About the Institute

GB Pant National Institute of Himalayan Environment and Sustainable Development was stabilized in 1988 to devise suitable R&D strategies to maintain intricate balance between socio-cultural, ecological, economic and physical systems that could lead to enhance quality of life and ecological sustainability of the ecosystem. The Institute carried out in-depth research into most of these priority areas, with keeping a sharp focus on its societal linkages. The Institute has emerged as focal agency to advance scientific knowledge; to evolve integrated management strategies; demonstrate their efficacy for the conservation of natural resources; and to ensure environmentally sound development in the entire Indian Himalayan Region (IHR). The Planning Commission, the Ministry of Environment & Forests, Government of India and many International Organizations have recognized the Institute as a Nodal Agencies for R&D programmes in IHR.

The mandate of the Institute :

- Undertake in-depth research and development studies on environmental problems of the Indian Himalayan Region.
- Identify and strengthen the local knowledge of the environment and contribute towards strengthening research of regional relevance in the scientific institutions, Universities/ NGOs/ Voluntary agencies working in the Himalayan region, through interactive networking.
- Evolve and demonstrate suitable technology packages and delivery systems for sustainable development of the region, in harmony with local perceptions.

About the Sikkim Regional Centre (SRC)

The Sikkim Regional Centre (SRC) was established in Gangtok, Sikkim in the year 1989 formerly known as Sikkim Unit. In the year 2004, a campus covering a land area of 17 acres made functional at Pangthang (2000 m, asl), at a distance of about 15 Km from Gangtok facing the mighty Mt. Khangchendzonga, having with the main office building, laboratories, a gamut of nurseries, herbal garden, functional arboretum, residential quarters, rural technology centre, etc. The functional arboretum (10 acres area) houses over 100 native tree species, besides numerous shrubs and herbs, bamboo groves, rhododendron's conservatory, medicinal plants and multi-purpose tree habitat zones, with over 100 inhabiting and visiting birds and small mammals. The broad focal area of SRC covers Biodiversity Conservation and Management and Biotechnology Applications, Sustainable Environmental Development, Knowledge Base Development, and Capacity Building, Climate Change Studies, Ecosystem Services, etc. SRC of the Institute has been taking up activities with research and development on the environment and development in Sikkim state and hilly region of West Bengal (Darjeeling and Kalimpong districts including foothill parts of Alipurduar and Jalpaiguri districts). Over the years, this center has brought-out several knowledge products as peer reviewed papers in reputed scientific journals, popular articles, books/booklets, and technical reports. The center is now attempting to build a strong-network of partners for delivering R&D products that serve policy and planning process in the State of Sikkim.

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Promoting Low-Cost Organic Farming Techniques in Khangchendzonga Landscape-India

THE MOUNTAIN INSTITUTE-INDIA

ICIMOD

GBPNIHESD

Technical Manual

Promoting Low-Cost Organic Farming Techniques in Khangchendzonga Landscape-India
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Foreword

Khangchendzonga Landscape is one of the six transboundary landscapes identified by the International Centre for Integrated Mountain Development (ICIMOD), in the Hindu-Kush Himalayan Region, which shares boundaries among three neighbouring nations Bhutan, India and Nepal. The region not only harbours rich biological diversity but also supports the interdependent ecosystems across the countries.

In India, the KLCDI programme has been conceptualized with an understanding "the Khangchendzonga landscape represents the biological, social and cultural entity, which is celebrated by the community living in the landscape through equitable access and conservation of natural resources". The programme is being implemented through multi-stakeholder partnership focusing on livelihood, ecosystem, governance, research and monitoring and regional cooperation.

