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Reducing Pesticides in the Farms

Working Approaches in Somadi and Mujhung VDCs of Palpa District

Health and Technical Education Development Centre Palpa (HTEDC)

Reducing Pesticides in the Farm: Working Approaches in Somadi and Mujhung VDCs of Palpa District

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Foreword

The Global Environment Facility Small Grants Programme of United Nations Development Programme in Nepal has been supporting implementation of community based innovative projects that not only focus on global environmental issues but also add to local livelihoods.

Health and Technical Education Development Centre (HTEDC), a Palpa based NGO, has successfully completed a project entitled 'Reduction of harmful pesticide for land improvement" in Somadi and Mujhung VDCs of Palpa district (currently Rainadevi Chhahara Village Municipality Ward No 2 and 5) funded by Small Grants Programme. The project, through a participatory action research encompassing 100 farmers in the project area, looked at the impacts of widespread use of pesticides on both soil and human health and demonstrated a sustainable soil management technique to help reduce the menace of the pesticides. Altogether 100 farmers, benefitted from the use of bio-pesticides and organic farming and 15 ha of farm land was brought to sustainable use by making it free of chemical pesticides and fertilizers.

This important publication documents the impacts of chemical pesticides and fertilizers on human and environment health and forwards the discussion about use of bio-pesticides and organic farming as a means to reduce the impacts.

I believe that this publication is useful to both researchers and development practitioners who has interests in arresting soil degradation from uncontrolled use of chemicals.

I express my sincere appreciation to HTEDC team and the local community for successful implementation of the project.

Vijaya Prasad Singh
Assistant Resident Representative

"We used chemical pesticides and fertilizers because we did not have adequate knowledge regarding its proper use or its alternative. The project helped us understand the negative effects of these chemicals on both the soil and our health."

-Women groups of Palpa

Photo Credit MRC

Foreword

I would like to congratulate the Health and Technical Education Development Centre, Palpa (HTEDC) for successfully completing the project titled "Reduced the harmful pesticide for land Improvement" and publishing this report. The project not only addresses the concerns of GEF focal area of prevention of land degradation but also empowers local communities to reduce the use of harmful agricultural chemicals and adopt organic vegetables and mushroom farming. The promotion of Matribhumi Improved Cooking Stoves (M-ICS) and organic farming has helped improve the health of families, particularly women and children, who can now study and work in a smoke-free environment.

This book captures initiatives undertaken during two years of project tenure and summarizes project approaches, activities, results, and discussion on organic farming. This book would be helpful to academia as well as development practitioners who wish to take the knowledge forward and replicate these practices in their area.

I would like to thank Mr. Ram Bahadur Raut for preparing this report with useful learning incorporated. My sincere thanks to Mr. Kanchan Mani Dixit for critically reviewing and providing input, as well as editing the document. Similarly, my gratitude extends to Mr. Vivek Dhar Sharma for developing the concept and reviewing the document.

Finally, I would like to thank the entire project team and wish everyone the very best for continuously working with rural communities to improve their livelihood and health.

Gopal Raj Sherchan
National Coordinator
UNDP GEF-SGP

Chandra Kant Pokhrel irrigating his organic vegetable field

Acknowledgement

I express my sincere gratitude to Mr. Gopal Raj Sherchan, National Coordinator and Mr. Vivek Dhar Sharma, National Program Assistant of UNDP GEF-SGP for believing in us and providing financial aid to carry out this project.

The project is the result of hard work of many individuals including community members, officials of VDCs and DDCs and, stakeholders of Mujhing and Somadi VDCs of Palpa District. Similarly, my sincere thank goes to Mr. Chandrakanta Pokharel, coordinator of user committee Somadi, Mr. Human Singh Karki coordinator, and the members of user committee of Mujhung for making this project successful. I would thank the project staff for their hard work and dedication. My thanks also go to Mr. Ramchandra Timilsina who trained the households to install Matribhumi Improved Cooking Stoves (M-ICSs) in their homes to improve their health. Installing M-ICSs have helped improve the health of women and children who now live in a smoke-free environment. I am also grateful to other trainers who provided orientation on organic farming, mushroom cultivation, constructing ponds, tunnels, and sheds to the participating farmers.

This book would not have been possible without help from Mr. Kanchan Mani Dixit, who took the time to go through every word of this report and provided much-needed input.He also coordinated with the designer to bring the publication at this stage; a warm gratitude to his effort. Lastly, I would like to thank the project colleagues who made the project successful.

Ram Bahadur Raut
Team Leader,
Reduction of Harmful Pesticide for Land Improvement Project
Health and Technical Education Development Centre Palpa (HTEDC)

Contents

Summary

Health and Technical Education Development Centre Palpa (HTEDC) carried out a project on reducing harmful chemicals from soil with support from Global Environment Facility-Small Grant Programme of United Nations Development Programme (UNDP) and other stakeholders of Palpa. The two-year project was implemented in Somadi and Mujhing VDCs, currently Rainadevi Chhahara Village Municipality ward no 2 (Somadhi) and 5 (Mujhung) of the Palpa District. The project encouraged the farmers to practice commercial organic vegetable and mushroom farming to improve quality of soil and their health by giving up the use of pesticides and chemical fertilizers and switching to organic farming. The project formed farmers groups and provided trainings such as building tunnels, producing off-season vegetable, improving cattle shed, as well as constructing plastic-lined ponds for collecting rainwater to be used for irrigation. Enhancing leadership of rural women was another focus area of the project. This report discusses the project's approaches, methodologies, results, and the outlines ways forward. The information is also supplemented by the stories in boxes that captures success of entrepreneurs of the VDC who were influenced by the project.

Participants of training on organic mushroom farming, Somadi 9

Context

Agriculture is the main source of income for the majority of Nepali people. About 65% of the population is engaged in agriculture. People are, however, moving away from subsistence agriculture to commercial farming (Khadka and Dixit, 2014)[1] seeking good income. Commercialization of crops requires extensive use of fertilizers and pesticides to increase production. Nepali farmers, in most cases, apply excessive chemical pesticides and fertilizers to their fields; much more than the recommended doses without even considering the waiting period, residue on the treated stuff, and effects on human health and the environment.[2]

Adding chemicals to the fields might yield more for some time as it kills harmful pest. However, in the long run, it reduces crop yield. This is because such chemicals also kill friendly microorganisms that form and maintain the soil, deplete soil nutrients and soil organic matters (SOM) leading to soil erosion.[3] These chemicals not only affect the soil health where it is applied but also affect other adjoining areas. Some pesticides may break down quickly after application but others may persist for longer periods and find its way in the food chain affecting living creatures, including human beings.

