AGROMINERAL RESOURCES OF PAKISTAN: AN URGENT NEED FOR FURTHER SUSTAINABLE DEVELOPMENT

M. S. Malkani[1], S. Qazi[2], Z. Mahmood[3], M. H. Khosa[4], M. R. Shah[5], A. R. Pasha[2] and M. I. Alyani[3]
[1]*Geological Survey of Pakistan, Muzaffarabad, Azad Kashmir*
[2]*National Centre of Excellence in Geology, University of Peshawar*
[3]*Geological Survey of Pakistan, Sariab Road, Quetta*
[4]*Department of Marine Geology, Lasbela University of Agriculture, Water and Marine Sciences, Uthal, Lasbela, Balochistan, Pakistan*
[5]*Department of Earth Sciences, CIIT, Abbottabad Campus, Abbottabad, Pakistan.*
malkanims@yahoo.com

Abstract

Pakistan is an agricultural country and fertility of cultivated lands is vital. Calcium (Ca) along with nitrogen (N), phosphorous (P) and potash (K) are key elements for plant nutritions. The **marl and limestone** (for Ca source) as fertilizer dates back to first century AD and Romans were aware to use in their lands for the better growth of their cereals with MgO content less than 10%. Generally pulverized limestone/dolomitic limestone in the size range 0.2-1mm is frequently added to a compound fertilizers upto 10%. It helps to neutralize acidity arising from nitrogenous compound (ammonium sulphate/nitrate and urea), neutralizes any free acid in the superphosphate components and contributes small amounts of Ca and Mg as plant nutrients. High calcium limestone is not widely used in fertilizer formulations. The shortage of phosphate resources demands for their explorations especially in the Indus Basin. The medium to high grade phosphate deposits are small but low grade showings of phosphate and potash bearing rocks/formations are very large. These rocks can be shifted on cultivated lands for testing. Hazara area hosts well known **phosphate deposits** (for P source) as for indigenous phosphate use and save valuable foreign exchange. Phosphate occurs in cherty dolomite of Cambrian Abbottabad and Hazara formations, and silty calcareous phosphorite of Hazira Formation northeast of Abbottabad, along the western flank of Hazara Kashmir syntaxes. The phosphorites are of pelletal type and commonly contain cellophane, dahlite, francolite, glaucophane, dolomite, iron oxide and pyrite in various proportions. **Kakul-Mirpur** area covers 13 sq. km area in the 9.5 km east of Abbottabad. The phosphorite horizon has a strike length of 516-607m with average thickness of about 4.5m. In this region there are two phosphorite horizons, an upper one at the contact of Hazira and Abbottabad formations and a lower one in the cherty dolomite of Abbottabad formation. This deposit has 1.08 million tons/mt with P_2O_5 content variation from 14 to 32%. **Kalue-de-Bandi and Lagarban area** is 40km northeast of Abbottabad. The phosphorite is found on the both limbs of syncline. Western limb has 3,033m and eastern limb 1,062m outcrop length with 3 to 8m variable thickness. Southward near Kalue-de-Bandi, 32m below the main deposit, another 305m phosphorite horizon is exposed. The P_2O_5 content of these deposits varies from 19 to 39%. The Kalue-de-Bande has 8.3mt with P_2O_5 content 24-34%. The Lagarban has high grade 0.3mt ore with P_2O_5 content 31% and low grade 1.7mt ore with P_2O_5 content of about 21%. **Dalola area** is located 6km south of Garhi Habib Ullah. There are three phosphorite horizons in the Hazira Formation with length of 1692, 152 and 303m with variable thicknesses of 3 to 23m. This deposit is different from others. It is black, dense, silty, calcareous, cherty, non pelletal and contains small amounts of manganese. The reserves are 9.2mt with variable P_2O_5 content 9 to 17 %. **Sirban Hill** area is 6km from Abbottabad and has 455m strike length and

3.9 to 3.6m thickness. The reserves are 1.9mt with variable P_2O_5 content 3 to 25 %. In **Minind area**, the SDA developed a mine near Kakul. A crusher was also installed at site and material was supplied to the National Fertilizer Corporation (NFC) at their Haripur Plant. Further ground rock phosphate was also supplied to NFC plant at Jaranwala. The SDA developed another mine at Rehala in the Tarnavi-Lagarban area for supply of 60,000 ton of rock phosphate to NFC Haripur Plant annually. Thin to thick phosphatic cherty beds are known from **Soban Gali, Paswal Mian and Banseri area** of Abbotabad hosted by Early Cambrian Abbotabad and Hazira/Galdaian formations. The P_2O_5 content of these deposits varies from 25-40% in the Ilyas and Banseri mine areas. The phosphate seems to be anomalous in green and black shale and greenish grey sandstone of Mughalkot formation and green to greenish grey shale and greenish grey to red spotted and red wavy laminated sandstone of Rakhi Gaj (both Girdu and Bawata members) formation. Phosphate is reported from Rakhi Gorge (in Sangiali and Rakhi Gaj Formations) and Mari-Bugti hills of eastern Sulaiman foldbelt. Phosphatic nodules in black and green shale and sandstone of Mughalkot formation of Gharwandi (Alu Khan Kach) and other areas of eastern Sulaiman foldbelt have been found. Cherty beds significant for phosphate exploration are common in the Cretaceous and Jurassic limestones of Khad Kucha of Mastung district and Chiltan, Takatu and Murdar Ghar of Quetta district of western Indus Suture and also in Loralai areas of Sulaiman foldbelt. Qureshi et al. in 2000 reported phosphate (apatite; P_2O_5 2.5-12.6%) and rare metals from Loe-Shilman of Khyber Agency.

Black bituminous shale, chert and other siliceous rocks are best host of phosphate and these are frequently found in Indus basin of Pakistan and further exploration should be accelerated because Pakistan is an agricultural country. Stanin and Hasan (1966) reported negligible phosphate showing in Pabni Chawki and Naka Pabni areas. The Tertiary, Cretaceous and Jurassic sequence in Sulaiman range were studied by Stanin and Hasan in 1966. They found nodules with 5% P_2O_5 in Domanda and Drazinda shales, which are encouraging for further study. The Rakhi Gaj area show nodules with 5-20% P_2O_5 in Sangiali group (Sangiali, Rakhi Gaj and Dungan formations) and lower Ghazij/Chamalang group (Shaheed Ghat shale). Phosphatic nodules in Late Cretaceous Mughalkot formation near Indus Suture in Kurgil area of Karim Kach River are found. It has been reported from the Cretaceous sequence near Kohat (Chichali Formation), near Chhoi in Kalachitta Range (Kawagarh Formation), Paleocene and Eocene rocks in the Salt range (Patala Formation), Eocene Chamalang group, and Paleocene Sangiali group (Sangiali and Rakhi Gaj formations) in the Sulaiman foldbelt, and Oligocene sequence in the Southern Kirthar range (Nari Formation). There is little or no economic value due to its low P_2O_5 content but indicates for large deposits. **Potash salts** (K_2O 9-14.4%) are associated with rock salts in Punjab and KPK and also lake salt in Sind. So far brine is being produced from Punjab. **Gypsum** has multi-uses like soil conditioning, cement resources, plaster of paris, etc and its huge deposits are found in Pakistan The use of marl and limestone as fertilizer for the fertility of agricultural lands in Pakistan is negligible and demands for vast usages. The shale with anomalous phosphate can be used directly for fertility of lands. Further try should be made to produce indeginous fertilizer and large money will be saved by reducing imports.