Sikkim being an organic state requires promotion of Low-Cost Organic Farming Techniques. In this context, a technical manual for capacity building of the farmers of the landscape and elsewhere has been prepared. The technical manual pertains easy to use, low-cost techniques of organic farming for the farmers and covers various techniques of bio-composting and bio-pesticides preparation. The manual will help to promote organic farming in the Khangchendzonga Landscape-India and will directly support the farmers to enhance their crop productivity, better-managed ecosystem services, and livelihood linkages. It will also act as a skill and capacity building material on developing organic farming based agro-horti entrepreneurship in the Khangchendzonga Landscape and other parts of the Himalaya. I am sure, this publication will serve multiple stakeholders, especially the farmers, in improving their livelihoods. The team of authors deserves appreciation for their efforts in realizing this manual.

Ranbeer S. Rawal
Director
G.B. Pant National Institute of Himalayan Environment and Sustainable Development (GBPNIHESD)

Conclusion

Organic farming provides a viable economic option for livelihood diversification, socio-economic development, and environmental sustainability. Aligning with the "Organic Mission" of the Sikkim state and expending the area of organic farming beyond the organic State, i.e. Sikkim, the Gorkhey and Samanden villages were identified for the promotion of organic farming on the basis of the prerequisite survey and the willingness expressed by the farmers. GBPNIHESD, SRC has been promoting organic farming under KLCDI-India through i) capacity building of farmers on different technology packages on low-cost organic farming technologies such as vermi-composting, bio-fertilizer, vermi-wash, and bio-pesticide; ii) providing technical supports and iii) monitoring the organic farming progression in the target areas.

In the above context the awareness and knowledge on organic farming of farmers have been enhanced during the skill and capacity building and extension education programmes and total 06 vermi-composting beds and 02 vermi-wash stands are functional in these villages. In addition, total of 05 farmers and 02 farmers are preparing bio-pesticides and bio-fertilizer respectively in the villages and applying in the farming. After one year of the progression, another survey was conducted and results indicated that the more than 90% farmers have adopted organic farming, however, which needs regular monitoring for a long-run.

The farming sector across the Himalayan region is greatly affected by socio-economic changes together with climate change. Therefore, sustained efforts are required for the promotion of organic farming through regular capacity building, developing basic infrastructure and statutory framework, creating market linkages, providing the necessary support to farmers through appropriate crop planning, and promoting and branding of the products. The decreasing use trend of inorganic fertilizers in Gorkhey and Samanden villages, and farmer's willingness to adopt the organic way of agriculture may lead these villages to be 100% organic in coming future. The ongoing activities and efforts of GBPNIHESD Institute in this direction under the KLCDI-India transboundary landscape programme will support the existing policy and schemes of the government for promotion of organic farming in the Indian part of the landscape in Sikkim.

References/suggested readings

Gurung J., Chettri N., Sharma E., Ning W., Chaudhary R.P., Badola H.K., Wangchuk S., Uprety Y., Gaira K.S., Bidha N., Phuntsho K., Uddin K., Shah G.M. 2019. Evolution of a transboundary landscape approach in the Hindu Kush Himalaya: Key learnings from the Kangchenjunga Landscape. Global Ecology & Conservation, DOI:10.1016/j.gecco.2019.e00599

Holmes K., Babendreier D., Bateman M., Chaudhary M., Grunder J., et al. 2019. Biopesticides Manual: Guidelines for selecting, sourcing producing and using biopesticies for key pests of tobacco. CABI, Wallingford, Oxfordshire OX10 8DE, UK

Niles M. 2008. Sustainable Soils: Reducing, Mitigating, and Adapting to Climate Change with Organic Agriculture. Sustainable Development Law & Policy, 19-23, 68-69

Verma S., Babu A., Patel A., Singh S.K., Pradhan S.S., Verma S.K., Singh J.P., Singh R.K. 2018. Significance of vermiwash on crop production: A review. Journal of Pharmacognosy and Phytochemistry , 7(2): 297-301

Background

Organic farming ensures holistic production of harvests through applying agronomic, biological, and mechanical practices, as opposed to using synthetic materials (FAO/WHO Codex Alimentarius Commission, 1999). Organic farming also ensures economic viability and environmental sustainability offering healthy ecosystems, including biodiversity, biogeochemical cycles, and soil biological activity that supports to mitigate climate change impacts.

