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India's move to organic fertilizer: Ambitions and realities

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India is looking to promote the use of organic fertilizers while being mindful of the structural and economic hurdles that may limit its adoption.

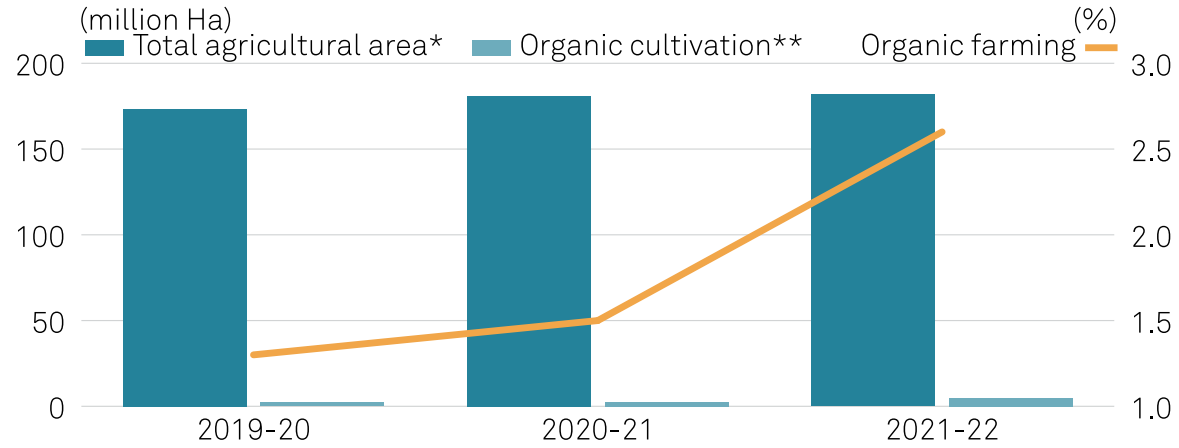
It is also taking all possible steps to avoid the situation in Sri Lanka, where a unilateral embargo on conventional fertilizer was imposed in May 2021, affecting crop yields.

Related content: Sri Lanka waking up to reality of food shortages after failed organic farming dream

Increasing organic agricultural land

During 2021-22, there was a significant increase in the organic agricultural land in India with 4.73 million hectare land under organic agriculture, thanks to the active participation of the government in promoting organic farming through various schemes such as Paramparagat Krishi Vikas Yojana – loosely translated as Traditional Agri-development Scheme.

Organic farming in India - relative comparison



*For principal crops, excluding wild harvest area
**Including in-conversion land
Source: Agricultural & Processed Food Products Export Development Authority (APEDA) and Department of Agriculture, India

The scheme promotes cluster-based organic farming with a participatory guarantee certification. Cluster formation, training, certification and marketing are supported under the scheme.

Financial assistance of INR50,000/ha (around $612/ha) over three years is provided, out of which 62% or INR31,000 is given as an incentive to a farmer toward organic inputs.

Estimating the percentage of land covered under certified organic in the future is difficult, but the government has ambitious plans of converting 14 million hectares of farmland to organic by 2025, representing about 7%-8% of total agricultural area for principal crops.

Major states under organic agriculture, which accounts for nearly 80% of the area under organic agriculture by cultivated farm area, are Madhya Pradesh, Maharashtra, Gujarat and Rajasthan. Broader implementation of the scheme is required to meet the target.

Huge cattle population

In addition to the scheme, India has an abundance of raw manure inputs, which gives it an advantage.

The country is home to one of the largest bovine population – cattle, buffalo, mithun and yak – in the world at over 300 million, according to the National Dairy Development Board, making it one of the major sources of organic manure.

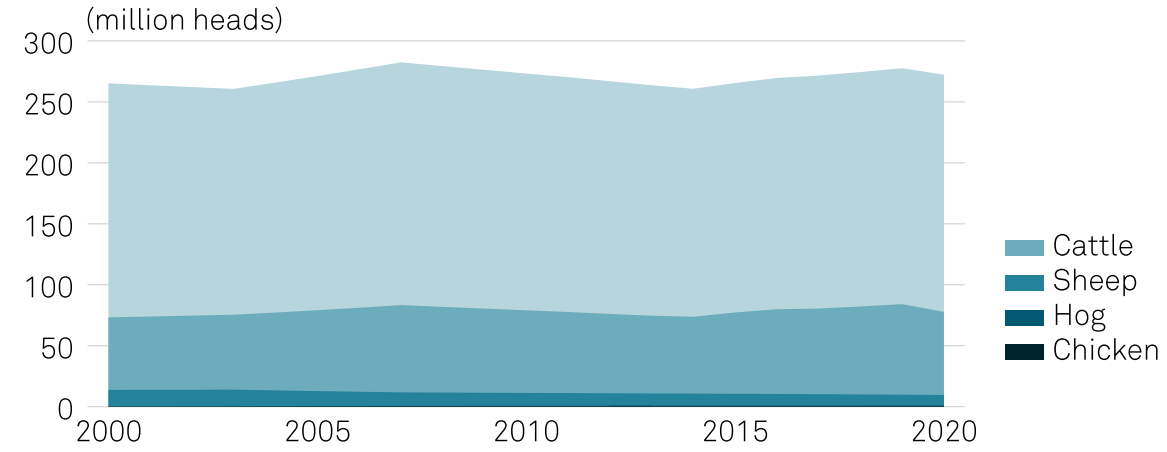
In 2020, the cattle population in India was around 194.5 million and Fertecon estimates 1,190 million mt of manure was produced on a fresh weight basis and – considering 25% dry matter – around 298 million mt of dry organic manure/farmyard manure was "potentially" made.

