

Mainstreaming circularity approaches for healthy soils in India

Learnings from piloting the *Urban-Rural Nutrient & Carbon Cycle (URNCC)* approach in Maharashtra

Background

Almost 40% of India (147 million hectares) is affected by **land degradation**, and 3.7 million hectares suffer from depletion of soil organic matter and nutrients. The major drivers of land degradation are agricultural practices, improper irrigation, cultivation in vulnerable or low potential land, and overuse of agro-chemicals.

There is growing momentum around land management focused on **soil health**. India has ambitious plans to halt and reverse soil degradation in the agriculture sector to address associated challenges such as low farmer incomes, high agricultural input costs, and environmental degradation.

In his landmark speech on 16 December 2021, Indian Prime Minister Narendra Modi presented an alternative path to conventional agriculture called *Natural Farming* (NF). NF is a chemical-free traditional farming method. It is considered an agroecology-based diversified farming system which integrates crops, trees and livestock with functional biodiversity.

Natural farming and agroecology focus on using, reusing, and recycling of locally available organic resources into agriculture production systems. These natural farming measures are based on the principles of supporting the soils to recuperate its natural productive potentials and to boost soil health. Traditionally, compost, vermi-compost and farmyard manure have been applied by farmers. Gradually these soil enhancing fertilisers were being

replaced by inorganic inputs which do not have these beneficial effects on the soil. Various efforts have been made to promote vermicompost. NADEP and others have attempted to encourage farmers to produce organic inputs on their farms. However, declining availability of locally available organic material has been detrimental to scaling such interventions.

In India more than 54 million metric tons (MT) of municipal solid waste are generated every year of which 50% is organic. Without treatment, organic waste, containing valuable nutrients and carbon originating in agricultural fields, accumulates in urban environments. This loss of nutrients from rural agricultural landscapes contributes to its degradation. There is a potential to **recycle urban organic waste into compost** and other soil enhancing products to return nutrients and carbon back to the soils.

Our approach

In Maharashtra, the **decreasing availability of organic soil fertilisers** in rural areas does not meet the farmers requirement for organic nutrient sources of their soils. In urban centres huge quantities of organic waste are being produced (daily 12,000 tons of organic waste) which can be converted into quality compost, a product used to enhance soil health, fertility and productivity.

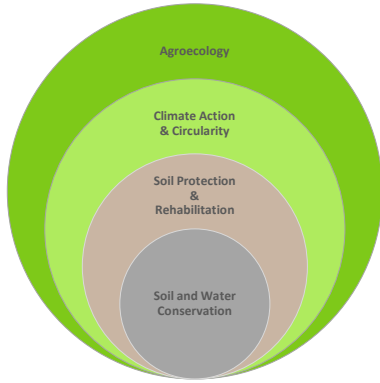
The **Urban-Rural Nutrient and Carbon Cycle (URNCC)** is a multi-sectoral circular economy approach, where waste is considered a resource in the agriculture value chain. It builds on investments made for sustainable watershed and soil management in the state of Maharashtra by addressing the gap of insufficient availability of organic fertilisers to promote organic agriculture, NF and agroecological farming practices on scale. In the cities, urban organic waste is recycled and processed into compost. The compost



Organic waste collection in Maharashtra (left) and farmers in the field applying city compost (right).

© GIZ / Ronny Sen (left), © GIZ / Klaus Wohlmann (right)

is then used on farms in rural areas to increase nutrients and soil organic matter thereby also adding carbon to the soil. The model pilots an **end-to-end approach in Maharashtra** addressing institutional and policy gaps by supporting research, capacity development, product branding and the establishment of market linkages using digital solutions.



URNCC is building on investments for sustainable watershed and soil management in the state of Maharashtra by addressing the gap of insufficient availability of organic fertilisers to promote organic agriculture, NF and agroecological farming practices on scale.

In 2019, the Indo-German development cooperation project ‘**Soil protection and rehabilitation of degraded soil for food security in India (ProSoil)**’ implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) in partnership with the National Bank for Agriculture and Rural Development (NABARD) introduced the URNCC approach in the state of Maharashtra under the **Swachh Bharat Mission**. Currently, there is a potential to produce 350,000 MT of city compost every year in the state. For the compost producers this represents a business potential of around 200 crores INR (20 to 25 Mio EUR).

