

Key facts

- Beneficial microorganism-rich product for integrated pest control.
- Suitable for various crops.

What is Jeevatu crop treatments?

- Some crop diseases and pests have developed resistance to synthetic pesticides. Farmers are therefore looking for new products and the demand for cheap, healthy, eco-friendly, and multipurpose alternatives to synthetic pesticides and manufactured organic amendments is increasing.
- Jeevatu is a consortium of beneficial and naturally occurring microorganisms², available in liquid form to prevent and treat crop diseases, preferably in organic farming systems. It has also been used to control foul odour from city waste and prepare value added compost.
- It contains mixed cultures of naturally occurring microorganisms³, like yeast, *Trichoderma* spp., *Penicillium* spp., *Aspergillus*, *Azotobacter* spp., *Lactobacillus* spp., *Bacillus* spp., *Pseudomonas* spp. and *Proteus* spp.
- Jeevatu-based organic crop treatments (J-T) can be part of an integrated nutrient and pesticide management plan to treat vegetables, cereals, pulses, spices, medicinal plants, flowers and fruit orchards. It can be applied on plants either directly, or (recommended) mixed with organic matter (Jeevatu liquid manure 1 and 2).
- Jeevatu liquid manure 1 is used to manage nutrient deficiency and various disease types and insect pests found in the root zone and under the soil surface.
- Jeevatu liquid manure 2 is used to control diseases and insect pest problems occurring above the ground.
- J-T is best suited for small and big land areas. It can also be used on very small areas such as seed nurseries, greenhouses and pots.
- Jeevatu is said to treat various kinds of disease such as bacterial, viral or fungal, affecting crops, to speed initial crop growth, thereby extending the crop cycle and resulting in higher quality crops, to increase yields, and to improve soil quality.
- No health or environmental hazards have been reported by the Central Microbiology Department of Tribhuvan University, Nepal. Yet, further analyses and scientific experiments are needed to validate the technology's

effectiveness on different soil-plant environments and under different climatic conditions in South and South-East Asia.

- Jeevatu does not contain genetically modified organisms (GMOs) nor is it derived from GM.

History

- The concept of Effective-Microorganisms (EM) was developed in the 1970s by a Japanese researcher, Dr. Higa. The main principle is to use a large variety of beneficial and compatible microorganisms that use diverse modes of action on the plant-soil ecosystem, as opposed to single microbial inoculants such as *Bacillus thuringiensis* (Bt). EM are produced under different brand names worldwide. While the nature and mode of action of effective microorganisms is known, the large range of beneficial microorganisms is not yet completely understood.
- Jeevatu inoculant and practices have been developed by the Nepalese non-profit company, the Nepalese Farming Institute (NFI). The bottles of Jeevatu are manufactured in Kathmandu by Nepalese Natural Bio-products Pvt. Ltd.
- NFI has organized several practical training courses for users in different agro-ecological zones in Afghanistan, Bhutan, India and Nepal.
- Jeevatu is not internationally patented. It has been registered temporarily by the Ministry of Agriculture Development, Nepal and is in the process of being homologated in Nepal.

Where it works

- In Nepal, demographic pressure on arable land has degraded soil fertility and forced some farmers to cultivate very unfertile and scattered pieces of land, sometimes close to urban areas.
- Jeevatu is adopted and promoted by farmers, farmer cooperatives and NGOs as part of integrated organic farming systems.
- Jeevatu has been commercialized by NFI in the Higher, Middle and Low Hills and the Terai administrative zones of

¹ Note: The scientific proofing of the effects of Jeevatu crop treatments and their underlying causes and the homologation of the product is still ongoing. Therefore, no composite sustainability indicator is calculated and this fact sheet has not undergone a scientific external review.