The cow dung manure or farmyard manure – a mixture of cow dung, urine, waste straw and other farm waste – contains 0.5-1.5% nitrogen, 0.4-0.8% phosphorus pentoxide and 0.5-1.9% potassium oxide[1]. The percentages could vary depending on sources of information.

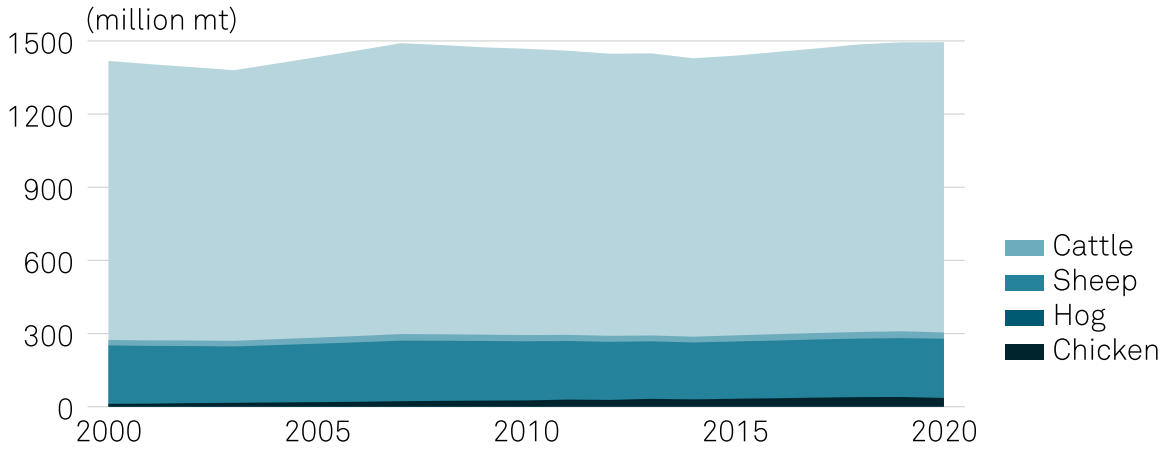
This in theory could substitute the 15% N, 20% P2O5 and 100% of K2O requirements of India. In total, it could satisfy over 20%-25% of India's plant nutrient requirements.

Livestock population and manure production in India

Livestock population by species



Livestock manure production estimates

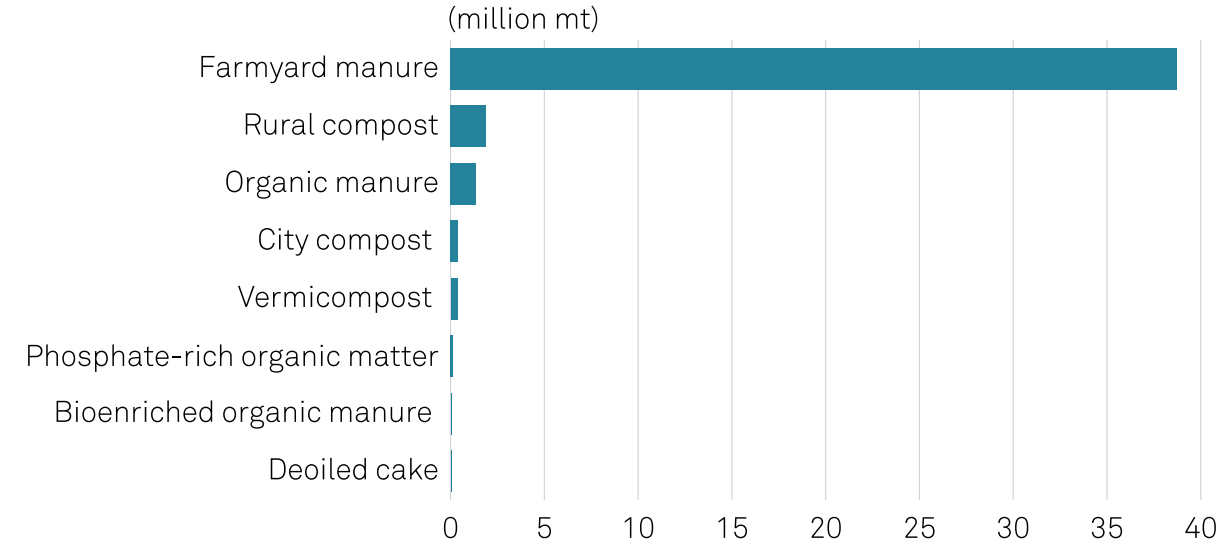


Source: S&P Global Commodity Insights, FAO

Although there is a huge potential for development, there are also various challenges to this. According to the National Centre for Organic and Natural Farming, only 38.74 million mt of farmyard manure was produced. The current farmyard manure produced could fulfill just 3% of the India's total nutrient requirements.