1 Khadka, S. and Dixit, A. (2014).*The Changing Intersection of Society and Development Goals An Examination Aimed at Improving Policymaking*. Southern Voice Occasional Paper 10.Bangladesh: Southern Voice on Post-MDG International Development Goals.

2 Shrestha, P. L and Neupane F. P, 2002: Socio-economic Contexts on Pesticide Use in Nepal, Landschaftsökologie und Umweltforschung 38 p. 205-223, Braunschweig.

3 Singh, B. and Ryan, J. 2015: Managing Fertilizers to Enhance Soil Health, France, May [downloaded from www.fertilizer.org/Library]

Chemical pesticides cause negative health effects in human beings, animals, and ecosystems; which might cause cancer and improper neural development among human beings.[4] Farmers have experienced problems such as acute and chronic neurotoxicity, birth defects, fetal death, altered growth, and genotoxicity.[5] Other effects include eye irritation, vomiting, skin irritation, dizziness, headache, diarrhea, and shortness of breathing.[6,7] Atreya K. (2007) estimated that probability of falling sick from pesticide related symptoms is 133% higher among individuals who apply pesticides compared to individuals in the same household who are not directly exposed. Similarly, pesticide exposure contributed to a health burden of NPR 1,105,782 (US $ 15,797) per year in the study area. He also estimated that the developmental and administrative funds from the government to Baluwa and Panchkhal Village Development Committee (VDC) of Jhiku Khola Watershed (JKW) was NPR 10 lakh per year. The aggregate health cost was equivalent to 55% of the annual development and administrative budgets of these two VDCs. Karmachary (2012)[8] carried out another survey in Panchkhal of Kavre District. His study showed that among 1,320 people interviewed, 68% felt discomfort immediately after the application of chemical fertilizer and pesticides. About 29% felt discomfort in respiration immediately after the pesticide applications. About 19% had skin rashes, burns, and irritation. About 14.29% faced the problem with muscle pain and 38% experienced headache and back pains.

The use of excessive chemicals in the fields have affected the health of women as well. With the increasing male out-migration, female member has to bear additional responsibilities of managing agriculture on top of their regular household chores. On one hand, the excessive use of chemicals in fields have deteriorated women health, while on the other hand, women have less time to take care of their children and families. In both cases, they lose. This is the reason they are attracted to less intensive farming practices (Tamang et al. 2014).[9] Widespread discrimination in getting the agricultural support and services they require to produce food is other serious challenges they face (Oxfam 2015).[10]

4 Dhital et al 2015

5 *Ibid*

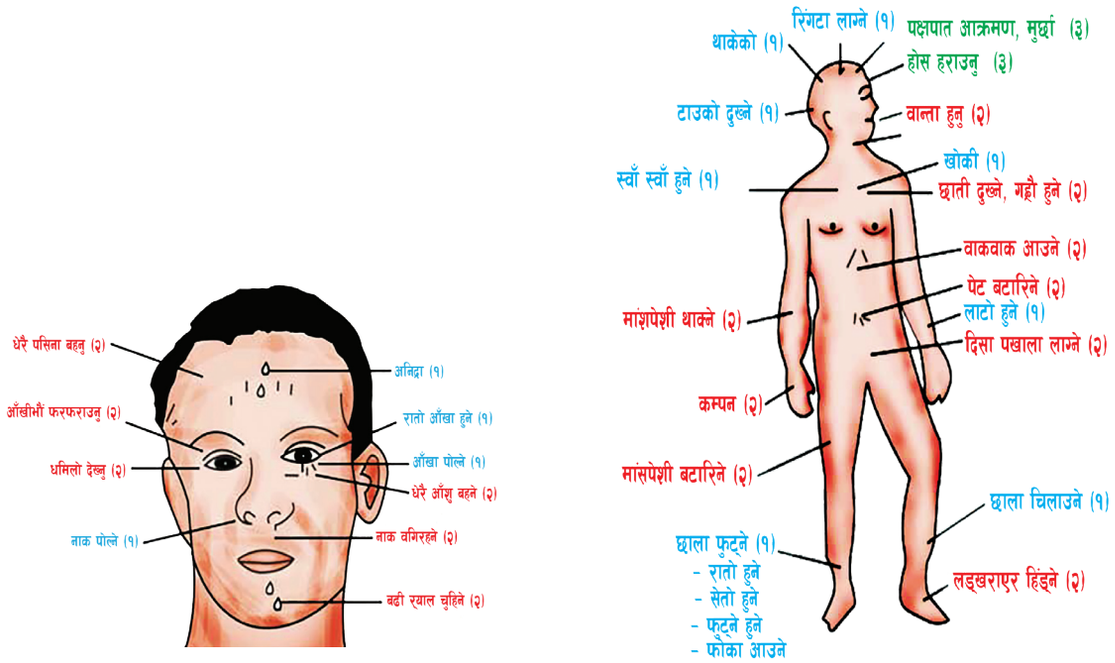
6 Subedi, I. P, 2015: Pesticide Use Practices Among Tomato Growers in Kavre District, Nepal, Nepalese Journal of Zoology, Volume 3, Issue 1, November.

7 Atreya, K., 2007: Pesticide Use in Nepal: Understanding Health Costs from Short-term Exposure, SANDEE Working Papers, Nepal

8 Karmacharya, S., 2012:Pesticide Use In Agriculture And Its Socio- Economic Contexts, A Case Study of Panchkhal Area, Kavre, Nepal, International Journal of Scientific & Technology Research Volume 1, Issue 9, October.

9 Tamang, S., Paudel K. P.and Shrestha, K. K. (2014). *Feminization of Agriculture and its Implications for Food Security in Rural Nepal*. Journal of Forest and Livelihood 12(1) October. Nepal: Forest Action.

10 Oxfam (2015).Promoting Women's Economic Leadership in Nepal. http://reliefweb.int/sites/reliefweb.int/files/resources/cs-women-economic-leadership-nepal-280715-en.pdf.