Realizing this fact, in the year 2003, Sikkim government passed a resolution in the Sikkim Legislative Assembly to adopt organic farming and convert conventional farming system prevalent in the State. In this direction, Government of Sikkim constituted a Sikkim State Organic Board in the year 2003 and subsequently in the year 2010 Government of Sikkim launched a mission to implement organic farming programme and targeted to convert 50,000 hectares of land into organic by 2015. With the achievement of targets, Sikkim State has been recognized as the country's first organic state in 2018. However, it has been noticed and farmers' perceived that after opting organic farming, farmers witnessed low productivity in harvests and increasing pest attack on organic crops, especially during the transition from conventional farming to organic farming. Thus to ensure optimum productivity of organic crops, there is a need to promote low-cost bio-fertilizer and bio-pesticides. In this direction, Government of Sikkim is supporting several programmes for the application of bio-fertilizer and bio-pesticides in farming fields. However, the adjacent areas that are contiguous to Sikkim state are unaware of such practices of organic farming.

Box 1: Sustainable Soils: Reducing, Mitigating, and Adapting to Climate Change with Organic Agriculture
Reducing Green House Gases (GHG) emission from agriculture fields and adapting to climate change will depend on organic production systems for: i) the overall emission reductions possibly using organic production methods; ii) the increased ability of organic production systems to sequester carbon; and iii) the demonstrated ability of organic production to better adapt to potential climate change related events, including drought, floods, pest increase, and biodiversity loss. Niles (2008)

Khangchendzonga Landscape (KL) has been identified as transboundary landscape with an approach built on principles of integrated socio-ecological systems with conservation and development perspectives under the Khangchendzonga Landscape Conservation and Development Initiative (KLCDI) programme (Gurung et al., 2019). KL located in the eastern Himalaya, a part of global biodiversity hotspot, representing unique biodiversity, bio-cultural and geo-climatic assemblage. It covers a total area of 25,085.8 km^2, shared by India (56%), Bhutan (23%), and Nepal (21%), offering life support systems to over 7.25 million people (87% in India, 11% in Nepal and 2% in Bhutan). KL-India covers a total area of 14,061.7 km^2 along an altitudinal gradient (40 m to 8586 m asl), comprising the state of Sikkim, and northern part of West Bengal (four districts, viz. Alipurduar, Darjeeling, Jalpaiguri, and Kalimpong). Three pilot sites are identified to implement activities of KLCDI in Indian part, these are:

1. Dzongu: The site covers 149 km^2 area sharing part of North district of Sikkim and varies from 800 m to 4595 m asl altitude. The entire

Dzongu is populated by indigenous Lepcha tribal community and shares boundaries with Khangchendzonga National Park, the UNESCO world heritage site.

2. Barsey-Singalila Site: The site covers 80 km^2 area, which spreads from1800 m to 3685 m asl. It shares parts of Singalila National Park (SNP) and Barsey Rhododendron Sanctuary (BRS) and also covers parts of Sikkim (West district) and West Bengal (Darjeeling district), India. It is a unique transboundary location with eastern Nepal.

3. Bandapani Site: The site covers 16 km^2 area, under Alipurduar district of West Bengal, India and shares transboundary foothill region with Bhutan. It is also identified as a corridor for wildlife migration, especially elephants, connecting Jaldapara National Park, Gorumara National Park, and Chapramari Wildlife Sanctuary.

