Briefing

Food and agriculture, sustainable markets

Keywords:
Agriculture, agroecology, food security, markets, sustainability

iied

PRACTICAL ACTION

Issue date
December 2016

Policy pointers

Ensure that organic fertilisers are given equal priority to chemical fertilisers in policies, subsidies and extension.

Take an integrated approach to the systemic problem of declining soil fertility by harnessing agroecological farming practices such as crop rotations, the use of diverse sources of organic matter, and balanced applications of organic and inorganic fertilisers.

Create well-functioning value chains for organic fertiliser through long-term dialogue and joint action by multiple stakeholders, facilitated by NGOs.

Give agro-retailers incentives to sell organic fertilisers and composts and train them in their importance so that they can pass this knowledge to farmers.

Fertile ground: harnessing the market to reverse soil degradation in South Asia

Soils are the foundation of all terrestrial life on the planet and are essential for agricultural production. Yet unsustainable farming practices are degrading soils across South Asia and many other parts of the world, threatening food security. Soil fertility and structure can be vastly improved through greater applications of compost, manure and other organic fertilisers. However, the shift away from diverse farming systems means that organic matter is now in short supply on many farms. There is a need to develop value chains to enable organic fertilisers and composts to supply much needed organic matter to depleted soils. Lessons from multi-stakeholder initiatives in Bangladesh and Nepal illustrate the potential for scaling up such value chains to foster more inclusive and sustainable agriculture.

According to the Food and Agriculture Organization (FAO), one third of the world's soils are moderately to severely degraded.[1] Soil degradation is often a result of: intensive cropping systems involving monocropping; the overall reduction of crop residues in improved cereal varieties; the reduction of rotations and fallowing; the continuous application of chemical fertilisers without commensurate additions of compost and other organic fertilisers; nutrient mining in some smallholder agricultural systems; and compaction by heavy machinery. Such practices lead to a decline in soil organic matter and a change in soil structure that reduces water retention and microbial activity. These effects in turn diminish agriculture's ability to withstand drought and climate change, and the soil's ability to provide nutrients to plants. They also contribute to pollution and soil erosion.[2]

One solution to this problem is to improve soil fertility through greater applications of compost, manure and other organic fertilisers. However, organic matter in rural areas of South Asia is often in short supply. Mechanisation has replaced draught animals with tractors, livestock rearing is in decline and crop and animal residues tend to be used mostly for fuel and fodder rather than returned to the soil. Moreover, powerful commercial interests promoting agrochemicals and a prevailing mindset geared towards maximising yields through the use of external inputs tend to drive government policy, technological innovation and agricultural investment. As a result of all these trends, not enough organic matter is making it back to the fields to sustain healthy soils.

This paper describes recent initiatives in Bangladesh and Nepal to address declining soil fertility and promote sustainable agricultural practices by scaling up the use of organic matter. By taking a market-based approach involving the promotion of 'organic fertiliser value chains' (Box 1

Markets for commodities like organic fertiliser do not magically materialise; they need to be developed, in some cases by NGOs

and Figure 1), and engaging with policy and the private sector, the initiatives offer a realistic, cost-effective and palatable solution for governments seeking to ensure food security and maintain the stability of national food production.

Innovative ways of enhancing collaboration can boost soil fertility

As elsewhere in South Asia, the declining health and fertility of soils is an urgent issue in Bangladesh and Nepal. Both countries once had a rich tradition in, and knowledge of, the use and value of manure and compost. However, the agriculture sector across lowland South Asia has been transformed by the Green Revolution — a package involving high-yielding varieties, irrigation (where possible), fertilisers, pesticides and mechanisation. While Green Revolution technologies have led to major increases in productivity, which have lowered food prices and enabled food production to keep pace with rapid population growth,[3] there is a limit to how much agricultural yields can increase when only chemical fertilisers are used. Productivity eventually slows and then stagnates. As soil fertility deteriorates, farmers have to use ever greater amounts of chemical fertilisers to maintain the same yields.[4]

Today, both countries are facing widespread soil impoverishment, yet urgently need to maintain the stability of food production in the face of high population growth and climate change. In order to improve soil quality and maintain yields, chemical fertilisers need to be balanced with greater applications of compost, manure and other organic fertilisers. However, organic fertilisers are not widely used in Bangladesh and this is resulting in low organic matter content in soils.[5] Soil organic matter content is now less than two per cent in many areas, whereas it should ideally be between four to five per cent.[6]

These impacts are driven by a national policy to support the use of chemical fertilisers. Farmers often use chemical fertilisers indiscriminately without adequate information on actual soil or plant requirements and do not follow the recommended dose. Over-application of some nutrients and under-application of others have had a significant negative impact on agricultural soils over the years and large swathes of soil are losing productive capacity.

