Phosphorus is needed to improve the soil fertility for crop production in large areas of our country. High cost of conventional, water soluble P fertilisers often restricts their use by resource poor farmers. It is thus necessary to seek alternative P fertilisers that are both agronomically and economically effective in crop production. Finely ground phosphate rock (PR) has been tested and used for direct application on acid soils of the country as a low cost alternative. However, direct application of PR with low reactivity does not give satisfactory results. Partial acidulation of PR or compaction of PR with water soluble P fertilisers represents a means of producing agronomically effective P sources from indigenous PR sources that may otherwise be unsuited for use as a fertiliser. With this background the present investigation was undertaken with the following objectives.

1. Chemical characterization of compacted PR.
2. Reactivity of compacted PR.
3. Effect of organic manuring and soil reaction on P use efficiency from compacted PR.
4. Multi-location field trials to evaluate the efficiency of compacted PR as a P source for crops.

1. Chemical characterization of compacted PR:

The chemical analysis of compacted PR (CPR) revealed that the total P content varied from 7.5 to 11.4 per cent with water solubility ranging from 10.0 to 33.9 per cent of total P whereas citrate soluble P varied from 0.25 to 5.76 per cent of total P. Water soluble as well as citrate soluble P were very low in phosphate rock. S content in compacted PR varied from 1.29 to 7.28 per cent while Ca, Mg, K and Fe content were present in the range of 25.1 to 32.6, 2.88 to 4.92, 0.84 to 1.51 and 0.2 to 0.34 per cent, respectively. Fe, Mn, Zn, Cu were present in fairly low amounts in both PR and CPR.

2. Reactivity of compacted PR:

Three successive extractions of compacted PR with 2% citric acid released more P than by Ammonium citrate and water. 22.8 to 47.8 per cent of total P in the phosphate rock was extracted by water whereas 31.2 to 52.9 and 49.7 to 63.6 per cent were extracted by NH₄ citrate and citric acids, respectively in three successive extractions.

3. Effect of organic manuring and soil reaction on P use efficiency from compacted PR:

In pot culture studies, it was found that as a source of P, compacted PR was significantly superior to PR in terms of dry matter yield and nutrient uptake by soybean crop. Land situation and organic matter was found significant in affecting dry matter yield, nutrient uptake and nutrient status of post harvest soil. All possible interaction between P-source, land situation and organic matter was found non-significant in affecting yield, uptake and nutrient status of post harvest soil.
4. Multilocation field trials to evaluate efficiency of compacted PR as P source for crop:

At Ranchi, in kharif non-significant resource was recorded during first year while in second year significant response was observed in terms of grain yield and nutrient uptake (Ca, P and S). Soybean grain yield was highest (13.8 q/ha) in SSP treated plot which was at par with JPR(B)+ SSP (13.1 q/ha), in Rabi significant response was observed during both the years. Grain yield and nutrient uptake of wheat with compacted PR were significantly higher than either JPR(A) or JPR(B). Among the different compacted PR materials, grain yield of wheat followed the order: JPR(B) + SSP > JPR(A) + SSP > JPR(B) + MAP > JPR(A) + MAP > JPR(B) + MAP + S > JPR(A) + MAP + S.

At Dumka and Darisai, crops grown were groundnut-wheat. Significant response to P application was recorded in terms of yield and uptake during both the years. Among compacted PR materials during kharif, JPR(A) + MAP produced highest pod yield (27.0 q/ha) at Dumka while at Darisai it was JPR(A) + SSP (15.2 q/ha). During Rabi JPR(A) + SSP (32.6 q/ha) at Dumka and JPR(B) + SSP (20.8 q/ha) at Darisai produced higher grain yield of wheat.

Significant increase in available P and S status of post harvest soils with use of compacted PR treated plots were recorded at all the three locations. No significant change in exchangeable Ca and organic carbon levels was observed in phosphate rock or compacted PR treated plots.