Search for technology to maximise pyrite utility in Bihar

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Rapid increase in population growth rate is greatly affecting the economy of the country. The development in the field of food production is required to keep pace with the increase of the population which is added every year, despite the boost provided by green revolution duly aided by the latest water-managemenent techniques, which have largely helped in increasing the agricultural production. Thus our Nation continues to be under the threat of food scarcity even today. To meet the challenge of this threat agricultural output perforce, has to be stepped up from the available land. Besides the existing vast tract of barren land, some of the present fertile land is also becoming barren due to its continuous use. Thus in the present context, need for reclaiming and replenishing the sick alkaline or acidic soils of the country and Bihar in particular is a necessity.

The Figure appended to this paper clearly depicts the areas plagued with acidic and alkaline soils in Bihar.

In order to get the maximum production from such sick soil amendments and correctives to the soils have to be used besides intensive and extensive efforts suited to the requirement of the soil. The conventional raw materials recommended for the purpose are gypsum and lime. Though the use of these materials is well established, yet the working economics are unfavourable and do not help the poor farmer despite the sizeable subsidy offered by the Government in popularising such use.

As against this, some of the sub-grade mineral materials and by-products like marginal grade pyrite and pyrite-waste from Bihar need special attention.

Pyrite-waste from Bihar have been tested on a collaboration basis between I.B.M.,Rajendra Agricultural University, P. P. and C. Ltd., B.H.U. and F.C.I. The results achieved indicate that pyrite can suitably replace gypsum in dealing with the alkaline or saline soils of the State.

Following Table No.1 gives a comparative result of use of Amjhore pyrites vis-a-vis gypsum on yield of paddy sodic soils.

Table No. 1

Original soil (pH)	Treatment	Grain paddy yield
10.6	Pyrite 12.5 tons/hect.	20 times
	Gypsum 12.5 tons/hect.	23 times

The above table thus clearly demonstrates, that Amjhore pyrite not only corrects the alkalinity but also enchances the output from the soils almost equal to that of gypsum. Hence this pyrite can suitably be utilised as an effective alternative to gypsum. Unfortunately, the favourable results obtained have not been promoted further. There is however a wide gap between the preliminary test result and its utility on a large scale. It is therefore necessary to enlarge such agricultural use of pyrite. A huge reserve of 300 million tonnes of pyrite lies at Amjhore in Rohtas district of Bihar which is hardly being utilised on commercial basis. This idle reserve can expect to have a potential market for upgrading the sick-soils of the country and Bihar in particular.