Source: Government of Nepal and FAO (2017). Field guide: pesticide management, Department of Agriculture, Ministry of Agricultural Department, Kathmandu.

These shreds of evidence point out that these chemicals are indeed harmful and organic farming needs to be promoted across the country for both soil and human health. This led to the conceptualization and implementation of the project at two VDCs of Palpa District.

History of pesticide use in Nepal

The government of Nepal defines pesticide as a poisonous medicine used for killing or destroying harmful pests that appear in seeds, plants, trees, animals, and fowls (Pesticide Act, 1991). The use of these chemicals in agriculture started before the World War II when sulfur, copper or deliverers of plants were used as pesticides. After the World War II, use of chemicals in agricultural fields accelerated.[11] In Nepal, use of DDT started during the 1950s to control malaria. This was followed by the use of Organochlorine pesticides in the 1950s, Organophosphorus pesticides in 1960s, Carbamates in 1970s, and synthetic Pyrethroids in 1980s. The most commonly used pesticides in Nepal are Malathion, Chlorpyrifos, Methyl, Cypermethrin, Deltamethrin, Mancozeb, Parathion-methyl, Fenvalerate, Dichlorvos, Endosulfan sulfate, Dimethoate, and Carbendazim.[12] Pesticide consumption in Nepal is increasing by about 10-20% per year.[13] In 1997/1998, about 50 thousand kilograms of pesticides were consumed which increased to 350 thousand kilograms in 2011/2012.[14] The government of Nepal has banned some of the chemical pesticides that are harmful to human beings and animals. The list of banned pesticides in Nepal is given in Annex 1.

11 Diwakar. J, Prasai T., Pant S. R. and BinaLaxmiJayana B. L., 2008: Study on Major Pesticides and Fertilizers Used in Nepal, Scientific World, Vol 6, No. 6, pp 76-80.

12 Mount Digit Technology (P) Ltd, 2014: Study on National Pesticide Consumption Statistics in Nepal, report submitted to Pesticide Registration and Management section of Ministry of Agriculture Development, Kathmandu.

13 *Diwakar et al 2008*

14 Dhital S., Rupakheti D., Tripathee L., Sigdel S R., 2015: A Review on Status of Pesticide Use in Nepal. Research Journal of Agriculture and Forestry Sciences. 20153(3):26–29.

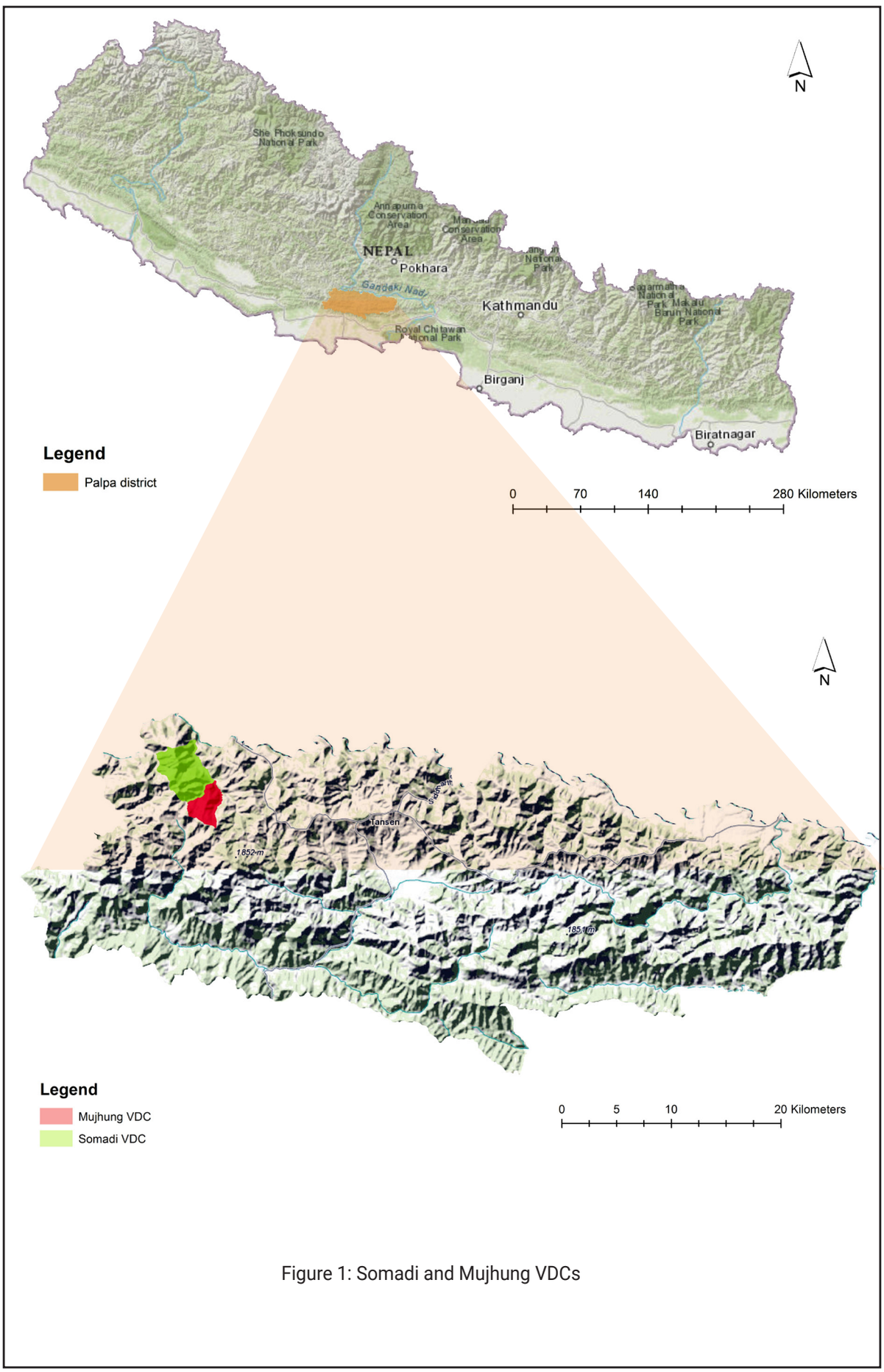


Figure 1: Somadi and Mujhung VDCs

The project

Project Name	Reduction of harmful pesticide for land Improvement
Project number	NEP/SGP/OP5/Y3/STAR/LD/14/05
Grantee's name	Health and Technical Education Development Centre Palpa
Project Location	Mujhung and Somadi/Palpa,currently Rainadevi Chhahara Village Municipality ward no 2 (Somadhi) and 5 (Mujhung)
GEF focal area	Land Degradation and Chemicals
Total project cost (NPR.)	Total project cost: 5,518,600 UNDP GEF-SGP: 3,100,000 (USD 32,561) Community: 1,694,600 VDC: 136,000 Local FM: 144,000 HTEDC: 244,000 MSFP: 200,000
Project duration	From April 2014 to April 2016 (2 years)