Other organic fertilizer sources such as rural compost, organic manure, city compost, vermicompost, among others, account for 4.25 million mt and could hardly fulfill 0.5% of India's total nutrient requirements.

Total production of organic fertilizer in India, 2020-21



Source: National Centre for Organic Farming

These realities are in contrast with the potential due to a number of reasons:

1. Manure production and distribution is a challenge among small farmers

Animal husbandry in India is majorly carried out by small farmers and pastoralists. Small and marginal farmers with holdings less than 2 hectares while pastoralists, who derive a substantial livelihood, income and security from their animals, own nearly 87.5% of all ruminant live stock in India.[2]

Pastoralists and a few small farmers prefer to graze their cattle on outdoor lands (pastures), which is why only 38.7 million mt farmyard manure could be produced and officially reported. Small farmers, however, could be grazing cattle on their farming land, which in turn supports plant nutrition but goes unaccounted for in the larger scheme of things.

According to the latest livestock census data by the Indian government, over 65 million households own cattle and only 0.189 million non-household enterprises and institutions do, which explains the significantly lower conversion, reporting and marketing of organic or farmyard manure.

Due to its small scale, the distribution and storage of organic fertilizer is also a big challenge.

"Lack of storage/warehousing [called godowns] and adequate distribution networks [road, rail] are always key issues in India due to poor infrastructure in many rural areas and distances involved," said Alan Bullion, projects director at Agribusiness, S&P Global Commodity Insights.

2. Organic fertilizers are more costly

Mineral fertilizers are heavily subsidized, making them the go-to option for farmers in India. On the other hand, organic fertilizer adoption is low due to the price difference compared to conventional fertilizers and a lack of demand for certified organic products.

"The current price for cow dung manure [dry] varies in the range of INR1,500-2,000/mt excluding transportation cost and poultry manure price is around INR5,000/mt, which is quite expensive," said Rajendra Paithankar, a farmer in Maharashtra.

Above prices, in terms of nutrient content, are way higher than the subsidized mineral fertilizers – four times in the case of cow dung manure and 1.8 times in terms of poultry manure – limiting adoption. Above price excludes transportation and application cost, that could be substantial in this case as large volumes of organic manure is required to substitute conventional fertilizers .

3. Nutrients available for rapid uptake and losses

Nitrogen is present in organic materials, largely in two forms:

• Nitrogen in the form of ammonium-N, nitrate-N and uric acid-N is readily available for rapid crop uptake

• Organic nitrogen that is broken down slowly which will become available for crop uptake over a longer period of months to years

However, there can be some losses after application as ammonium-N can be volatilized as ammonia gas. Further losses may also occur through nitrate leaching and denitrification. Therefore, the actual nitrogen available for plant uptake is much lower.

In the case of phosphates and potash, 60% and 90% of the nutrient is readily available for uptake, according to India's Agriculture and Horticulture Development Board.

4. Price sensitivity

India is a price sensitive market and the demand for organic food is not prevalent, making organic farming less inciting for local farmers.

The quality of organic fertilizers can also vary a lot as the exact amount of nutrient content accessible to plants is difficult to calculate, affecting crop yields.

The path ahead

The Indian fertilizer ministry is keenly aware of the above challenges but looks set to reduce the use of chemical fertilizers following the announcement of the **PM Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth**.

The increase in industrialization and the ongoing move of farm jobs to services will also gradually institutionalize the dairy and meat industry.

This will promote high-quality manure production in bulk, which then could be incentivized for producers and could be made available to farmers who choose certified organic farming at subsidized prices. This, however, will take strong political will and execution.

The Indian government has reduced chemical fertilizer subsidies by 22% for the new financial year from April, but this due to falling global prices. It is unlikely that the subsidies for chemical fertilizers will be reduced to encourage organic fertilizers as chemical fertilizers have helped India to become self-sufficient in foodgrains.

Instead, the government is using other options as discussed to incentivize the uptake of more sustainable fertilizers. The scale of such schemes needs to be increased in the near future if they want to achieve the target of 14 million hectares in organic farming by 2025.

Conventional fertilizers are here to stay and will be required to feed the most populous country in the world, but with the more nuanced approach, India is likely to move towards a more successful organic fertilizer adoption, even if it takes a longer path.

[1] FAI Fertilizer Statistics which further sites research papers by C.N. Acharya (1957), J. A, Doji (1953) and Van Slyke (1955)

[2] Article by Sagari. R. Ramdas for the Wire- Grazed and Not Confused: Why Not All Livestock Rearing Practices Are Ecologically Unsound