MGNREGA: Investment in Soil Systems Asset Creation

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Preserving and enriching soil and associated natural resources within the framework of MGNREGA and employment generation is a way of ensuring and enhancing individual and national productivity in the future

Apart from its people, the asset that has most fundamentally nurtured the productivity and sustainability of Indian civilization over the millennia has been its soil and associated natural resources. The abundance and diversity of India's flora and fauna (both macro and micro) and the adequacy of its hydrological cycles all depend, as do humans, upon the fertility and functions of the soil. All sectors of the economy rest directly or indirectly upon the food and material produced, and the employment and income created by agricultural pursuits. These cannot succeed without well-functioning soil systems that make other factors of production efficient and productive.

The soil systems of India are, thus, the most basic material asset of the country, and yet they have been tragically depleted and diminished over centuries of use and misuse. The most salient parameter for evaluating this is the loss of soil organic matter (SOM), which provides the essential source of energy for the myriad soil organisms that make inert mineral material into dynamic and productive soil systems. SOM has the advantage of making soil more absorptive and retentive of water, an increasingly scarce and crucial resource as a result of the changing climate. Water absorption and retention have the added benefits of reducing soil erosion and abating the damages from flooding. So more robust and better-functioning soil systems not only create value by increasing agricultural productivity but also protect values and assets, which would otherwise be lost, and diminish costs imposed by natural disasters.

MGNREGA serves the dual objectives of creating employment and income opportunities for Indian men and women living below the poverty line, who direly need enhanced income streams to lead acceptable lives, and of creating assets that put their labour to good use that enhances individual and national productivity in the future, making India as well as its citizens more productive and secure.

This proposal is to recognize and support the development and restoration of soil systems as a focus for MGNREGA employment and asset creation. This can be done quite simply and reliably by the collection, processing and application of decomposed biomass, vegetative and/or animal, to soils that are deficient in SOM.

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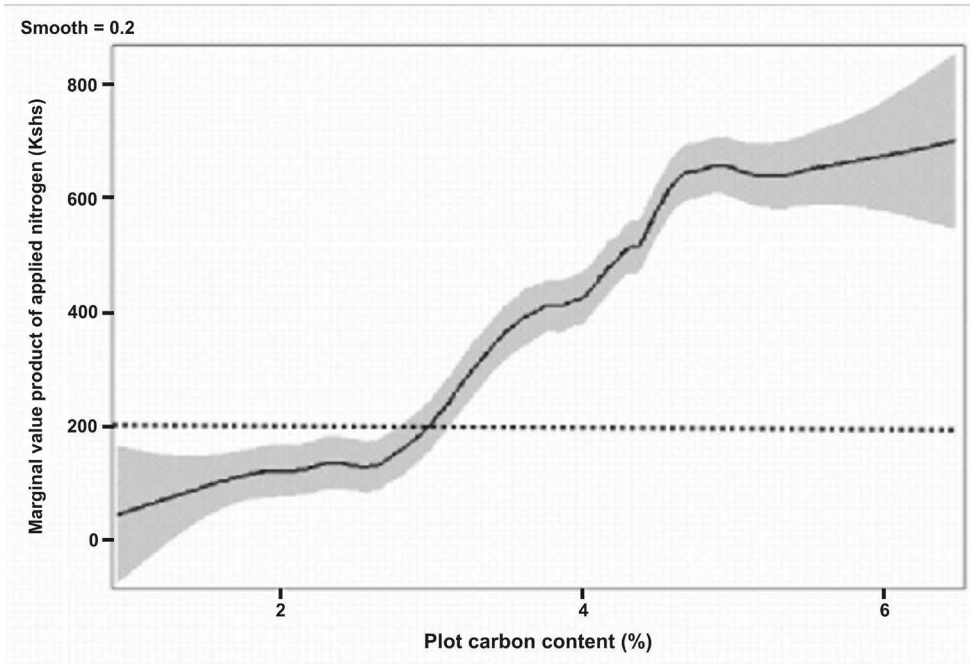
Indian soils, cultivated for centuries and sometimes millennia, and in recent years less resupplied with organic matter and plied with inorganic nutrients that further diminish SOM and nutrient reserves, have some of the lowest levels of SOM in Asia. Whereas a normal range would be 2 to 6 per cent, many soils in this country have less than 1 per cent SOM.

When SOM levels are so low, there is little economic response to the application of inorganic nitrogen fertilizers. The increase in production obtainable from such fertilizers is less than their cost. A study done in Western Kenya (P.P. Marenya and C.B. Barrett, Agricultural Economics, 2009) found that until the levels of soil organic carbon, a main component of SOM, were at least 3–4 per cent, the marginal economic return from applying nitrogen fertilizer on small-holder plots was negative. One reason subsidization to lower fertilizer prices is necessary to promote its use is that applying fertilizer is not actually profitable on soils that are deficient in SOM. Sufficient stocks of SOM are needed for chemical fertilizers to be productive; it cannot, by itself,

Figure 1: Estimated Marginal Value Product of Nitrogen Fertilizer (Kshs/kg N) Conditional on Plot Soil Nitrogen Content



Source: Marenya and Barrett, Agricultural Economics, 2009

be a substitute for the soil's endowments of SOM.

How do we build stocks of SOM? Whereas animal manure is a source of higher quality organic matter for soil enrichment, vegetation biomass that is well-decomposed can support the multiplication of soil organisms that are needed for fertile soil systems. These organisms mobilize and cycle nutrients within soil systems whereas compost restores the micronutrient supplies that are essential for the metabolism of plants.

Most non-arable areas have a good supply of biomass, a renewable resource, which can be collected and processed, along with crop residues from arable areas, to manufacture compost. In many situations, the supply of biomass (grasses, shrubs, weeds, tree branches, etc.) can be augmented by the growing of appropriate plant species on non-arable areas (wastelands), benefiting from the solar energy and rainfall that would otherwise not be utilized. Planting fast-growing leguminous trees and shrubs is beneficial because these have the advantage of nitrogen content in their vegetation and also of nitrogen-fixation in the soil.

For rapid and effective decomposition, one critical step in the process is the shredding of the vegetative biomass into small pieces, breaking the protective surfaces that plants have on their leaves, stems and roots, so that microorganisms can more quickly break down the organic matter into its constituent tissues and molecules. Appropriate implements and tools, possibly some of them motorized, will make labour much more efficient and can reduce the drudgery; efficient wagons, wheelbarrows or other simple vehicles will be helpful, for cutting, transporting, shredding, decomposing and applying material on a large scale. It is difficult to 'overdose' soils, especially deficient ones, on organic matter.

Work can be denominated and compensated in terms of the volume of material collected and processed into compost for soil enrichment. The objective, however, is not just to apply material to the soil but to build up soil organic matter, a measurable quantity. Soil testing could establish pretty simply a baseline level for a particular field (needing sampling within the field because there can be considerable variability). To the extent that reliable measurements and validation can be done, this activity could demonstrate carbon sequestration, which has value for mitigating climate change, a growing concern.

Agronomists who work on soil evaluation could advise on the methods of measurement and validation necessary to determine the amount of work done in collecting, processing and applying compost and to document soil fertility improvements as a result of compost applications. To the extent that the MGNREGA participants are compensated for improving the fertility of land that they own or rent, there will be incentive to do this work effectively.