Health and Technical Education Development Centre Palpa (HTEDC) implemented the project 'Reduction of Harmful Chemicals from Soil' with support from Global Environment Facility-Small Grant Programme of United Nations Development Programme (UNDP) (UNDP GEF-SGP) and other stakeholders of Palpa. The project was implemented in Somadi and Mujhung VDCs of Palpa District. This is because farmers from both the VDCs used huge amount of chemical pesticides and fertilizers in their fields that was damaging the quality of soil. The health of the farmers were also deteriorating as they did not use any safety measures during application of chemicals. The Somadi VDC has a population of 2,724 with 1,191 males and 1,533 females living in 635 households. Similarly, Mujhung VDC has a population of 2,147 with 933 males and 1,214 females living in 532 households (Census 2011). The numbers might have increased by the time this report is being prepared.

Baseline survey

A baseline survey was carried out in the Somadi and Mujhung VDCs before the project was implemented to understand the status of chemical use. The result showed that the farmers applied more than three-fold to the recommended dose of pesticides, chemical fertilizers, insecticide and fungicides in their fields. They did not follow safety measures during use of those harmful chemicals. Farmers used heavy doses of Mancozeb (DM 45), Indofil (M 45), Metalaxyl, Nuvan, Chlorpyrifos, Thiodan (Endosulfan) Rogar, Furaden. Urea and Dialkylphosphates (DAP) were also used more than recommended. Some of these chemicals are Persistent Organic Pollutants (POPs) that has been banned in Nepal by the Nepal Government. In an average, about 1,500 kg solid and/or 1,500 liters of liquid pesticides were used annually in the project area. In Somadi, farmers used 8,400 kg Urea, 1,800 kg DAP and 300 kg Potash whereas farmer of Mujhung used 6,400 kg Urea 3,500 DAP and 1,200 kg Potash in a year. These Nitrogen-rich fertilizers are recommended only when plant requires nitrogen, but the farmers applied them without any knowledge of their need. Among surveyed farmers, 57 farmers used the higher dose of fertilizer for semi-commercial vegetable production. Annex 2 lists the pesticides used by the farmers along with their potential health hazard.

Objectives

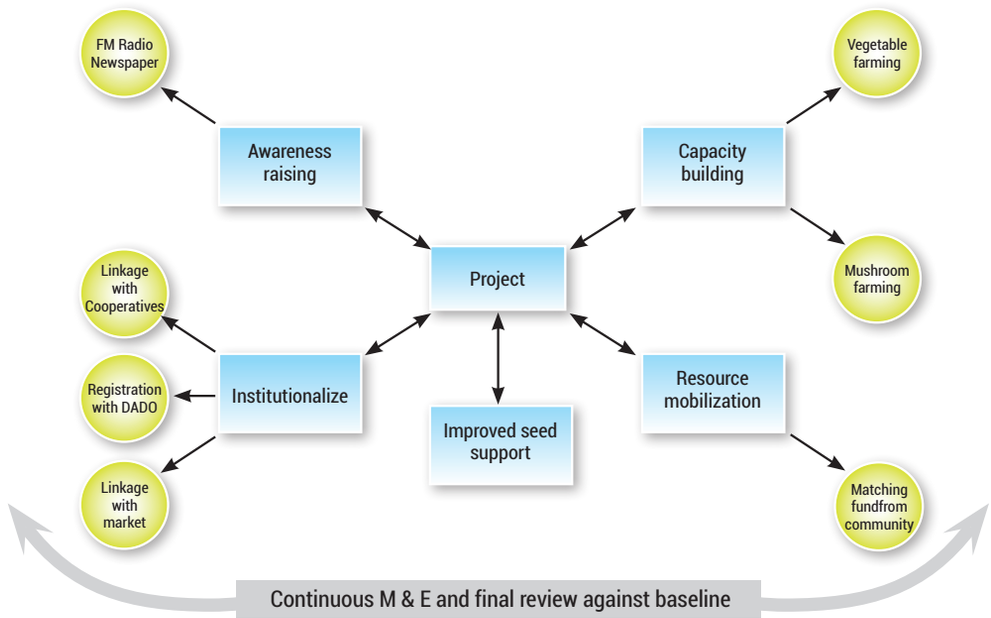
The overall objective of the project is to improve soil health by encouraging farmers to switch to organic farming from chemical based farming. The specific objectives are to:

- Reduce the use of chemical fertilizer and harmful pesticide in the project area.
- Enhance local livelihood through organic farming
- Build local institution for the promotion of organic farming.

Working approach

In the first phase, the project carried out baseline survey and sensitized local people against the use of chemical fertilizers and pesticides. Efforts were made to generate awareness through local FMs, newspapers and public discussions on the scope and benefits of organic farming. After mobilizing local communities, the selected local farmers were trained on organic farming and also provided support to build animal sheds, plastic tunnels and water harvesting pond for irrigation. While doing so, the project ensured participation of women and indigenous peoples and also collaborated with VDC and line agencies for resource mobilization.

In the second phase, the project focused on institutionalizing farmers' group, developing linkages with cooperatives and exploring market for locally produced organic vegetables. Continuous monitoring and periodic review at VDC and DDC were carried out to ensure transparency of the project. The final review of the project was carried out against the baseline and the results were documented and published for wider circulation.



Activities

The following activities were carried during project implementation:

Information sharing: The project carried out a district and VDC-level sharing orientation workshops to inform stakeholders about the project objectives, design, and implementation plan. The primary objective of these workshops was to share the project related information to the concerned stakeholders and right holders.