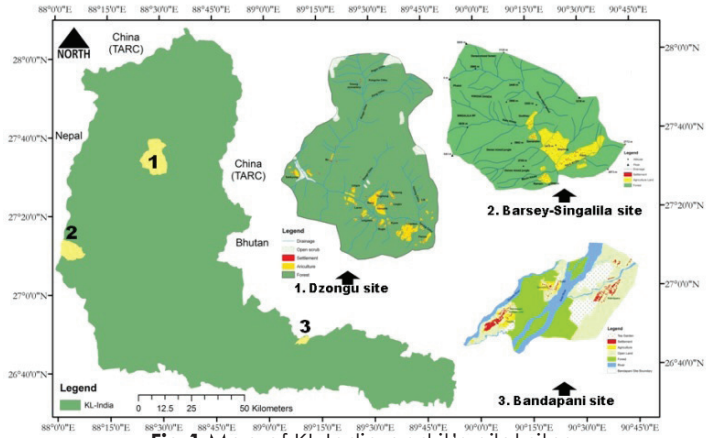

Fig.1 Map of KL-India and it's pilot sites

Integrating organic farming in Gorkhey and Samanden villages of Barsey-Singalila pilot site of KL-India is an important component of KLCDI-India activity, offers livelihood diversification and economic development opportunity to the community viz-a-viz ecosystem management. Gorkhey and Samanden are small villages bordering Singalila National Park in West Bengal and Barsey Rhododendron Sanctuary in Sikkim. A total of 65 households are residing in both the villages and mainly dependent upon agriculture for their livelihood, potato, peas, and maize being the major crops, while some are engaged in operating homestays during the tourist seasons. The villages lie on the trekking route of Singalila National Park closer to Phalut which is the famous trijunction of the two Indian States- Sikkim and West Bengal, and Ilam district of Nepal. Due to no motorable road connectivity, villagers depend upon horses for carrying goods of daily needs mainly from Ribdi and Sombarea, their nearest market in Sikkim state. The hardship in goods transportation and increasing tourist influx in the village makes it difficult for villagers to rely entirely on the outer market for daily supply of food and vegetables. The increase in the quality and quantity of agricultural productivity in the villages itself can help to sustain the growing ecotourism and make the villages self-dependent. With this sole concern, the promotion of organic farming is realized prerequisite to add value in the living of the community and sustain the ecosystem services.

Ever since the beginning of the implementation phase of KLCDI-India programme, the activities are more focused on livelihood improvement such as promotion of off-season vegetables; supported through polyhouse construction, organization of demonstration cum training events on polyhouse based farming; distribution of high-value off-seasonal vegetable seeds and seedlings, distribution of seedlings of Yacon (*Smillanthus sonchifolius*) and peach (*Prunus* sp.) and training on growing techniques in Gorkhey and Samanden villages. Besides these various other activities in relation to the animal

husbandry and community-based ecotourism promotion were also undertaken. In continuation, the noted activity for next consecutive year of the implementation phase of KLCDI-India is to "Support Technologies transfer in horticulture (fruit and vegetable growing) promotion and efficacy monitoring in Gorkhey and Samanden: intervention in bio-pesticide and bio-composting technologies".

Assessment of organic status: Gorkhey and Samanden

Focusing the activities on promotion of organic farming in the villages, analysing the organic and inorganic farming status of the villages and exploring the knowledge regarding the farming system in the region, 40 farmers of Gorkhey and Samanden villages were randomly surveyed with structured questions related to the type of farming, manures used and various other details associated to the agricultural practices. This study revealed that farmers have been using inorganic fertilizers along with organic manures in the field since 10-15 years, to increase productivity. On an average, an individual farmer used fertilizers i.e. Urea 40-50 kg/year, Super Phosphate 30-40 kg/year, Di ammonium phosphate 30-40kg/year, Farm Yard Manure (FYM) 7500-9000 kg/year and forest manure 300-400 kg/year as manures for farming in the region. Despite some of their crops are infested with various diseases and pests, the use of pesticides is negligible in the region. The survey results indicate that after skill and capacity building on organic farming village farmers are using fewer amounts of inorganic fertilizers as compared to the organic manure.