Project name	Soil protection and rehabilitation of degraded soil for food security in India (ProSoil)
Commissioned by	Federal Ministry for Economic Cooperation and Development (BMZ)
Project region	Maharashtra, Madhya Pradesh
Lead executing agency	National Bank for Agriculture and Rural Development (NABARD)
Implementing partners	Local non-governmental organisations, research institutes, State Departments, State Agriculture Universities, National Institute of Agriculture Extension Management and others
Duration	01.04.2015 – 30.06.2024

Challenges

Establishing a **sustainable circular model at the urban-rural interface** remains challenging due to existing gaps such as the

access of farmers to quality compost and viable business opportunities for agri-entrepreneurs in the rural areas.

URNCC is also addressing the **lack of awareness around innovative organic products such as city compost**, limited capacities at the compost producing Urban Local Bodies (ULBs) to produce quality compost, weak market linkages between farmers, agri-entrepreneurs and ULBs, and the non-availability of city compost application guidelines for farmers from the extension systems.

The **quality of city compost** is critical to be used in agriculture. Under the SBM the infrastructure for compost production through various methods, primarily through the windrow composting method, has been developed with ULBs in the state. Initially, many ULBs were having difficulties to produce compost of a quality compliant with the **Fertiliser Control Order (FCO) norms**. Furthermore, the accredited testing facilities for **testing** the compost as per FCO norms have insufficient capacities to manage the testing of all incoming compost samples. Testing will be an even bigger challenge with increasing demand for testing from ULBs.

URNCC pilot in Maharashtra from 2019 - 2021

To strengthen urban-rural connections, **NABARD, the Urban Development Department (UDD) in Maharashtra and the Pro-Soil project** signed a tripartite Memorandum and Understanding (MoU) to set up an executive group and a working group around URNCC. This cooperation aimed to secure interventions at the strategic and political level while promoting wide-scale use of organic city compost for sustainable agriculture in rural areas.

The *Swachh Maharashtra Mission (SMM)*, under *Swachh Bharat Mission (SBM)*, provides the infrastructure for compost production and introduced the ‘HARIT’ label for branding of quality city compost in the state. Under the URNCC pilot from 2019 – 2021 interventions were categorised and described under four broad areas:

Quality assurance of city compost

- 🌱 **Streamlining compost production processes:** Standard Operating Procedure (SOP) for composting process developed and used for monitoring the process to ensure required physical parameters as per FCO norms and to reach the highest production potential. SOP is a step-by-step guide for practitioners which will help in streamlining ULBs composting process.
- 🌱 **Regular compost sample testing:** Compost sample testing at accredited laboratories is mandatory for ULBs before selling compost. An SOP for compost sampling for testing has been developed to improve standards for sampling and ensure representative samples.
- 🌱 **‘HARIT’ certification process:** Supported the streamlining of the ‘HARIT’ certification process at state level to ensure

compliance of compost quality and monitoring. Only ULBs with valid compost sample test certificates as per FCO norms are now authorised to use 'HARIT' branding when selling and marketing compost.

Inclusion of State Agriculture University as additional testing facility: The *Mahatma Phule Krishi Vidyapeeth* (MPKV) has been authorised by the State Government as additional testing facility to increase testing capacities.

Capacity building: Capacity building modules for various aspects on compost production were developed and measures were undertaken to train ULB staff on composting and sampling processes as per the SOP. Online and physical trainings were conducted, and on-site handholding support provided to address ULB specific quality issues.

Development of a digital marketing platform ('HARIT Ticker')

Connecting compost producers and farmers: GIZ together with the UDD, Maharashtra, has developed and piloted a block-chain based digital marketing platform called 'HARIT Ticker' for linking farmers and FPOs with ULBs.

Monitoring instrument for the state: There is a network of ULBs mandated to effectively process urban waste. This necessitates an effective monitoring system to understand the quality and quantity of urban compost being produced and sold by ULBs in the state. The 'HARIT Ticker' has been developed as a tool to assist the ULBs to better manage stock, storage, production and distribution of the compost.

Development and piloting of business models around URNCC

Scoping study and assessment of challenges and gaps: A scoping study has been conducted to assess the issues and challenges for marketing and sale of city compost. The study identified various stakeholders involved in the process e.g., private compost plant operators, ULBs, FPOs and fertiliser marketing companies. The main challenges identified during the scoping were: high transportation cost for individual farmers, low availability of city compost for farmers in peak season, lack of storage and distribution facilities, and lack of credit facilities.

