limited. On both these counts, tea is at an advantage where the small holdings account for only 18% of the area under cultivation and the time taken for fertilizer to generate results being around two years. On the other hand, in the coconut sector approximately 80% of the area under cultivation is operated on a small scale basis[6] and it takes over four years to reap the full benefits of fertilizer application.

Another important phenomenon that has to be borne in mind is that although in the tea sector the overall application of fertilizer in 1976 was around 75% of the recommended dosage, the larger plantations managed by state organizations or under private ownership have been effecting fertilizer applications at much higher levels. On the other hand, among the small holdings, the use of fertilizer has been on a much lesser scale. This would apply to other crops as well though in the case of paddy and coconut large scale operations are a scarce factor.

Thus, to realise a significant break-through in the consumption of fertilizer in the country it is imperative that the small agricultural producer be convinced of the commercial desirability of utilising a higher volume of fertilizer. This is by no means an easy task since farmers are used to certain methods of cultivation; some of them do not use any chemical fertilizer at all and see no reason why they should do so when their forefathers had not adopted such practices. Others are not commercially oriented and would be unwilling to exploit opportunities for financial advancement; they may be content with an income that would enable them to satisfy their existing requirements with no desire to expand their traditional needs.

However, the task would not be overwhelming since most people would be anxious to raise their levels of income and benefit from the commercial gain to be realised by the greater application of fertilizer. In fact, in the paddy and coconut sectors an investment of Rs. 1/- on fertilizer should usually yield a rate of return of around Rs. 10/- and Rs. 7/- respectively.

## Measures for the encouragement of the greater use of Fertilizer

Most important requirement to encourage the greater use of fertilizer is to ensure its ready availability in all relevant areas, especially in the villages, at the proper time at reasonable prices. Until the liberalisation of

6. Masterplan on Promotion of Fertilizer Distribution and Consumption, Main Report, Page 4.

fertilizer imports in November 1978, the Ceylon Fertilizer Corporation (CFC), which falls within the purview of the Ministry of Agricultural Development and Research, was the sole importer of this commodity into the country. This institution still continues to be the only importer of fertilizer although other wholesalers, both in the private and public sector, are proposing to enter the import arena in the near future. Including the Ceylon Fertilizer Corporation, there are at present 6 institutions that are engaged in the wholesale distribution of fertilizer in the island. Three of these iustitutions are in the public sector (Ceylon Fertilizer Corporation, Colombo Commercial Company and Janatha Estates Development Board) while the other three are in the private sector (Baur & Co., Roberts Forage Works and Amalgamated Manure Works.)

The public sector institutions account for 80% of the imported fertilizer at the wholesale level while the balance 20% is distributed by the organizations in the private sector. These six wholesalers engage both in the mixing and sale of fertilizer. They transport the fertilizer from the Port to their storage and mixing plants and with the exception of the CFC sell mixed or straight fertilizer to customers at their gates. The CFC has a number of warehouses located in the various part of the island from where sales are effected.

The large State and private sector plantations obtain their fertilizer requirements direct from the wholesalers. The transport that brings the produce of the estates to the metropolis takes fertilizer on their return journeys back to the plantations. Thus, there is no serious problem in the supply of fertilizer to the large plantations. However, in the case of smaller estates, and especially small holders and individual farmers intermediary agencies are involved in the transport and sale of fertilizer to users. Most of the distribution of fertilizer at the retail level is undertaken by Mu'ti-Purpose Co-operatives Societies (MPCSS). Others engaged in this activity are private dealers authorised by the CFC and the Agricultural Serviee Centres of the Ministry of Agricultural Development & Research.

In recent times the Ceylon Fertilizer Corporation has been successful in making available the different varieties of fertilizer at the wholesale level in sufficient quantities although the distribution of this eommodity at the intermediary and retail level has not been that satisfactory. To ensure the availability of fertilizer at the intermediary level, a chain of regional fertilizer warehouses are being established in the districts to service mainly the non-plantation sector. The first of such warehouses is nearing completion at Maho with a storage capacity of 16,000 tons and facilities to

undertake the mixing of fertilizer. This warehouse is expected to be fully commissioned towards the end of 1979. Action is also being taken to establish a second such warehouse in the South with a storage capacity of around 10,000 tons. Other locations recommended in the Masterplan on the Promotion of Fertilizer Distribution and Consumption are Anuradhapura, Polonnaruwa and Badulla. The CFC is responsible for the eseablishment and operation of these warehouses while the Federal Republic of Germany is financing their capital costs from counterpart funds.

The philosophy of the regional warehouse concept is to store adequate quantities of fertilizer in these warehouses so that it would be easily available to retailers (or to direct users in the surrounding areas) especially at the commencement of the fertilizer season. These warehouses are being so located that they are connected to the national railway system thereby reducing the cost of transport to the minimum.