Promotion of Organic Farming

In view of the above, a possibility was observed to encourage organic farming through skill and capacity building events and on-site demonstration on organic farming practices such as vermi–composting, vermi–wash, bio–pesticides and bio–fertilizer. The practices need to be affordable for marginalized farmers with easy learning materials. In this context, the low-cost organic farming techniques were demonstrated in the farmer field in the Gorkhey

and Samanden villages under KLCDI-India. The details of low cost technologies are as follows:

Low-Cost Organic Farming Technologies

Vermi-composting- *(a method of using worms to transform organic waste into a nutrient-rich fertilizer),* a viable and eco-friendly technology where the organic materials are converted into vermi-compost through the joint action of earthworms and microorganisms. It is a healthy and clean way to eliminate wastes going into our landfills, which improves the

farmland environment. Vermi-composting is inexpensive and only takes two to three months to produce results, which improves the root structure, plant growth, new shoots and blooms of plants. In addition, vermi-compost has ingredients that repel insects, and it can be used as an insect repellent.

Procedure of vermi-composting

- Vermi-composting unit should be in a cool, moist and shady site
- A layer of 1 feet of chopped dried leaves/grasses should be kept as a bedding material at the bottom of the bed.
- A layer of cow dung should be added on to it repeatedly up to 2.5-3 feet height. A layer of green leaves may be put in between cow dung.
- The bed of breadth 6x3 feet and the length can be made depending upon the availability of land.
- Earthworms *(Esina foetida)* should be added on the top of the bed because the earth warm feeds from top to bottom and a thin layer of cow dung to be added on top of it.
- Water needs to be sprinkled immediately after the release of worms
- Cow dung and chopped dried/green leafy materials (raw material) should be mixed in the proportion of 3: 1.
- Beds should be kept moist by the sprinkling of water (daily) and by covering with gunny bags/polythene
- Bed should be turned once after 30 days for maintaining aeration and for proper decomposition.
- Each bed should contain approx 150-200kg of raw material
- Compost gets ready in 45-50 days with approx 100-150kg.
- When the raw material is completely decomposed it appears black and granular in texture. Watering should be stopped as compost gets ready. The compost should be kept over a heap of partially decomposed cow dung so that earthworms could

Vermi-composting bed prepared at Gorkhey village

Vermi-compost ready to use

Box 2: Overview of bio-pesticides

- Microbial bio-pesticides consist of microorganisms (e.g. bacteria, fungi, viruses, viroids or protozoa) or their products (metabolites, e.g. protein toxins) as an active substance. Entomopathogenic nematodes are sometimes classed as microbial pesticides.
- Macrobials (macroorganisms) include insects' natural enemies (e.g. parasitoids such as Trichogramma wasps or predators such as coccinellid beetles) and entomopathogenic nematodes (though the latter are often considered as microbials).
- Biochemical bio-pesticides are a diverse group that includes naturally derived biochemicals such as plant extracts/botanicals, which are derived from plants and are active against the target pest or pathogen. Botanicals may have direct effects on the target pest or indirect effects via the host plant. Biochemical bio-pesticides may also be based on metabolites derived from fermentation of living microorganisms e.g. Spinosad.
- Semiochemicals are naturally occurring chemicals emitted by plants, animals and other organisms (which may be synthetically produced) that modify insect pest behaviour. These can be used as repellants, attractants for use with traps, or for mating disruption.

Holmes et al. (2019)

migrate to cow dung from compost. After two days compost can be separated and sieved for use.

Bio-Pesticide- *(a natural pesticide that is made of minerals, bacteria, plants, and animals),* there are around 1,400 products that are registered as bio-pesticides, and 299 active ingredients considered to have bio-pesticide properties. Bio-pesticides are said to be a safer alternative to synthetic chemicals.

Locally available plants and grass can be used for bio-pesticides, which are considered poisonous or toxic and not consumable by animals or those that have very pungent smell can be taken for the ingredients of bio-pesticide. This is a broad-spectrum organic pesticide and can be used against any type of pests which do not act by directly killing the pests rather it acts by repelling it.