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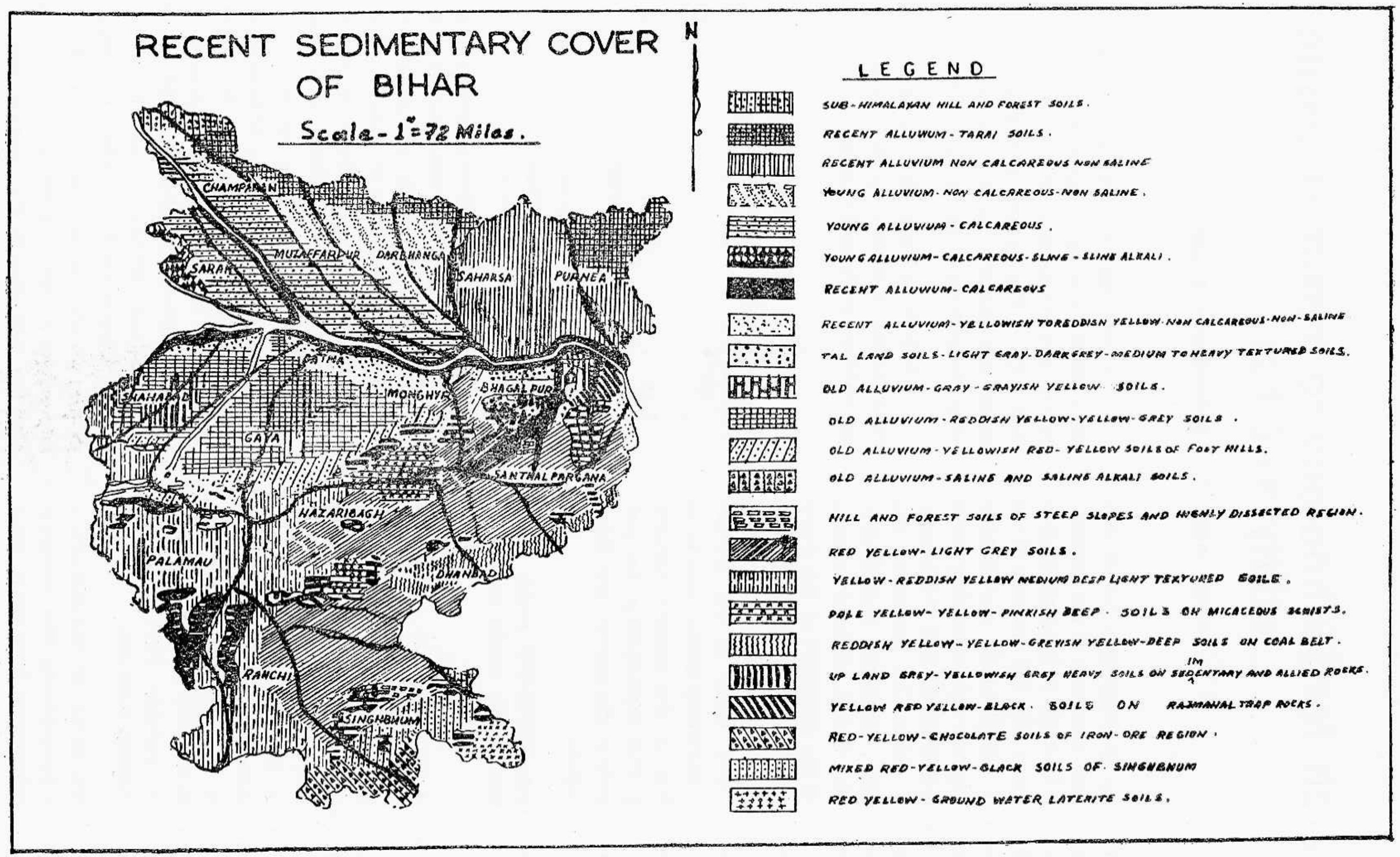
RECENT SEDIMENTARY COVER OF BIHAR
Scale - 1" = 72 Miles.
N
LEGEND
SUB-HIMALAYAN HILL AND FOREST SOILS.
RECENT ALLUVIUM - TARAI SOILS.
RECENT ALLUVIUM NON CALCAREOUS NON SALINE
YOUNG ALLUVIUM - NON CALCAREOUS - NON SALINE.
YOUNG ALLUVIUM - CALCAREOUS.
YOUNG ALLUVIUM - CALCAREOUS - SLINE - SLINE ALKALI.
RECENT ALLUVIUM - CALCAREOUS
RECENT ALLUVIUM - YELLOWISH TOREDDISH YELLOW - NON CALCAREOUS - NON - SALINE
TAL LAND SOILS - LIGHT GRAY - DARK GREY - MEDIUM TO HEAVY TEXTURED SOILS.
OLD ALLUVIUM - GRAY - GRAYISH YELLOW SOILS.
OLD ALLUVIUM - REDDISH YELLOW - YELLOW - GREY SOILS.
OLD ALLUVIUM - YELLOWISH RED - YELLOW SOILS OF FOOT HILLS.
OLD ALLUVIUM - SALINE AND SALINE ALKALI SOILS.
HILL AND FOREST SOILS OF STEEP SLOPES AND HIGHLY DISSECTED REGION.
RED YELLOW - LIGHT GREY SOILS.
YELLOW - REDDISH YELLOW MEDIUM DEEP LIGHT TEXTURED SOILS.
PALE YELLOW - YELLOW - PINKISH DEEP SOILS ON MICACEOUS SCHISTS.
REDDISH YELLOW - YELLOW - GREYISH YELLOW - DEEP SOILS ON COAL BELT.
UP LAND GREY - YELLOWISH GREY HEAVY SOILS ON SEDENTARY AND ALLIED ROCKS.
YELLOW RED YELLOW - BLACK SOILS ON RAJMAHAL TRAP ROCKS.
RED - YELLOW - CHOCOLATE SOILS OF IRON - ORE REGION.
MIXED RED - YELLOW - BLACK SOILS OF SINGHBHUM
RED YELLOW - GROUND WATER LATERITE SOILS.
CHAMPARAN
SARAN
MUZAFFARPUR
DARBHANGA
SAHARSA
PURNEA
SHAHABAD
PATNA
MONGHYR
BHAGALPUR
GAYA
SANTHAL PARGANA
HAZARIBAGH
PALAMAU
DHANBAD
RANCHI
SINGHBHUM