However, it is necessary to ensure that fertilizer is available to the small holders and farmers at the village level at the required time. For this purpose, it is necessary that retailers should possess adequate stocks of their own at the commencent of the fertilizer season to meet the first wave of demand that could be subsequently replenished by supplies from the regional warehouses. Most retailers are reluctant to deal in fertilizer since it is inconvenient, difficult and unpleasant to handle and store. To encourage retailers, both private and co-operatives, to engage in the fertilizer retail business a higher margin of profit and adequate credit facilities should be provided.

With regard to the prices of fertilizer, there is already a state subsidy of 50% of the C & F cost currently in operation. This commodity is also free of customs duty and the Business Turnover Tax. Despite the state subsidy, the prices of fertilizer has been significantly fluctuating over the several years, at times even within a fertilizer season. This will be seen from the data in Table VI in respect of two major types of fertilizer, urea and VImixtures. This type of fluctuation discourages the expansion of fertilizer consumption.

TABLE VI

**Changes in Retaii Prices of Fertilizer 1973 - 1978**

| Date of change in prices | | VI* | Urea |
|---|---|---|---|
| | | Retail prices in Rs. per cwt. | |
| Before | 1973 | 18·90 | 20·13 |
| | 73 - 10 - 01 | 26·30 | 26·63 |
| | 74 - 07 - 12 | 109·20 | 134·25 |
| | 74 - 09 - 09 | 173·25 | 134·25 |
| | 74 - 10 - 21 | 84·00 | 94·00 |
| | 75 - 05 - 21 | 84·00 | 94·00 |
| | 75 - 11 - 06 | 61·75 | 94·00 |
| | 76 - 10 - 01 | 61·70 | 67·15 |
| | 77 - 03 - 15 | 57·25 | 50·39 |
| | 78 - 01 - 01 | 60·25 | 33·00 |
| | 78 - 07 - 05 | 80·66 | 93·62 |
| | 77 - 08 - 21 | 74 71 | 83·20 |

*Source:* Masrerplan on Promotion of Fertilizer Distribution and Consumption; Ceylon Fertilizer Corporation

* One of the most popular paddy fertilizer mixtures in the island.

What is important is that the prices of fertilizer should be stabilised over a reasonable period of time at levels that would encourage greater consumption.[7] Once reasonable prices are determined the state subsidy could fluctuate depending on the world market prices and the local cost of production of fertilizer should not be determined at too low a level where its true value would not be appreciated by those who handle and use that commodity. Exceptionally low prices would lead to unnecessary waste arising from negligence and carelessness in handling, transport and storage. Waste should be minimised since the value of fertilizer to the nation would always be substantial although its retail prices may be artificially reduced by state subsidies to encourage greater use. Moreover, substantially reduced prices would also be an invitation for its smuggling out of the island in appreciable quantities. It would also be an encouragement for the production of undesirable commodities based on fertilizer.[8]

7. Since the profitability of different crops vary, it would be difficult to decide on a reasonable retail price for fertilizer applicable to all of them. In the circumstances it would be preferable to determine a fair retail price to satisfy the requirements of the major crop that is least profitable.

8. It is reported that illicit liquors are being manufactured using urea as a base.

To encourage the use of fertilizer among small holders and individual farmers continuous propaganda is necessary, both at the national and village levels, to convince them of the advantages of the higher application of fertilizer. Simultaneously, credit facilities should be extended to provide them with the means to purchase fertilizer at the appropriate time and also adequate extension services should be established to impart proper instructions for the maximisation of the benefits of fertilisation. The operation of demonstration plots at the village level could have a considerable impact because these would enable the cultivators themselves to witness the success of fertilizer application.

However, while encouraging the farmer and the small-holder to use larger quantities of fertilizer it is most important to ensure its availability in sufficient quantities. Otherwise, the users who have been motivated to apply fertilizer in increasing dosages would be frustrated if supplies are not forthcoming at the appropriate time.

Thus, the primary short-term objective in the agricultural sector of Sri Lanka is clear; to encourage and promote the use of fertilizer in increasing quantities so that the stagnation in the growth of agricultural activity could give way to a significant and accelerated rise in production in the shortest possible time. To realise this goal it is necessary that while motivating the small-holder and the farmer in the greater use of fertilizer, measures be adopted to ensure that this commodity is readily available at reasonable prices. Action should also be taken to ensure the operation of other factors that are required for the maximisation of the benefits of fertiliation such as the use of high yielding plant materials; weed, pest and disease control; and adequate water and drainage facilities. In the higher application of fertilizer for greater agricultural productivity the interests of the producer would undoubtedly coincide with the welfare of the nation.