

# THE SIGNIFICANCE OF THE EPPAWALA ROCK PHOSPHATE DEPOSIT FOR SRI LANKA'S AGRICULTURE

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## INTRODUCTION:

The Eppawala rock phosphate deposits were discovered in Sri Lanka in 1971. These deposits are located at Eppawala in the North-Central Province of Sri Lanka, about 16 miles from Kekirawa junction. These deposits occupy a range of hills trending North-South, with peaks rising to over 500 ft. The northern part of the deposit occupies an area of over 250 Ha. and detailed geological investigations have been carried out in this part of the deposit. The apatite bearing deposit near the surface is composed of a leached zone followed by apatite bearing limestone (carbonatite) at depth. The proved ore reserves of the leached zone in the northern part of the deposit are of the order of 20 million metric tons (MT); an estimated ore reserve of at least 20 million tons is indicated in the southern part.

## CONSUMPTION PATTERN

According to the report on long range fertilizer projections in Sri Lanka (for the period 1977 - 1985) prepared

by the Ceylon Fertilizer Corporation in January 1977 the requirements of rock phosphate during the year 1977 for direct application as phosphate fertilizer for the major plantation crops (tea, rubber and coconut) are about 31,000 tons. The same report had estimated an additional 11,000 tons for rice in some areas of the wet zone and 5,500 tons for minor export crops and pastures. The consumption of phosphate fertilizer for the period 1977 to 1987 is given in Table 1.

### (a) Rock Phosphate

The consumption of rock phosphate in paddy has been negligible. In tea consumption of Local Rock Phosphate (LRP) has increased from 4.3 MT in 1979 to 13.6 MT in 1987. In rubber it has increased from 2.9 MT in 1979 to 3.4 MT in 1987. This is bound to increase further because in 1987 the R.R.I. recommendation was changed from 50% LRP to 100% LRP in mature rubber.

The recommendation of the TRI is for a 100% use of LRP except in tea

nurseries. In rubber it was 50% use of LRP but was revised in 1987 to 100% in mature rubber areas. The NFS has been monitoring the progress of the rates of substitution of LRP for Imported Rock Phosphate (IRP) as recommended by the TRI and RRI in estates managed by the JEDB and SLSPC. This data for the years 1982 to 1987 are given in Table 2.

In the tea sector, both the JEDB and the SLSPC have increased their rates of substitution in 1987 when compared to the rates in 1986. The former from 75% to 79% and the latter from 85% to 89%. The national average has also recorded an increase from 57% to 73% between these two years.

The two State plantation organizations have also recorded increases in the substitution of LRP for the imported product in the rubber sector. In the JEDB, it has increased from 42% in 1986 to 47% in 1987. In the SLSPC, it has increased from 64% to 71%. On the other hand, the national average has marginally decreased from 37% to 36%, indicating a considerable decline in substitution among other plantation groups between these two years.

### Processed Phosphate Fertilizer

The manufacture of phosphate fertilizer from LRP has certain difficulties.

Table 1  
Consumption of Phosphatic Fertilizer from 1977-1987 in Thousand tons

Year	Paddy		Tea		Rubber		Coconut			MEG		OTH. CROP		
	TSP	IRP	IRP	LRP	IRP	LRP	IRP	LRP	TSP	IRP	LRP	TSP	IRP	LRP
1977	12.9	1.9	15.1	-	2.3	-	5.5	-	-	-	-	7.5	5.8	-
1978	14.4	2.2	20.6	-	3.9	-	7.8	-	-	-	-	10.0	7.8	-
1979	2.9	-	9.6	4.3	5.7	2.9	10.6	0.7	-	-	-	5.4	7.5	-
1980	18.3	-	8.5	5.1	7.0	1.4	14.3	1.7	-	-	-	7.7	6.5	-
1981	17.7	-	3.2	10.4	3.0	2.7	6.6	1.4	-	-	-	8.4	8.8	0.1
1982	22.2	-	3.1	9.9	4.3	2.6	7.0	1.3	-	-	-	10.3	4.8	0.8
1983	21.8	-	5.7	8.7	5.0	2.6	8.6	0.7	0.2	0.4	0.2	5.0	4.3	0.5
1984	25.1	0.7	6.4	10.6	5.4	3.7	13.2	1.1	4.8	0.7	0.2	6.9	8.5	0.4
1985	28.0	-	7.6	9.6	7.0	3.5	11.6	0.1	5.9	0.5	0.1	6.8	7.4	0.6
1986	36.5	-	6.9	8.5	7.5	4.2	9.2	-	7.7	0.8	5.6	-	4.2	0.1
1987	28.8	-	5.5	13.6	6.8	3.4	9.8	1.5	7.1	0.5	0.1	7.6	4.0	1.2

Source - NFS.