District-level orientation workshop: A district-level orientation workshop was organized at Tansen, Palpa on June 28, 2014. Twenty men and five women representing political parties, journalist, Administrative Development Office (DADO) and stakeholders participated. The program shared project objectives, target, budget, and working modality with the participants.

VDC-level orientation workshop: VDC-level workshops were organized simultaneously in both the Somadi and the Mujhung VDCs on 26 August 2014. Local stakeholders, political parties, VDC secretary, chairperson of Citizen Awareness Centre (CAC), community groups, line agencies and people from different walks of life participated.

Participants of training on organic vegetable farming at Mujhung

Improved Cattleshed of Bhagwati Pokhrel of Somadi 7

Organic mushroom cultivated by Sudeep Raut of Somadi 9

Baseline survey: A baseline survey was carried out in the selected locations of the VDCs to understand the use of chemicals in agricultural fields. Leaders, farmers and knowledgeable people, and representative of the entire users of two communities were interviewed. The collected information was then analyzed.

Group formation: The project formed an 80-member group of organic vegetable farmers and a 20-member group of mushroom cultivators from the two VDCs. Both dalits and the janjatis were included in the groups. The groups hold regular interaction programs to share their experiences

Institutionalizing groups: In order to have sustainable functioning of farmer groups, they were registered with the District Agriculture Development Office (DADO).

Trainings

Cattle shed improvement: One hundred households of the project area who participated in organic farming received support from the project to improve their cattle shed. The project provided each household Rs. 4,000 to purchase construction material and hire technicians. The project also provided support to construct eco-san toilet to collect human urine and feces separately.

Organic vegetable farming: Two-day training on organic vegetable farming was provided to the farmers of Somadi on 27-28 August 2014 and Mujhung on 29-30 August 2014. Eighty farmers from the two VDCs, who improved their cattle sheds, received the training. The participating farmers also received orientation on the preparation of bio-pesticide, its use and preventive cultivation techniques to have pest-free crops

Mushroom cultivation: The project supported mushroom cultivation in both VDCs. Twenty farmers received the trainings to construct thatched house and prepare straw bulb for seeding. Trainings were also conducted to produce mushroom

M-ICS: The project enhanced the skill of existing workforce of project to install M-ICS.

पाल्पामा विषादी प्रयोग न्युन कार्यक्रमले सार्थकता पायो

प्राङगरिक् तरकारी तथा च्याउ खेतीमाफर्त् रासायनिक मल तथा विषादीको प्रयोगमा कमी ल्याई माटो सुधार गर्ने उद्देश्यले संचालित कार्यक्रमको सोमादी र मुझुङमा स्थलगत अनुगमन गरिएको छ। पाल्याको सोमादीको सर्दैवा, ताङसियल, दिगका साथै मुझुङको भालुखान,मगाल, मुझुङ मा सञ्चालित तरकारी, च्याउ खेती, मातृभूमि चुल्को लगायतको अनुगमन गरिएको हो। संस्थाले सञ्चारकर्मीलाई स्थानीय कृषकसँग सोही विषयमा अनुगमन, छलफल तथा अन्तरक्रियासमेत गराएको छ। २०७० साउनदेखि सुरु परियोजना अन्तर्गत संचालित गतिविधिका बारेमा स्थलगत अनुगमनका क्रममा सोमादी तरकारी समूहका अध्यक्ष चन्द्रकान्त पोखरेल, सोमादी च्याउ समूहका अध्यक्ष लोकबहादुर राउत, मुझुङका तरकारी समूहको अध्यक्ष हुमानसिंह कार्की र मुझुङ च्याउ समूहका अध्यक्ष संजीब बस्नेतले कार्यक्रम साउमा आएपछि स्थानीय जनताको जिवनस्तर सुधार ल्याउन सहयोग गरेको बताए।

परियोजनामा आवद्ध भएका हरिभक्त नेपाल, केशवराज पाण्डेय, तुल्सीराम पाण्डे, सुन्दरबहादुर थापा, ओमबहादुर खत्री, लोक बहादुर राउत, मिन बहादुर घर्ति, नारायण पोखरेल लगायतले कार्यक्रमले तरकारी, च्याउ खेतिको बारेमा क्षमता विकास गरी च्याउ र तरकारी खेती गरेर आम्दानी गर्न सफल भएको बताएका छन । परियोजना अन्तर्गत दुई वटा तरकारी समूह र दुई वटा च्याउ समूह गठन भएका छन्। स्वास्थ्य सीपमूलक शैक्षिक विकास केन्द्र मार्फत् सञ्चालित परियोजना अन्तर्गत संस्थाका प्रबन्ध निर्देशक रामबहादुर राउतले लक्षित गाविसमा रासायनिक मल तथा विषको प्रयोग ३५ प्रतिशतमा झार्ने र किसानको क्षमता अभिवृद्धि मार्फत वैकल्पिक जैविक विषादी निर्माण गर्न सय किसानलाई संगठित गर्ने उद्देश्य रहेको बताए। उहाँले परियोजना मार्फत् कम्पोष्ट मल उत्पादनका लागि सय घरमा भकारो सुधार गर्ने र पशुचौपायाको मलमुत्र सकलनबाट विषादी बनाउन सिकाईएको बताए।

जसबाट प्रागारिक उत्पादनका रुपमा ८० घरमा तरकारी तथा २० घरमा च्याउ खेतीमा सहयोग गरिएको छ। परियोजनाले विपन्न, दलित, जनजाति र महिलाको जीवनस्तर उकास्न सहयोग पुगेको बताइएको छ। सोमादी गाविसका सय घरमा भकारो सुधार भएको छ भने कृषकलाई तालिम दिएर तरकारी र च्याउ खेतीमा आकर्षित गरी आम्दानी बढाईएको संस्थाका अध्यक्ष इण्डपाणी पोखरेलले बताए। प्रांगरिक तरकारी खेती तालिम, च्याउ खेती तालिम दिएर कृषकलाई सक्षम बनाइएको छ। दुई गाविसमा सहयोग गरेको कुरा पनि पोखरेलले बताए। परियोजना अवधिभर २० जना कृषकलाई अर्गानिक च्याउ खेती गर्न टनेल निर्माण गर्न सहयोग गरिनेछ। परियोजनाले बेमौसमी तरकारी तथा च्याउको बिउ सहयोग गरेको छ। यस गाविसका किसानले रासायनिक मल तथा विषको प्रयोग ३५ प्रतिशतमा झारेका हुनेछन् सय घरले भने केवल प्राङगारिक मल तथा जैविक विषादीको मात्र प्रयोग गरेका हुने बताइएको छ।