FPO-based business models: To overcome these challenges and to establish a working supply chain for city compost, FPO centric business models were being developed and implemented with selected FPOs in Maharashtra. During the piloting of these business models their viability has been proved. The ProSoil project has developed the capacities of FPOs to further operationalise these viable business models around city compost.

Source of revenue for Sustainable Organic Waste Management for ULBs: While piloting URNCC, capacity development support has also been provided to ULBs. ProSoil has supported the ULBs to undertake a feasibility assessment of potential demand, business, and stakeholders in the potential regions to which they can market their city compost. ULBs were then linked with established FPOs through various engagement models to ensure the regular supply of compost to the FPOs at a fixed cost.

Promotion of compost – linking farmers to compost producers

Exposure visits of farmers to compost production facilities: To make farmers aware about the composting process and quality standards followed during its production, exposure visits for farmers groups were organised at various production facilities. During these exposure visits farmers gained insights into the production process and learned about the product specifications.

Demonstration plots: Field plots for various crops to demonstrate the application of city compost have been established with ProSoil's implementing partners, FPOs and farmers. During regular exposure visits, farmers observed the impacts of city compost on crop growth and soil quality. The initial field trials with city compost resulted in an increased crop productivity compared to e.g., farmyard manure. The processes and results of these demonstration plots were documented and presented at various platforms.

Scientific crop trials: Scientific crops trials on various crops using city compost have been completed by the MPKV. MPKV developed crop wise recommendations for the application of city compost as an organic fertiliser to the State Agriculture Department in Maharashtra for further promotion among farmers.

Initiatives at ULB level: Farmer melas, dedicated compost stalls, exposure visits for farmers to compost production plants, coordination with fertiliser sellers have been implemented.

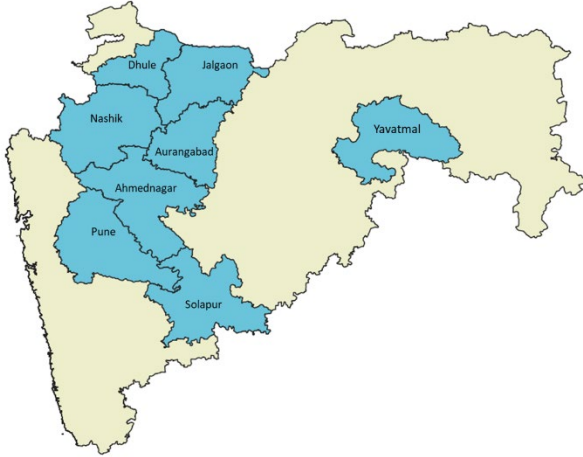


City compost production facility in Sangamner, Maharashtra.

© GIZ / Ronny Sen

Results

The URNCC pilot has been successfully implemented in **eight districts in Maharashtra**: Ahmadnagar, Aurangabad, Nashik, Dhule, Yavatmal, Solapur, Jalgaon, Pune.



Map of districts in Maharashtra where initiatives as part of the URNCC model have been piloted.

The pilot phase contributed to a raised awareness of farmers through demonstrations for this soil enhancing product and there has been an increased demand of quality city compost from farmers and FPOs. In total nine FPOs have taken up the **city compost business**. FPOs are now directly buying compost from ULBs and supplying to it to their farmers through various modes. The model works on the rural as well as on the urban side: while FPOs are able to take up a new business opportunity and FPO members benefit by saving on individual transportation costs, ULBs have regular customers for the sale of their compost at market rates. ULBs have established a **marketing model** wherein they work together with selected villages and farmers to establish demo plots to showcase city compost application on various crops. The 'HARIT Ticker' is fully functioning and playing a crucial role in strengthening the functionality of the city compost supply chain. Currently 30 FPOs with a potential of around 10,300 farmers, and 396 ULBs (100% in the state) are registered on the digital marketing platform.