Equally important is the need for proper utilisation of Amjhore pyrite. The deposit has a total reserve over 300 million tonnes having 40% sulphur, out of which 20 million tonnes is of proved category. In addition, the pyrite ore reserves are overlain by pyritiferous shales containing about 10% sulphur which are estimated to be about 1500 million tonnes. Thus the total reserve of sulphur is around 270 million tonnes in Amjhore area which happens to be one of the largest sulphur reserves in the world.

Normally to manufacture 1 tonne P_2O_5 i.e. 2.17 tonnes of tripple super-phosphate having 46 percent P_2O_5, requirement of raw material is as follows :

Pyrites of 40 % S. content	—	1.9 tonnes.
Rock phosphate of 32% P_2O_5 content	—	3.2 tonnes.
Coal	—	0.27 tonnes.

Pyrite and coal are available in plenty in this state. Apatite is also available in Singhbhum district. It requires beneficiation. Therefore, there is ample scope to manufacture such fertiliser in the state.

Amjhore pyrite mines were developed as captive mines for supplying pyrites to Sindri Fertilisers for manufacturing sulphuric acid. With an investment of about Rs. 7.5 crores and an employment for 1800 men, the Amjhore mines are now facing an almost closure, because sulphuric acid plant at Sindri, to the contrary, has not been designed to take Amjhore pyrites for the production of sulphuric acid.

F.C.I had commissioned M/s Kemira Oy., of Finland for an end to end survey and they have given indications that the Amjhore pyrites could be effectively utilised in the plant at Sindri. The technology for production of sulphuric acid from Amjhore pyrites is also available with M/s. Lurgi Chemie of West Germany. Both the above technologies need to be tested in our country.

Whatever may be the technology, there is need to adopt a process which have a fool-proof system to control major pollutants viz sulphur dioxide, sulphur trioxide and acidmist. This is specially essential after our recent worst experience of gas leakage in Bhopal in Madhya Pradesh.

In the existing Sulphuric Acid Plant of 200 t. p. d. capacity the Indian standard for sulphur-dioxide emission is 4 kg. per tonne acid which is on higher side compared to standard of emissions adopted by U K, USA, West Germany and Japan.

Inspite of favouraole indications from M/s Kemira Oy and M/s Lugri Chemie, FCI has taken a decision to have a plant based on imported elemental sulphur. This would mean a heavy investment of precious foreign exchange which the country can ill-afford.

It also appears that a fertiliser plant at Paradeep has been planned on imported elemental sulphur. Here also it is felt proper that the economics of producing acid at Amjhore itself from the pyrites and then transporting it to Paradeep for use in the production of phosphatic fertilisers need to be very carefully examined considering the expenditure of heavy foreign exchange likely to be involved.

All these points lead us to a conclusion that it would be in the national interest to fully develop and exploit the huge reserves of pyrites available at Amjhore in Bihar. In this connection, it would be worthwhile to consider either production of sulphuric acid at Amjhore to feed both Sindri Fertilisers and Paradeep Fertilisers or to have an integrated phosphatic fertilizer plant at Amjhore.