² Beneficial microorganisms, as defined by Higa and Parr (1994), are "a large group of often unknown or ill-defined microorganisms that interact favourably in soils and with plants to render beneficial effects which are sometimes difficult to predict". In comparison, effective microorganisms (EM) are defined as "specific mixed cultures of known, beneficial microorganisms that are being used effectively as microbial inoculants" (Higa and Parr, 1994).

³ At 2.7 x 10⁷ colony-forming units (cfu)/ml, according to a laboratory report, Ashta Scientific Research Service Pvt. Ltd, Dillibazar, Kathmandu, 2012.

Nepal, ranging in altitude from 3,200 to 60 m above sea level.

Figure 1. Bottle of Jeevatu in a dealer shop



Photo: Sarah Crestin-Billet

- It is difficult to adopt Jeevatu crop treatment in water-scarce areas where the field is located far from the water source and where Jeevatu is not commercially available.

Technological aspects

- Jeevatu can be used (1) directly, by mixing the original product with water or (2) after fermentation (Jeevatu liquid manure 1 and 2). Early and more intense treatment is necessary to control pests. After the pest problem has been managed, the prophylactic treatment should follow.
- The bottles of Jeevatu have to be stored at room temperature and the expiry date (one year after manufacturing) should be respected.

1. Direct use of Jeevatu (spraying and drenching)

- As a prophylactic spray, 5 per cent solution (19 parts water mixed with 1 part Jeevatu). Applied twice a week to crops.
- As curative spray, 10 per cent solution (9 parts water and 1 part Jeevatu). Can be sprayed daily till the pest problem is controlled.

Figure 2. Jeevatu mixed with water for direct spraying



Photo: Sarah Crestin-Billet

2. Jeevatu liquid manure 1 and 2

- Choose an open sunny place and dig a circular pit 1 foot (30 cm) deep and 2 feet (60 cm) in diameter.
- Make the pit surface smooth with raw cattle manure to increase and balance the temperature.
- Place a plastic sheet (500 gauze, 4 x 3 feet or 120 x 90 cm) in the pit in a bag-like shape. Jeevatu liquid manure is mixed inside this plastic 'bag', stirred and fermented alternatively under anaerobic (without air in the closed bag) and aerobic (with air in the open bag) conditions as follows.

Figure 3. Bags in pit and empty pit for Jeevatu liquid manure 1 and 2 fermentation

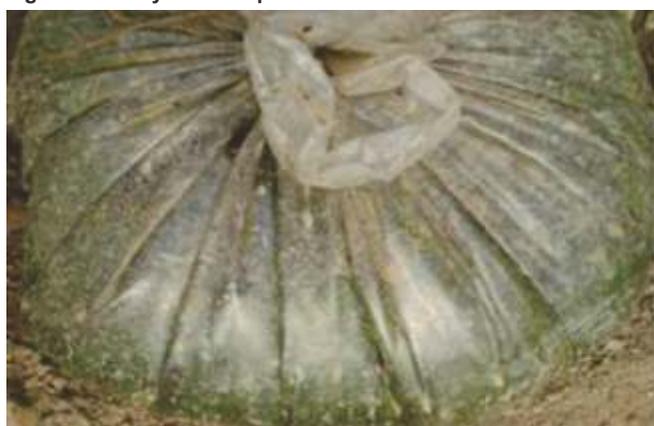


Photo: Sarah Crestin-Billet

For liquid manure 1 (drenching)

- Put 25 kg of decomposed compost in the bag, pour 1 l of Jeevatu, 25 l of cattle urine and 25 l of water. Mix thoroughly and then tie the bag tightly.
- Open the bag twice a week and stir the mixture thoroughly. When the surface of the liquid manure inside the bag turns green and no there is foul odour, the preparation is ready to use (see Figure 4). The process takes 15 to 30 days, depending on the temperature (15 days in summer and 30 days in winter).
- Dilute 1 l of Jeevatu liquid manure 1 with 3 l of water and drench the root zone of the crops, twice a week.