परियोजनाले सय घरको भकारो सुधार गर्न सहयोग गरेकोछ। परियोजना सकिंदा दुई टन कल्ने जातको च्याउ वार्षिक रुपमा उत्पादन भएको हुनेछ भने १० हेक्टरमा टमाटर, काउली,बन्दा काँको सिमी बोडी अर्गानिक उत्पादन भएको हुने संस्थाको लक्ष्य रहेको थियो।

-कमल अधिकारी पाल्या

Hari bhakti Nepal of Somadi showing organic vegetable field to the journalists

Demonstration of Matribhumi Improved Cooking Stove at Hotel Amrit, Tansen

Media campaign and promotion: The project held a campaign on "no chemical in your farm" at communities of the two VDCs. To promote the campaign, ward-level volleyball competition was organized at Bhagwati Higher Secondary School of Somadi on 26 October 2014. The campaign was carried out to motivate farmers to adopt organic against traditional chemical-based farming. It shared good practices collected from the two VDCs. The following media were also used:

Community FM radio: The project partnered with RuRu FM to develop and broadcast a weekly program called "Krishakka Kura" (Farmer's Voice). Success stories on organic farming from the field and techniques of organic farming were aired. The project team provided much-needed input in each episode. One episode also highlighted the activities carried out during the organic campaign.

Newspaper articles: Writing in the local media was also done to sensitize the communities. Journalists visited project area to observe the changes brought by the project implementation. The news coverage in the local newspapers shared both the good practices and case studies of successful farmers.

Improved seed: The project provided improved seeds of six vegetables to the project farmers. The different sets of vegetables were provided in the two VDCs based on local market demand, its suitability and farmer's preference. Farmers of Mujhung received seeds of cauliflower, cabbage, cucumber, peas, beans, and tomato. Similarly, Somadi farmers received seeds of cucumber, bottle gourd, sponge gourd, bitter gourd, brinjal (eggplant) and snap. Each family was asked to keep a record of vegetable produced, consumed and sold.

Switching to commercial organic farming

Ms. Bhagwati Pokharel of Somadi-7 is a 40 years of old farmer entrepreneur. She has six family members that includes three sons and a daughter. She successfully switched to semi commercial vegetable from subsistence production. Her husband and other family members also provide support to run her business.

Her economic conduction was not good. The returns from her agricultural field were not satisfactory and hardly met her family needs. She used chemical fertilizers and pesticides in her vegetable garden. Sometime the seeds did not grow due to degraded quality of soil and or the seeds. She had to borrow from her husband and sons to purchase fertilizer and seeds.

After she got engaged in the project, her life made a sharp turn. At first she was not convinced that the insects and the pests can be controlled without use of chemical pesticides but the practical session on use of animal urine during the training help her understand that the biopesticides are beneficial than chemical pesticides. At the first attempt, her vegetable production was excellent with minimal insect infestation and sold 20 Kg of cauliflowers. She earned Rs 16,000 in the beginning of her first season of organic production. She has now mastered on organic farming and able to articulate the benefits of organic products. She now uses plastic tunnels to grow off-season vegetables and use animal urine on the crops to fight insects. She confidently says: "Organic campaign of my village gave me energy and a hope." She plans to go in large scale commercial organic vegetable production so that she can match with the income that her son gets working abroad.

Plastic pond and tunnel: The project provided materials and technical human resource to construct 20 community plastic ponds that collects rainwater for dry period irrigation. The farmers provided in-kind contribution in the form of labor. Upon request from organic vegetable-farmers, the project supported 80 households with plastics to build the tunnels to grow off-season vegetables and fruit. The project also explained the farmers on the importance and need to keep a record of produced vegetables.

Support to mushroom production: The project supported the 20 mushroom farmers with mushroom seeds and thatched houses.

Exposure visits: The project organized an exposure visit to Triyasiagri product marketing and management cooperative in Waling, Syangja. Organic vegetable farmers and concerned stakeholders from the project VDCs participated to learn the techniques and the marketing strategy of Waling farmers. The project also organized journalists' visits to the project site to encourage them to prepare and share success stories in media.

M-ICS: After the training, the project supported to install 93 M-ICSs. A demonstration of M-ICS was done at Tansen, Palpa as a part of the campaign to further promote the stove.

Results

Adoption of organic farming and reduction in use of chemical fertilizers and pesticides: The project was instrumental in encouraging 100 farmers to adapt organic farming in about 15 ha of land from chemical based farming. It brought changes in their farming practices. Farmers now use nitrogen-rich urine, collected from improved cattle shed and biopesticide to curtail the use of chemical fertilizers and pesticide. The organic farming was not limited to vegetable farming but also in producing organic mushroom cultivation. In mushroom cultivation, farmers replaced formalin with chili powder.

In project VDCs, 80 farmers practice organic vegetable farming and 20 farmers organic mushroom farming. This switch in practices has reduced consumption of chemical pesticides and chemical fertilizers. It has been calculated that by engaging 100 households in organic farming, the project was successful in reducing 515kg of chemical pesticides in a year. Similarly, use of 1,868 kg of fertilizers has been replaced with organic Farm Yard Manure (FYM).

Income generation from organic farming: The switch to organic farming had also increased their income. In a study carried out by the project in 2016, it was revealed that 40 farmers engaged in organic farming in 2.7 ha land had earned Rs 1,763,040 in a season with an average of over Rs 44,000.The organic initiatives still continues, about two trucks of Tomatoes are sold each day with an annual turnover of Rs 1, 25, 00, 000 from these VDCs.