Similarly, in Nepal today the majority of the intensively farmed lowland (the terrai) is largely dependent on chemical fertilisers. While government policy in Nepal is to increase soil organic matter content to four per cent from the current average of less than one per cent, recommendations and strategies to increase the use of organic fertiliser often clash with policy advice and perceptions from a generation of scientific experts schooled in Green Revolution technologies.

There is large untapped potential in both countries for the production of a variety of organic fertilisers. Growing cities, business activity and consumption patterns are leading to burgeoning solid waste volumes, suggesting a rich source of organic waste for recycling into fertiliser. New forms of organic fertilisers — such as vermi-compost and granular fertilisers — are increasingly being manufactured in both Bangladesh and Nepal. But these remain isolated and small-scale initiatives.

In both countries, the international NGO Practical Action has helped bring together — at both district and national level — a range of actors including organic fertiliser and compost manufacturers, government agencies, district extension staff, farmers' groups and others interested in increasing the use of organic fertilisers and composts. Through regular multi-stakeholder meetings, the issues have been explored and action plans developed and implemented with the goal of building national organic fertiliser value chains (Figure 1). Detailed research has identified the main obstacles to well-functioning value chains for organic fertilisers in both countries. These include contradictory policy signals, such as subsidies for chemical fertilisers; poor awareness of soil fertility problems; burdensome licensing procedures and unrealistic standards; weak capacity among companies; the complexities involved in securing sufficient quantities of raw materials from multiple sources;[7] and low demand (Table 1).

Practical Action's long-term 'collaborative mechanism' process of multi-stakeholder dialogue and action has helped to coalesce individual initiatives and untapped potential into wider initiatives.

In Nepal, the Soil Management Directorate (SMD) of the Ministry of Agriculture Development had already been intensively supporting the emerging organic fertiliser industry. However, these

Box 1. What is an 'organic fertiliser value chain'?

An organic fertiliser value chain is the full range of activities involved in converting waste (kitchen waste, municipal waste), farmyard manure, crop residues, and other organic materials from their raw state to a form of fertiliser that can be safely used in food production, and adding value to it in the process. It includes collection, processing, sale, transport, use and awareness-raising by the multiple actors involved in each 'link of the chain.'

industries were not fulfilling their capacity due to weak institutional and managerial conditions and a lack of demand. The collaborative mechanism has inspired SMD to establish new connections among companies and District Agriculture Development Offices, as well as to take practical steps such as leading farmers for organic fertiliser trials and extending soil testing services. SMD and market actors have also started engaging more actively. This national collaborative mechanism is being mirrored locally in three districts of the Kathmandu valley — a high-potential vegetable producing area supplying the booming urban market. Key drivers for change include strong political will, and to some extent public awareness of environmental hazards and soil degradation. To date, the process has attracted a great deal of interest and support, and stimulated action plans involving a range of actors, including organic fertiliser and compost manufacturers, district extension staff, farmers' groups and others.

In Bangladesh, the development of national collaborative mechanisms has been very different, driven by several years of innovation and multi-stakeholder dialogue at district level. This has included: demonstration plots for organic fertiliser in farmers' fields; hand-outs for farmers on the recommended doses of organic fertiliser for different crops; providing soil testing services; supporting vermi-compost production by farmers; trying to ensure that organic fertilisers are made available by agro-retailers; and manufacturing compost from urban waste. While some fertiliser companies have already started producing organic fertiliser and small-scale NGOs have also been successful in promoting organic fertilisers locally, they lack a compelling and sustainable business model. Key barriers are: a weak supply chain; inefficient production; and little interest from business conglomerates to enter into this sub-sector combined with greater interest in chemical fertilisers. A viable business model linking urban waste recycling with the large-scale fertiliser market is also yet to develop.