Table 1: Locally available poisonous plants

Local Name	Scientific Name
Titeypaate	*Artemisia* spp.
Angeri	*Lyonia* sp.
Balu	*Sida cordifolia*
Chimal	*Rhododendron* sp.
Bhotepati	*Elscholtzia fruticosa*
Boke timur	*Zanthoxylum armatum*
Chilly Plant	*Capsicum* sp.
Chingphing	*Heracleum wallichi*

Procedure of bio-pesticide

- Collection of locally available poisonous or toxic plants (Table 1)
- The collected plants

Box 3: Significance of vermi-wash on crop production: A review

As a rich source of vitamins, hormones, enzymes, macronutrients and micronutrients, use of vermi-wash helps to enhance the growth of plants. The comparative study was done on the effect of vermi-wash on crop production capacities of soil by improve the physiochemical property of soil and reduced the insect pest infestation which would have facilitated increased uptake of the nutrients by the plants resulting in higher growth and yield. It also helps in sustainable crop production.

Verma et al. (2018)

should be chopped into fine pieces and mixed with cow urine and water.

- The mixture should then poured in an airtight jerry cane and left for fermentation for about 20- 30 days to get a final concentrated mixture.
- While using, one liter of the concentrated mixture should be mixed with 9 liters of water.
- The mixture can be used/ stored for a period of 6 months.
- Use of pesticides can be more effective in the morning or evening time when the pests are less active.

Vermi-wash- *(the earthworm washed water),* it is a liquid fertilizer collected after the passage of water through a column of earthworm culture. It is also defined as the extraction of coelomic fluid of earthworm along with its excretory products and micronutrients from soil. It is rich in nutrients, hormones, amino acid, vitamin, and enzymes. Thus spray of vermi-wash on plants helps in good growth of plants and conserves micro-organisms in the soil. Also, it manages the growth of harmful bacteria and fungi probably due to some antimicrobial activities.

Procedure of Vermi-wash

- For the preparation of vermi-wash a simple wooden structure needs to be constructed for holding the bamboo basket (*doko*) at around 4 feet in height, in which farmyard manure and earthworm can be added with 1 liter of water.
- Below the bamboo basket, another basket with holes should be kept filled with sand and stone gravels for filtration of the water

dropping from the above basket.

- The collected water after filtration is known as vermi-wash. The collected wash can be used as foliar manure application in vegetables, etc. by mixing it with water in the ratio 1:10 (i.e., 1 liter of vermi-wash in 10 liters of water).

Bio–fertilizer- *(substance which contains living microorganisms),* on applying to the seeds, plant surfaces, or soil, it colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Jiwa Amrit Jal and Panchakabya are among the ancient bio-fertilizers used by traditional farmers in organic farming. They are helpful in adding life to the soil. These are the solutions prepared for applying/spraying over the crops/vegetables and very helpful in treating several crop diseases and in maintaining healthy growth of food crops.

Procedure of Bio-fertilizer

- Collection of ingredients i.e., Cowdung (1-2 kgs), jaggery (gur) 50gm, 1 liter of cow urine (gauth), 1 kg of soil collected from the base of a tree and 8 liters of water should be mixed in a big vessel.
- The mixture should be stirred in clock-wise and anti-clockwise direction for several times for thorough mixing.
- Finally, the mixture should be poured in an airtight jar and kept aside for fermentation for 10-12 days. The mixture should be stirred once a day daily.
- After 10-12 days it (Jiwa Amrit jal) is ready to use.
- While using, mix Jiwa Amrit jal with water in the ratio 1:10 (i.e. 1liter of vermi-wash in 10 liters of water).
- To use it as a foliar spray filter the liquid using a cotton cloth to separate out the waste. If you do not filter it your spray nozzle will be blocked.
- As a bio-fertilizer, it can be used once every two weeks during normal growth of a plant and once a week during flowering and fruiting. It can be used on a weekly basis with a foliar spray. It has been noticed that after spraying of bio-fertilizer, all pests can be seen disappear from the crops.