A stringent process for the '**HARIT**' certification has been established. Currently, 125 ULBs are certified (compared to 95 ULBs in 2021) or are under process for recertification to ensure high quality standard at city compost production facilities. Twenty ULBs have been recertified as of now. State level incentive mechanisms for the production and sale of certified compost is being provided such as an INR 1,500/MT subsidy by UDD for ULBs. UDD has made it mandatory for all ULBs to produce compost only from organic waste collected in segregated manner. In line with this, SOPs for compost processing and compost sampling for testing purposes have been issued in form of a state order.

For better **governance** of the URNCC an executive group and working group has been formed.

Month - Year	Compost generated (MT)	Compost sold to farmers (MT)	Total Compost consumption (Agriculture and non-agriculture use) (MT)	Revenue Generated (INR)
Sep-21	15,447	1,022	2,558	15,33,248
Oct-21	8,944	1,015	2,569	11,07,038
Nov-21	8,951	1,624	4,151	48,72,760
Dec-21	12,911	1,616	1,137	24,23,419
Jan-22	11,585	1,690	4,799	25,34,255
Feb-22	8,093	1,109	2,015	11,08,777
	65,931	8,075	17,229	1,35,79,497

Overview of produced city compost, sales for use in agriculture and non-agriculture and revenue generated.

Success stories from the field

An early experimental field trial during the *Kharif* season in 2018 conducted with potatoe farmers in Ahmadnagar district compared the performance of city compost compared to farmyard manure (FYM) applied. Farmers with support of ProSoil observed and documented the difference in the crop growth parameters and yield as compared to FYM.

Some feedback from the field:

- 🌱 The crop could withstand moisture stress during the dry spell, as the water holding capacity improved.
- 🌱 The certified compost with labels on the bags was of good quality, fine and well decomposed, whereas city compost without labels included almost 30% stones.
- 🌱 The plot where city compost has been applied was free of any fungal and bacterial wilt affected plants as compared to the plot with FYM.
- 🌱 Cost for city compost incl. of transport was more expensive as compared to FYM (8 MT at INR 2,500 per MT versus 6 MT at INR 1,666 per MT).
- 🌱 Good crop growth for two seasons where city compost applied i.e., Onion, Sorghum during the *Rabi* season in 2019.



Managers and decision-makers can monitor the daily production and sales of city compost using the 'HARIT Ticker'. This real-time monitoring addresses many challenges effectively by ensuring regular supply to meet demand by FPOs and farmers during peak season.

© GIZ / ProSoil

Farmer Ashok Phalke applied city compost on his onion crop and shared his experience in the short film

[Living Adaptation: Indian farmers turning garbage into gold](#)



“The soil became friable, previously the soil was hard. Also, the water-retaining capacity of the soil increased. Water drained into the soil well, due to which the crops could better receive the nutrients from the soil. Which in turn improved the harvest.”

Scaling-up URNCC from 2022 to 2024 and beyond

In the next phase, **scaling-up the URNCC** is paramount to realising its full potential. Considering the need and requirements of organic inputs to support the transformation of agriculture towards NF and agroecology as part various programmes and schemes of the Government of India and NABARD. Interventions implemented under the URNCC in Maharashtra during the pilot phase now need to be promoted through institutions such as NABARD, the Ministry of Housing and Urban Affairs (MoHUA) and the Ministry of Agriculture and Farmer’s Welfare (MoAFW) Government of India at national level. This can be achieved through advocacy, cross-sectoral exchanges and providing support through policies, guidelines, protocols, capacity building etc. developed during the pilot phase.

On ground level, **FPOs** can play a major role in establishing the supply chain in the rural areas to ensure a continuous supply of city compost to farmers. Promoting viable business models developed during the previous phase is key. The capacity development and credit support to FPOs for the implementation of

business models around the URNCC can be provided through NABARD. The ‘HARIT Ticker’ can also be deployed as a tool for monitoring of FPO businesses.

The UDD is focusing now on maintaining and further improving the compost quality, as well as on providing incentives to compost producers and extending its use of the ‘HARIT Ticker’ for other products. Based on the pilot phase **short-, mid- and long-term strategies** are being proposed for scaling-up the URNCC.

Short-term strategies

Short-term strategies are focusing on further strengthening the linkages between farmers, FPOs and compost producers (ULBs) to ensure engagement for continuous demand and supply of quality compost.