Research in Bangladesh involved market mapping and cost-benefit analysis to assess: a variety of business models; potential demand for organic fertilisers including composted human waste (dried faecal sludge); the key private sector actors in the organic fertiliser business; and financing and funding opportunities for private sector partners. The outcome of both district and national level learning has been a renewed national dialogue on

Figure 1. The role of different actors in organic fertiliser value chains

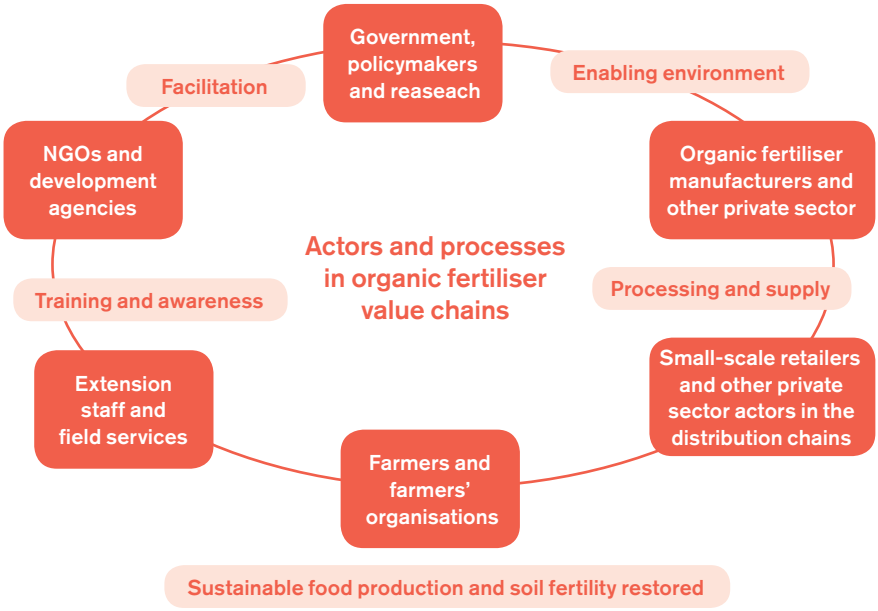

Table 1. Organic fertiliser in Bangladesh and Nepal compared

Chain link	Bangladesh	Nepal
Source of chemical fertiliser (NPK)	Manufactured in the country and imported	Imported: heavily influenced by Indian markets and policies
Policy environment	No government policy or financial support for organic fertiliser manufacture or use No subsidy available for organic fertiliser but exists for chemical fertiliser	Favourable government support for organic fertiliser manufacture and use; subsidies for production (50 per cent subsidy on equipment for commercial producers and direct subsidies to farmers for on-farm compost)
Quality and standards	Standards or recommendations exist for composition of organic fertiliser Adulteration and quality control are big issues Monitoring systems for organic fertiliser quality are weak	
Licensing	Lengthy licensing procedure that requires three field trials	Provision for temporary licensing that requires only two field trials
Raw materials	Segregation and compost production from organic waste are being piloted and tested. Limited testing and commercial development of faecal sludge-based compost (though cultural stigmas are an obstacle)	Well-developed systems for separation and use of urban waste. Traditional use of human waste in agriculture (decomposed soil from pit latrines)
Supply chain	Not at all developed	Somewhat developed

Box 2. Six key recommendations to restoring soil fertility

1. Give organic fertilisers equal priority to chemical fertilisers in policies, subsidies and extension.
2. Give retailers (and wholesalers) the incentives to sell organic fertilisers and composts alongside chemical fertilisers, and the knowledge about how to use them properly so they can educate farmers.
3. Provide technical assistance to existing organic fertiliser companies in quality control, business plans, labelling and marketing.
4. Streamline the licensing process for organic fertilisers to require fewer field trials and shorten the processing time.
5. Increase farmers' capacity to produce fertilisers and compost on-farm through training and extension.
6. Take an integrated approach to increasing soil organic matter, balancing applications of organic and inorganic fertilisers and adopting more agroecological farming.

the policies, regulation and research needed to nurture organic fertiliser value chains.

In both countries, there has been substantial buy-in from a range of stakeholders, including government agencies, companies, NGOs and farmers. There has been some success in increasing the availability of, and demand for, organic fertilisers and composts, although this is inevitably a long-term process and is still at an early stage.

