

The spring of phosphorus that never runs dry

by H.R.U.D. Bandara

Eppawela phosphate deposit always seems to be an issue. It is always in the talk.... Much water has flown under the bridges and quite flows the Jaya Ganga. Eppawela rock remains in a chilled silence to the sorrows and joys of the people in the area.... Eppawela is well known for its apatite deposit.

This apatite contains phosphorus that has been used as a phosphate fertilizer for more than two decades. Eppawela Phosphate deposit was discovered by Geological Survey Dept. in 1971. It is situated in the village of Eppawela, a very remote area. Present reserve position of the deposit is estimated at 60 million metric tonnes containing about 33.40% of phosphate pentoxide (P₂O₅) and is considered to be one of the richest and unique phosphate deposits in the world. It can be classified as a high-grade ore.

Lanka Phosphate Ltd. was incorporated on 10th July 1992. It is fully owned by the Secretary to the Treasury on behalf of the Government of Sri Lanka.

The Company has exclusive mining rights over 450 hectares of land at Eppawela on which a large rock phosphate (Apatite) deposit is located.

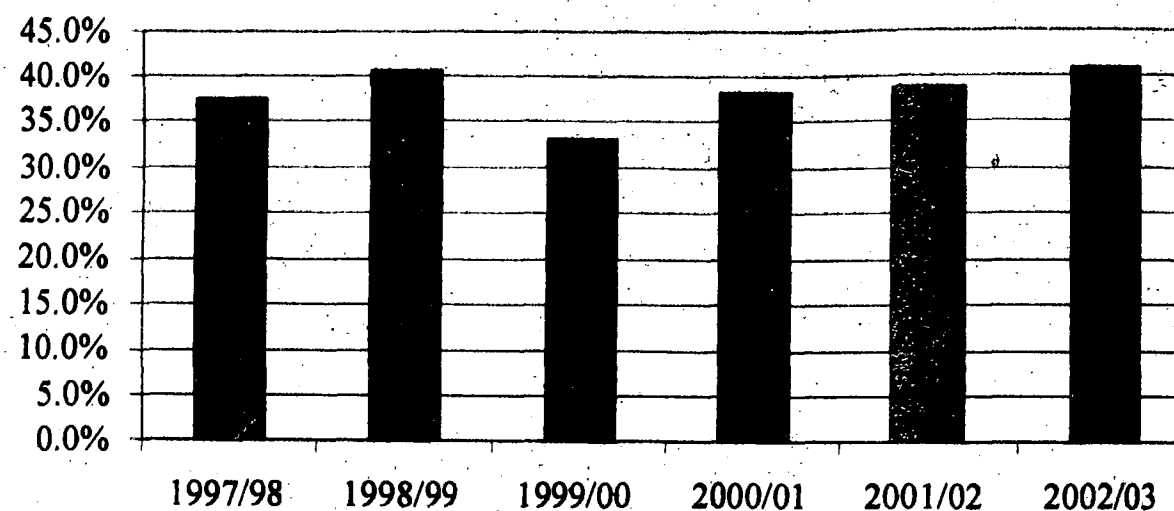
Eppawela is located on the Kekirawa - Talawa Road and is almost 240 Kilometers from Colombo and 130 Km from the Port of Trincomalee. The area falls within the administrative district of Anuradhapura.

Apatite deposits

Phosphorus comes from phosphate rock known as apatite. Phosphate deposits are one of world's scarcest resources. Phosphate rock is the only economical source of phosphorus for production of phosphate fertilizers and phosphate chemicals. There are two types of phosphate deposits i.e. sedimentary type deposits and igneous type deposits. Sedimentary deposits occurred due to upliftment of ancient oceans by earth up-heavals. In these deposits, bones and teeth of early fish species are found. Most phosphate deposits are sedimentary deposits. Igneous type deposits occurred from molten flows as early earth cooled and solidified.

Eppawela Phosphate deposit is an igneous type deposit. The two main Phosphate bearing minerals

MARKETSHARE



in the ore are Chlorofluorapatite and secondary Francolite together with minor amounts of Crandallite. Such meta-sedimentary rock associations are common in the Highland series rocks of the Sri Lanka Precambrian.

The apatite occurrences at Eppawela are found concentrated in the weathered and leached zones of hillocks extending to depths of 30 to 100 m.

The apatite bearing deposit near the surface is composed of a leached zone followed by apatite bearing limestone (carbonate) at depth.

The leached zone is identified as apatite marble. The work already done on the deposit reveals variable compositions with in leached zone of the deposit also among apatite crystals released from the parental rock.

The marble rock formation occurs together with other Precambrian (more than 570 million years of age) rocks such as quartzite, gneisses and charnockites. These rocks from part of a greater rock group known as Highland series. These rocks had been formed initially in Precambrian ocean basins as sedimentary deposits. Later due to the generation of high pressures and temperature in the deeper parts of the sediment piles, metamorphic rocks had formed.

This rock has come to the present position due to process of uplift occurrence through millions of years.

The rock phosphate deposit (Carbonate one) is exposed in the form of six hills rising to a maximum elevation of about 200 meters from

above mean Sea Level and covering a surface area of approximately 150 hectares. The "Ore" which has been identified occurs in the form of a leached zone forming the capping of the six hills. The average thickness of the zone is about 75 meters form the rest of the hills. The "Ore" is currently estimated at 60 million metric tonnes (proven and inferred) containing about 33% - 40% of P₂O₅ and is considered to be one of the richest and unique phosphate deposits in the world.