Smoke and germ free households: Ninety-three households enjoy smoke free environment after installing M-ICS in their households. The project also successfully mobilized resource from Multi Stakeholders Forestry Programme (MSFP) to install M-ICS in 200 households. Installing M-ICS has gained popularity among rural women due to its multiple benefits. It made their kitchen smoke-free and reduced their cooking time. Now, the family members utilize their free time in other productive work and children study in a smoke-free environment with their family helping them in studies. It has been estimated that use of M-ICS saves about five kilograms of firewood each day in each family, saves cooking time and improved the health of women. The M-ICS reduces greenhouse gas emission by about 60% over the conventional stove. At a larger level, reduction in the use of firewood saved the forest that absorbs greenhouse gas emission thus mitigating effects of climate change. Five large-scale M-ICSs have been installed in hotels of the District Headquarter. Similarly, the construction of both the cattle shed and eco-san toilet have created a germ-free environment around the households reducing chances of getting infection from using dirty toilets.

Demonstrated women entrepreneurship: This project helped demonstrate women entrepreneurship. Today 30 women are directly involved in organic vegetable production and four women in organic mushroom production. They have become more excited and eager to invest in organic vegetable and mushroom farming. With the raised income level, their confidence has also increased. The training also built their capacity to calculate the demand and supply of the organic vegetables. This has helped them assess benefit for going organic by increasing their household income

Human Singh Karki harvesting organic tomato from his field, Mujhung 8

Resource mobilization: The project was successful in mobilizing local resources during project implementation. The local community contributed Rs 1,694,000 (32%), HTEDC contributed Rs 244,000, local FM radio contributed Rs 144,000, VDC contributed Rs 136,000 and MSFP supported Rs 200,000.

Institutional setup: Eight organic farming groups were registered with District Agriculture Development Office (DADO) and one mushroom farming group linked with District Mushroom Farming. The project also linked the farmers with the cooperatives to market their organic products.

Goma Karki: Successful organic entrepreneur

Goma Karki of ward number 7 of Mujhung VDC, lost her husband few years back. Earning became her primary responsibility in addition to other household chores and taking care of children. She did not have any source of income beside agriculture, which was also not sufficient to cover her household expenses. She had to borrow money from others during time of sickness. People were reluctant to lend her money doubting her pay back. Sending children to school and taking care of their fees was her biggest challenges. She even sold her household assets to take care of her daily expenses.

She volunteered to participate in the project and accepted go organic because commercial production could be the only means to earn and meet her household expenditure. She participated in the trainings on shed improvement, micro irrigation, plastics tunnel construction and bio-pesticide preparation. She showed a great courage to initiate production in two ropanis which was a great risk for her, who was for the first time, practicing organic vegetable production.

Since the last two years, she has been producing and selling organic vegetable in all season. She now saves Rs 4,000 monthly after spending on children's education and meeting her household expenses. She paid back all her debts and now she provides loan to other who are in need.

"Before I used to practice agriculture only for household purpose and didn't know such benefits can be achieved from organic vegetable farming"-she said. She did not believe in saving crops and earning as commercial scale from using organic techniques. Now, she is urging all her neighbors to go organic for both personal and societal benefits.

Kesav Pandey: An Innovative Mushroom entrepreneur

Keshav Pandey of Somadi VDC is an organic mushroom producer and entrepreneur. He started producing mushroom from 2011 leaving behind his dream of migrating to the Middle East to earn. He was not yet satisfied by his investment in traditional agricultural practice as the return was low. He used to apply chemical fertilizers and pesticides to grow more to earn.

When the project started by HTEDC, he actively participated in the organic campaign. He was very enthusiastic and asked lots of questions during training. After the training, he prepared business plans of possible commodities that could be produced and sold in the local market. Among many options, organic mushroom production became a viable enterprise that is profitable. He then decided to switch to organic mushroom production.

He constructed a thatch house, using skills gain from the training. He used Akabare chilli pest spray, in place of Formalin, that yielded excellent result. The return was encouraging. He produced 450 kg of mushroom in the first year and made Rs 90,000 after deducting initial investment in a single lot.

He joined district level mushroom producer farmer's network initiated by DADO. He started receiving additional support from DADO. In a second year, he improved capacity and planning to produce mushroom in 1000 bulb. He has become a role model among the youth in village. "I was not satisfied from vegetable production using chemical but now I'm fully satisfied from mushroom production and the earnings from that. I earn 5-7 hundred thousand rupee a year from organic mushroom production", he said. He has no market problem and all his products sells good.

Tulasi Ram Pandey showing the cabbage from his organic farm at Somadi 2

Discussions

Soil is fundamental to life. The quality of soil governs types of the vegetation and ecosystems it supports. One of the key factors responsible for replenishing the soil quality is the Soil Organic Matter (SOM). It controls soil microbial population and facilitates nutrient recycling.[15] Thus, it is imperative that quality of soil needs to be improved for the healthy human life and functioning of an ecosystem. It also plays a key role in increasing soil stability and stops soil degradation. The baseline on the use of pesticide provided the evidence and showed a strong need to initiate an organic movement in these areas to repair damaged soil and produce organic vegetables. To improve soil health, first, it was necessary to remove chemicals from the soil. The orientation workshops organized in the two VDCs informed farmers, stakeholders and right holders about the value of soil, methods to improve its quality.

It was also equally important to change the mindset of farmers regarding the use of chemical pesticides and fertilizers. The perception of farmers in Nepal is that they believe pesticide as a Medicine (*Ausadi*). This might be the reason that they do not adopt any safety measures during application of pesticides in their fields. The project thus attempted to generate public awareness of the negative consequences of using chemical pesticides.

Farmer's informal interaction programs have transformed into a regular Experience Sharing Forum where they discuss innovation, methods, benefits, and losses. This forum has helped others understand the benefits of switching to organic production. Community FM stations have been an effective medium to share information at community level. Since the communities themselves run the FM stations, their interest will be to generate positive changes in their communities. *Krishakka Kura* aired through local FM was popular among farmers because they could ask questions and share their experiences in the live broadcast. The program helped the farmers understand the value of organic farming and also helped explore markets to sell the organic vegetables.

The farmers from the two VDCs were organized into groups and were registered with the DADO Formalizing the groups was essential to legitimize the farmers' group. Being formal, it opened opportunities for the farmers to seek support from both the government and non-governmental organizations.

Trainings on vegetable farming to local farmers not only enriched their farming knowledge, but also enhanced their skills to calculate the demand and supply of the organic produces.