Figure 4. Ready to use liquid manure



For liquid manure 2 (spraying)

- Mix 1 l of Jeevatu with 37.5 l of urine and 37.5 l of water, in the bag. Mix thoroughly and then tie the bag tightly.
- Open the bag twice a week and stir the mixture thoroughly. When the surface of the liquid manure inside the bag turns green and there is no foul odour, the preparation is ready to use. The process takes 15 to 30 days, depending on the temperature (see above).
- When used as a prophylactic spray, dilute 1 l of Jeevatu liquid manure 2 with 3 l of water; spray twice a week.
- When used as a curative spray, dilute 1 l of Jeevatu liquid manure 2 with 1 l of water; spray every day till the pest problem has been controlled and then follow up with continuous prophylactic treatment.

Economic aspects

- Liquid manure 2 is one of the most cost-effective treatments.
- Following NFI recommendations for input quantity and frequency of application for one crop cycle of vegetables (3 months), the total cost of the prophylactic treatment is \$117. One bottle of Jeevatu costs Nr 100 (\$1.015). Sixty bottles of 1 l each are necessary to treat 1 ha of land twice a week with liquid manure 2. Water, urine and compost are usually sourced on the farm and are free.
- The time required for production and treatment depends on

the plant disease. If one disease appears per crop cycle and requires four days of curative treatment, the total labour time should be about 10 person-days.

- The achievable gross margin depends on the type of crop and the intensity and type of treatment with Jeevatu and is, therefore, not recorded here.

Table 1. Cost of prophylactic treatment of vegetables with liquid manure 2

	Unit	Amount	Rate	Cost (\$)
INPUT				
Jeevatu	L	60	1.015	61
Water for fermenting	L	2 250	0	
Urine	L	2 250	0	
Water for diluting	L	6 750	0	
Plastic sheet	piece (500 gauze, 120 x 90 cm)	10	1.015	10
Subtotal				71
LABOUR				
Solution production	person-days	5	3.045	15
Treatment twice a week during 3 months	person-days	10	3.045	30
Subtotal				46
Total				117

Note: For liquid manure 2 fermentation, Jeevatu, water, and urine are mixed at a ratio of 1: 37.5: 37.5.

Environmental aspects

- Jeevatu replaces synthetic pesticides and, therefore, reduces toxic residues on vegetables, soil and surface and groundwater.
- Soil biomass increases. This can help conserve and increase biodiversity.
- However, as the content and mode of action of the microorganisms in Jeevatu are not yet fully understood, not all impact (positive or negative) on the environment can be predicted and a rigorous scientific follow-up is recommended to explore this.
- The carbon footprint of Jeevatu production and sales is said to be lower than that of synthetic pesticides.
- The technology does not require any energy.
- Urine can replace water, reusing some organic wastes and saving water.

Social aspects

- Lower production costs and no health problems for adopters due to reduced chemical use and exposure. Being totally free of pesticide residue, the crops can be consumed immediately and are said to taste better.
- No harm to human health has been reported.
- The technology is simple but requires some time to learn and to apply appropriately.

- Illiterate people can adopt Jeevatu if trained.
- Suitable for both women and men.

Issues for replication

- Lack of access to Jeevatu bottles is a barrier as the distribution network is very limited.
- Affordability of Jeevatu bottles could be an issue for poor farmers.
- Manure availability is an issue for farmers who do not rear livestock or use it as cooking fuel. In livestock production, the availability of animal feed and straw is an issue for farmers with limited or unsuitable production area.
- Water scarcity and disruption in the supply of power to pump water, can affect the use of Jeevatu.
- Labour shortage during peak times can be a problem.
- Access to proper training and information to choose the appropriate treatment, is key.
- Recommended communication pathways: organic farming training centres, farmer field days and workshops, distribution of information pamphlets in local languages, press releases and mobile phone advertisements.

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Related topic

Jeevatu-based Compost fact sheet.

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