The phosphate mineral, fluorapatite (3Ca₃(PO₄)₂.CaF₃), is very insoluble and for this reason, drastic chemical treatment with strong acids (Sulfuric Acid, Phosphoric Acid, or Nitric Acid) is necessary to produce soluble phosphate products. Single superphosphate (SSP), Triple superphosphate (TSP), Monoammonium phosphate (MAP) and Diammonium phosphate (DAP) are the major products from phosphate rock acidulation. These commercial fertilizers contain highly soluble phosphorus compounds approaching 100% water solubility. Such phosphorus quickly combines with a variety of constituents of a moist soil. Because of the high reactivity of soluble phosphorus, it moves only a short distance (usually less than an inch) from the point of application.

Biological necessity of phosphorus

Phosphorus is present in every living cell. And without it there would be no life, human, animal or plant. Phosphorus is a vital resource for sustaining world agriculture. Phosphate rock is produced in some 40 countries and out

of which 12 countries have capitalized 92 percent of the world's production.

The United States is the world's leading producer with about 30% of the total production followed by China, Morocco and Russia. The other prominent phosphate production countries are Brazil, Israel, Kazakhstan, Senegal, South Africa, Togo and Tanzania. Eppawela deposit represents less than 1% of world Phosphate reserves.

The phosphorus was first discovered by the German physician, Henning Brandt in the 17th century. Since then the extraction of phosphorus was done from animal urine and the bones until the 19th century.

Phosphorus is one of three nutrients that are essential for plant growth.

Its function cannot be performed by any other nutrient and adequate supply of phosphorus is required for optimum growth and reproduction.

Generally phosphorus deficiency is not visual as Nitrogen, Potassium and Magnesium. When phosphorus is limiting, the most striking effects are a reduction in leaf expansion and leaf surface area. Apart from that the number of leaves is also reduced.

Shoot growth is more affected than root growth, which leads to a decrease in the shoot root - dry weight ratio.

Nonetheless, root growth is also reduced by phosphorus deficiency leading to less mass to reach water and nutrients.

Short and weak roots do not

absorb sufficient Add The spring of phosphorus that never runs dry water and other nutrients to the plant.

Other effects of Phosphorus deficiency on plant growth include delayed maturity, reduced quality of forage, fruit, vegetable and grain crops and decreased disease resistance.

The market

Due to low water solubility of phosphate rock its direct application as a fertilizer is only limited to few crops. Presently, ore is mined and ground to 100 mesh size by two stage grinding to produce Rock Phosphate of fertilizer grade (ERP) for direct application particularly for perennial crops such as tea, rubber, coconut, export cash crops and the fruits. Although application of ERP is not recommended to short form crops due to low solubility.

Eppawela rock phosphate fertilizer (ERP) is the only fertilizer extracted locally except for dolomite. More than 92% of the total fertilizer consumption of the country is done through imports.

A total of around 600,000 mt of fertilizer is used annually. At present the country imports around 550,000 mt of fertilizer annually for the cost of nearly Rs. 7 billion. A rapid increase in the world market price of fertilizers could cause a heavy drain on the foreign exchange reserves. It is therefore necessary to use fertilizers judiciously and to find effective alternative source of local available materials. In this context, the locally available ERP fertilizer has an important role to play. Before the discovery of Eppawela deposit a large amounts of rock phosphates (IRP) were imported.

With the research recommendations rock phosphate imports have gradually come down and instead the use of Eppawela phosphate visibly increased.

Year	Market share
1997/98	37.5%
1998/99	40.5%
1999/00	33.0%
2000/01	38.3%
2001/02	38.7%
2002/03	40.9%

Eppawela rock phosphate fertilizer (ERP) is sold only in the domestic market at present. At present about 40,000 mt of Eppawela phosphate is marketed locally per annum. Tea plantation dominate

55% of the use of ERP and whereas rubber and coconut sectors share 34% of the use. The export cash crops and the fruits mainly share the balance.

At present we market Two types of Phosphate i.e. Eppawela rock phosphate (ERP) and High-grade Eppawela rock phosphate (HERP). The main characteristic feature of HERP is its higher solubility than the Imported rock phosphate now being sold in the market. Despite its higher grade it's available at a very competitive price for you to boost the harvest of tea, rubber, coconut, pineapple, banana, betel, spices and the other export cash crops. The research is being carried out to test the suitability of High-grade Eppawela rock phosphate (HERP) for the 50% substitution of Triple super phosphate (TSP) for paddy and the vegetables

Cropwise use of ERP

Others 11%
Coconut 18%
Rubber 16%
Tea 55%

We feel that there is a scope for increased use of our phosphate at present and in the future as well. Therefore it is necessary to build up end users' confidence in our phosphate as a reliable quality source of Phosphate fertilizer. Closeness to the grower is essential in understanding local conditions and needs at every stage. Thereby it will be much easier for the growers to select the right phosphorus fertilizer at the right time and the right price.

If you could kindly assist us in conveying this message to the grassroots level, it will be a big service to the plantation sector because valuable foreign exchange is being wasted for importing varieties of phosphate where an equally efficient source is available locally. This is a national necessity because our country is an agricultural country. We should appreciate National Fertilizer Secretariat, Research Institutes, Tea Small Holding Development Authority, Planters' Association, Rubber Development Dept., Thuruvaviya Fund, Agrarian Services Department and Coconut Cultivation Board for their continuous support to our efforts in dissemination fertilizer information in the country.

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