- 🌱 Promotion of compost among farmers through various mechanism by UDD and NABARD – linking ULBs with farmers and FPOs for demonstration plots etc.
- 🌱 Farmers institutions like FPOs, FPO federations, farmers or local agri-entrepreneurs for successful business opportunities have been identified and linked with ULBs and credit institutions.
- 🌱 The support to farmer institutions (credit linkages, capacity building etc.) for the successful implementation of businesses through initial focus on A-Grade institutions and established FPOs through NABARD.
- 🌱 UDD to provide necessary guidance to ULBs on quality assurance of compost through technical guidelines, capacity development and developing incentive mechanisms.
- 🌱 Existing system by the respective Urban Development Departments in the states to ensure quality compost production (e.g., Maharashtra UDD has developed its own certification and branding system ‘HARIT’ that ensures that compost quality complies with FCO norms).
- 🌱 ‘HARIT’ certified ULBs are spread across the state for production of quality compost. Capacity building and necessary technical and financial support provided by UDD.
- 🌱 Grading of ULBs on basis of their capacities to produce quality compost and support them for reaching maximum production potential with quality assurance.



City compost production facility in Nashik, Maharashtra.

© GIZ / Ronny Sen

- More testing facilities nominated and identified for timely testing and issuance of 'HARIT' certification to ULBs.
- Working group formed under tripartite MoU is functional with additional members from SAUs, FPO Federations and credit institutions which monitors and provides necessary guidance to all stakeholders.

Mid-term strategies

Mid-term strategies are focusing on the mainstreaming of the URNCC through various schemes and channels of NABARD and other agencies.

- Collaborations with respective state missions to ensure quality of compost and linking with farmer institutions.
- Collaboration with agriculture department for promotion of city compost through *Bharatiya Prakritik Krishi Paddhati* (BPKP).
- Adoption of 'HARIT Ticker' for 'HARIT' certification process and monitoring.
- Business models are an established instrument to establish the supply chain and increase the access to farmers and provide an opportunity for FPOs to explore new businesses. Guidelines on business model implementations, credit and technical support provided by NABARD for FPOs.
- Credit support mechanism for FPOs indicated and supported through banking system, private players, etc.
- Quality assured city compost considered as source of organic inputs under various schemes of NABARD with focus on NF and agroecology.
- Capacity building strategy for ULBs and FPOs developed by UDD and NABARD respectively and necessary capacity building support provided.
- Grading of farmer institutions based on their ability to do successful business and hence identifying the capacity needs for their gradual improvement.

Long-term strategies

Long-term strategies focus on mainstreaming the URNCC into national level schemes.

- Recommendations on use of quality assured city compost in NABARD's ongoing and proposed schemes/projects on NF and agroecology.
- SOPs, guidelines, and protocols of production and testing i.e., testing frequency, sampling methodology, are needed for all the states and ULBs to ensure quality of compost. Such guidelines and protocols to be customised and issued by the national level ministry.
- Digital platform 'HARIT Ticker' used by other interested state missions and other partners for compost promotion, marketing, and sale.
- Since the processing of urban organic waste is the prerogative of the ULBs collaboration under the mandate of the SBM and respectively state level mission (e.g., SSM). Hence, a collaboration with state level missions under the SBM to ensure the ULBs produce compost as per FCO norms.

India and Germany have signed a Joint Declaration of Intent to promote holistic solutions for resilient agriculture and food systems such as agroecology. The upcoming Indo-German Lighthouse on 'Agroecology and Sustainable Management of Natural Resources' presents an opportunity to address issues that cause soil degradation from various angles – by promoting alternative paths of agricultural intensification that preserve diversity and existing traditional knowledge while unlocking the potential of modern technologies and innovative approaches such as the URNCC.



© GIZ / Klaus Wohlmann

Published by	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	Photo credits	GIZ / Ronny Sen GIZ / Klaus Wohlmann
Registered offices	Bonn and Eschborn, Germany GIZ Office India A2 / 18 Safdarjung Enclave 110029 Delhi, India T +91 11 49495353 E info@giz.de I www.giz.de/en	Responsible	Rajeev Ahal (Rajeev.ahal@giz.de)
		Design	Stephanie Katsir
		GIZ is responsible for the content of this publication.	
		On behalf of	German Federal Ministry for Economic Cooperation and Development (BMZ)
Project	Soil Protection and Rehabilitation for Food Security in India (ProSoil)		
As at	May 2022, New Delhi		