Bio-fertilizer can be beneficial for the farmer if it is used in proper manner. The bio-fertilizer will help i) to keep pests away from the plants, ii) to develop bigger and better leaves and stems; iii) to develop plant canopy and root system denser; iv) to increase the quantitative and qualitative yield of crops; and v) to maintain and sustain the agro-ecosystem. ■

Box 4: Training on Organic Farming and Its Outcomes

To promote organic farming in Gorkhey and Samanden villages, GBPNIHESD, Sikkim Regional Centre, in collaboration with The Mountain Institute, India; Sikkim Kishan Society, Daramden; and Directorate of Forests, West Bengal organized two day training cum field demonstration event under KLCDI India programme through intervention in bio-pesticide and vermi-composting technologies in Gorkhey and Samanden villages. With a vision "*build the capacity of the farmers on organic farming for coping up with the agriculture productivity*", the objectives: i) promotion of organic farming for improved horticulture farming (fruit and vegetable growing), ii) promotion and efficacy monitoring for better yield of off-seasonal vegetables, iii) intervention on bio-pesticides and bio-composting, and iv) integrate the organic farming practices for promoting cleanest and organic village with sustainable livelihood and ecotourism.

The training was participated by the 38 farmers and started with introduction and necessity of organic farming as 'The one who adds life

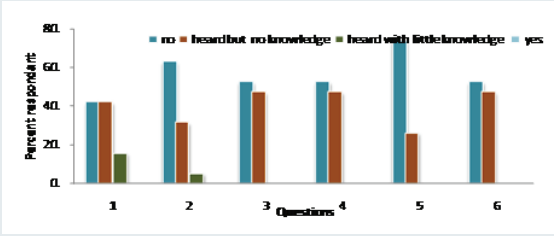

Fig. 2 Responses of participants on pre-training assessment

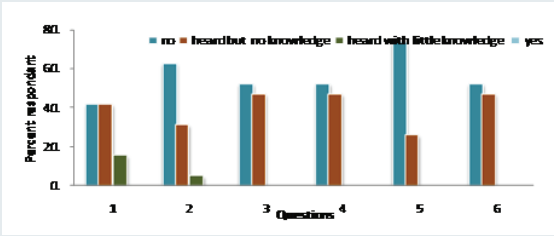

Fig. 3 Responses of participants on post-training assessment

to the soil are the FARMERS or KRISHAK', and added that the continuous use of inorganic chemicals and fertilizers have slowly been killing the soil fertility. The various pest and diseases and the crops damaged were listed out. Alongside the seasonal calendar of sowing and harvesting crops was prepared with the help of community people. The importance of organic farming for the effective and sustainable use of ecosystem services was also discussed during the training session.

The output of the event on organic farming for empowering skill and capacity of farmers (participants) was estimated on the basis of their knowledge enhancement. Through analysis of the pre-assessment forms, it was found that most of these topics were unknown for the participants and they did not have much information/ idea about them (Fig. 2). However, the post-training evaluation was conducted at the end of the training, with the help of the similar assessment form (Fig. 3). The participants were asked to: i) give their views regarding the training programme, and ii) fill the post-assessment form and give rankings to questions asked, according to their level of understanding of the different topics fields discussed and taught in the training. According to the post-assessment form, most of the participants were found to have better knowledge and confidence regarding these topics

Questions

1. Do you know the difference between organic and inorganic farming?
2. Have you heard about the technologies involved in organic farming?
3. Do you know about- Vermi-composting?
4. Do you know about Bio- composting?
5. Have you heard about the Bio-pesticides?
6. Do you know the benefit of organic farming over the inorganic one?