Towards a virtuous soil fertility cycle

Unless a workable solution is found, the vicious cycle of over-reliance on agro-chemical inputs and inadequate additions of organic matter will continue to deplete soils, increase vulnerability to drought and variable weather, and contribute to polluting and environmentally degrading farming. To break this vicious cycle, farmers and policymakers need to focus on maintaining soil fertility, which in turn requires greater attention to soil organic matter and the value chains that can supply it in large enough quantities. This will include building awareness of soil fertility problems, simplifying licensing procedures and unrealistic standards, building capacity among companies, securing sufficient quantities of raw materials from multiple sources, and stimulating demand (Box 2).

One of the key lessons of this case study is that such value chains do not simply materialise by themselves. They need to be nurtured over time, and require action by multiple stakeholders. For example, agro-retailers play a vital role as they are often the first or only technical advisors available to farmers and have a strong influence on the inputs that farmers purchase.

Civil society organisations such as Practical Action have a crucial role to play in initiating and growing poorly developed value chains. Governments cannot do this alone, as they are often too sectorally partitioned to bring all the different actors together. Farmers' interests also need to be borne in mind. Therefore, collaborative mechanisms ideally need to be spearheaded by a civil society entity that is knowledgeable and well respected by all the parties involved, at least until the value chain is sufficiently well developed to become self-sustaining.

At the same time, fertilisers are only part of the answer to the problem of declining soil fertility in countries such as Bangladesh and Nepal. A large part of the solution lies in adopting more agroecological practices such as zero tillage, crop rotations, inter-cropping, legumes, cover crops and mulches. These practices protect and enhance soil fertility over time and are cheaper for farmers than buying fertiliser or compost.

Seth Cook, Chris Henderson, Menila Kharel, Afsari Begum, Abdur Rob and Sujan Piya

Seth Cook is a senior researcher in IIED's Natural Resources Group. Chris Henderson is senior agriculture policy and practice adviser at Practical Action UK. Menila Kharel is agriculture programme coordinator at Practical Action Nepal. Afsari Begum is programme manager, Food, Agriculture and Markets Programme at Practical Action Bangladesh. Abdur Rob is head of agriculture, markets, DRR & CCA at Practical Action Bangladesh. Sujan Piya is head of agriculture at Practical Action Nepal.

Notes

[1] www.fao.org/soils-2015/news/news-detail/en/c/275770 / [2] www.fao.org/fileadmin/user_upload/soils-2015/docs/Fact_sheets/En_IYS_Veg_Print.pdf / [3] Between 1950 and 1990, grain harvests around the world increased by an average 2.1 per cent per year, nearly tripling grain yields during that period. This was largely due to the introduction of hybrid wheat and rice, combined with chemical fertiliser applications. See Mann, C (1997) Reseeding the Green Revolution. *Science* 277:1038–1043. For impacts on food prices, see Evenson, R and Gollin, D (2003) Assessing the impact of the Green Revolution, 1960 to 2000. *Science* 300 (5620): 758–762. / [4] www.katalyst.com.bd/docs/tpieces/tpieces01.pdf / [5] Mondal, M (2010) Crop agriculture in Bangladesh: challenges and opportunities. *Bangladesh Journal of Agricultural Research* 35(2): 235–245. / [6] BARC (2012) Fertilizer recommendation guide. Bangladesh Agricultural Research Council, Dhaka. / [7] In order to ensure that sufficient quantities of organic matter are returned to the soil, organic fertilisers and compost should be produced from all available source materials, including animal manure, vermi-compost, crop residues, sawdust, household organic waste and faecal sludge.

Knowledge Products

The International Institute for Environment and Development (IIED) promotes sustainable development, linking local priorities to global challenges. We support some of the world's most vulnerable people to strengthen their voice in decision making.

Practical Action is an international non-governmental organisation (NGO) that uses technology to challenge poverty in developing countries. We enable poor communities to build on their skills and knowledge to produce sustainable and practical solutions.

Contact
Seth Cook
seth.cook@iied.org

80–86 Gray's Inn Road
London, WC1X 8NH
United Kingdom

Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
www.iied.org

IIED welcomes feedback via: @IIED and www.facebook.com/theiied

This research was funded by UK aid from the UK Government, however the views expressed do not necessarily reflect the views of the UK Government.

UKaid
from the British people