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Table 2  
Annual substitution of LRP for IRP in Tea and Rubber plantation  
1982-1987

Year	TEA				RUBBER			
	JEDB	SLSPC	National	Rec.	JEDB	SLSPC	National	Rec.
1982	83	84	75	100	38	64	39	50
1983	67	69	63	100	43	49	37	50
1984	67	85	65	100	58	50	43	50
1985	61	91	58	100	61	45	35	50
1986	75	85	57	100	42	64	37	50
1987	79	89	73	100	47	71	36	50

This is largely due to the associated impurities present which the presently known processes cannot accommodate. In general LRP is very rich in P<sub>2</sub>O<sub>5</sub> content, but invariably contains high R2O3 and chlorine which largely restricts its utilization potential. Another disadvantage in using the Eppawela deposit for the manufacture of other phosphatic fertilizer is the non-uniformity of the grade as well as reserve. In order to utilize this deposit, beneficiation processes have to be resorted to which are time consuming as well as capital intensive. Added to these are the shortage of sulphur and its ever increasing international market price which is forcing technologists to find suitable and economical ways for its utilization. Partially acidulated super phosphates are slowly gaining ground because this process can also accommodate deposits with high impurities in a most profitable way, by overcoming factors like shortage of sulphur, non-uniformity of grade, etc.

Partially Acidulated Phosphate Rock (PAPR) is a phosphate fertilizer manufactured by additions of sulphuric or phosphoric acids to phosphate rock in quantities smaller than those needed for full acidulation, namely for production of super phosphate. Thus, a fertilizer is obtained containing a part of its phosphate in a water soluble form, and the other part having a very low solubility. In Sri Lanka while phosphate rock is recommended as a direct application for perennial crops, phosphate fertilizers containing all or most of its phosphate in a water soluble form are preferred for annual crops.

The consumption of TSP for paddy has been increasing steadily from 12.9 thousand MT in 1977 to 36.5 thousand MT in 1986 as given in Table 1. If single super phosphate is used the quantity required per annum would be around 90 thousand MT.

Chatterjee et al (1983) has reported on Partially Acidulated Phosphate Rock (PAPR) prepared from igneous phosphate deposits of India and Sri Lanka. This work has shown that the distribution of the chemical constituents in the Indian phosphate rock and the Eppawela rock phosphate is very similar. He has reported that in the Indian rock phosphate which had an initial P<sub>2</sub>O<sub>3</sub> content of 25.0% and an R<sub>2</sub>O<sub>3</sub> content of 30%, the total P<sub>2</sub>O<sub>3</sub> has increased to 39.5% while the R<sub>2</sub>O<sub>3</sub> has decreased to 3.29% after beneficiation. Similarly, in the Eppawela rock phosphate the total P<sub>2</sub>O<sub>5</sub> has increased from 33% to 39.9% and the R2O3 decreased from 14.03% to 3.5% as a result of beneficiation.

The work by Chatterjee et al (1983) has also shown that 30% acidulation with H<sub>2</sub>SO<sub>4</sub> is optimum for treating Eppawela rock and that the physical characteristics of the product deteriorate only when 40% sulphuric acid is used. The increase in sulphuric acid concentration however was found to increase the water soluble P<sub>2</sub>O<sub>5</sub> from 6.1% to 8.6% and the available P<sub>2</sub>O<sub>5</sub> from 9.9% to 12.9%. The percentage of total P<sub>2</sub>O<sub>5</sub> made water soluble and available also increased from 22.2% to 40.0% with increase in the concentration of the acid Chatterjee et al (1983)

also reports that the growth, dry matter yield and P<sub>2</sub>O<sub>5</sub> uptake by a maize crop using treated rock phosphate is the best with single super phosphate followed by the treated Eppawela rock phosphate and the igneous Indian phosphate rock.

#### Conclusions and Recommendations

The use of Eppawela rock phosphate as a direct application is now recommended for tea except for nurseries, 100% for mature rubber and 50% for immature rubber and is not recommended for coconut. Experiments should be initiated to explore the possibility of utilizing it for immature rubber also. A review should be undertaken on the research which has been conducted on the use of LRP in coconut and if further research is warranted such research should be initiated immediately.

The technology of PAPR manufacture from LRP should be initiated immediately bearing in mind the economic viability of such a project arising out of the high cost of sulphur and the inherent high sesquioxide content in LRP. Field and green house experiment should be started on the use of PAPR on paddy and other short term crops.

#### References

- CHATTERJEE S.C. et al (1983) Evaluation of Low Grade Phosphate Rock Deposits in Indian Context.  
(2) Studies on Important Igneous Deposits of India and Sri Lanka.