Once the farmers were convinced, the project initiated organic movement which included cattle shed improvement, biopesticide and FYM preparation, providing improved seeds and plastic tunnels to the farmers to produce off season vegetables. The use of biopesticides and FYM has completely replaced the pesticides and chemical fertilizers in the fields. The farmers, however, felt that the production had decreased in the first year after switching to organic farming and had to bear the loss. They did not have hundred percent organic vegetables in first year of project implementation because of the persistent residual effect of the chemicals used before the project. The farmers were happy when they saw that production has increased due to improvement in the soil quality and their produces started to sell at market. Today, vendors and consumers are ready to pay higher prices for the vegetables as the awareness of the organic product has increased. This has motivated the farmers to put their extra effort and continue producing organic vegetables.

The project also linked the farmers with cooperatives so that the organic vegetables and mushroom can find a proper market. Linking the farmers with cooperative would ensure sustainability of the initiatives started in these VDCs.

HTEDC received several requests from neighboring VDCs for their cattle shed improvement, plastic tunnel and ponds after the residents saw returns from the organic farming.

One of the successful initiatives was the production of organic mushroom. To produce organic, the producer use chili spray in place of harmful chemicals such as formalin. This new technique needs wider dissemination to encourage farmers in other parts of the country to cultivate chemical-free mushroom.

With low or zero smoke emission inside the kitchen, the M-ICSs have helped improve the health of rural people, particularly women and children. The smoke-free environment at project household has motivated people other than the project area to install M-ICS. The community has now initiated a dialogue among the

15 Review and conclude Managing Fertilizers to Enhance Soil Health, Bijay Singh and John Ryan First edition, IFA, Paris, France, May 2015 . The publication can be downloaded from IFA's website www.fertilizer.org/Library IFA

Organic vegetable farmers of Mujhung 7

stakeholders to declare their wards as smoke-free or Internal Pollution Free (IPS). They perceive that this process, if successful, would ensure improvement in the health of their community and help save forest. To meet increasing demand for M-ICSs, skilled human resources have been developed in the two communities who are available anytime for installing the stove.

The success of the project in these two VDCs can be attributed to good coordination among stakeholders and effective community mobilization. As such, the project was successful in bringing different organization on board for resource mobilization.

Ways forward

The baseline on use of pesticide was pivotal in raising awareness of local farmers. This not only helped farmers to estimate the amount of pesticide reduced but also helped them understand the evil aspect of the pesticides. Thus, baseline survey should be prerequisites to initiate organic farming.

Improvement in animal sheds to collect urine and dung separately have encouraged farmers of the project area to construct eco-san toilet to manage organic manure. This can be an effective way to motivate farmers to further promote organic farming and reduce the use of pesticides.

Farmers have started to earn from organic farming, however, market promotion is a challenge as middle persons are still earning more. Although the project initiated market promotion through cooperatives, it is still in a nascent stage. In order to strengthen it and occupy market, more farmers need to join hands to produce organic vegetables in larger-scale. Developing social entrepreneurship is also another option that benefits both the producer and users.

Continuous supply of improved seeds is another challenge. The cooperatives can establish a seed bank to maintain the local germplasm to overcome the challenges faced by the local farmers.

The success of organic farming in these VDCs has a high possibility of replication in other parts of Nepal. It is thus essential to integrate the complete package of commercial organic farming. This include baseline data collection, trainings on organic farming, compost and biopesticide preparation, establishing irrigation facility and improving animal sheds to separately collect urine to be used as pesticide, and distribution of improved seeds and developing market linkage.

Certification of organic product is costly for small farmers. Thus, there should be cheaper way of certification such as self-declaration of no pesticides, no chemical fertilizers, and going organic.

Project's linkage with SDGs

Improved soil and people's health: *Hundred farmers have completely stopped using chemicals in their fields. Mr. Bhandari, who owns Agro-vet shop at PalpaTansen shared that he was wondering why people of the area have suddenly stopped purchasing pesticides. According to him, sales of pesticides and chemical fertilizers have sharply reduced with the initiation of the project. Farmers now apply farm yard manure (FYM) and bio-pesticides to compensate depleting organic matter in soil and kill pests respectively. They have now acquired the skills to prepare organic pesticide and are much aware of the safety measures. The plastic ponds have helped the farmers irrigate their farm during water scarce seasons to maintain soil moisture.*

Tunnel for mushroom farming at Somadi 9

Farmers of Somadi 9 preparing straw bulb for mushroom cultivation

Annex 1 : Name of pesticides banned in Nepal date wise

S.N	Name of Pesticide	Banned date
1	Clorden	April 19, 2001
2	D.D.T	April 19, 2001
3	Dieldrin	April 19, 2001
4	Endrin	April 19, 2001
5	Aldrin	April 19, 2001
6	Heptachlor	April 19, 2001
7	Mirex	April 19, 2001
8	Toxaphene	April 19, 2001
9	B.H.C	April 19, 2001
10	Linden	April 19, 2001
11	Phosphamidon	April 19, 2001
12	Organomercury chloride	April 19, 2001
13	Methyl parathion	Dec. 31, 2007
14	Monochrophotus	Dec. 31, 2007
15	Monochrophotus	Nov. 05, 2012
16	Endosulfan	Nov. 05, 2012
17	Phorate	Decided to ban but not published in Gazette

Source: Ministry of Agricultural Development, Pesticide Registration & Management Division

Annex 2 : List of chemical pesticides used by the farmers of Somadi and Mujhing VDCs with their potential health hazard.

Type of chemicals	Classification	WHO class	Type	Potential Health Hazard
Mancozeb (DM 45)	Fungicide	NH	Dithiocarbamate fungicide with a combination of Maneb and Zineb controls many fungal diseases in crops, fruits, nuts, vegetables, and ornamentals plants.[1]	Itching, scratchy throat, sneezing, coughing, inflammation of the nose or throat, and bronchitis.[2]
Indofil (M 45)	Fungicide	NH	Often called king of fungicides used to control fungal pathogen in cereals like Paddy, pulses vegetables like Potato, Tomato, Chilies, fruits like Grapes and apples.[3]	
Metalaxyl, (Krinoxyl Gold)	Fungicide	II (Moderately Hazardous)	Fungicide used to control Pythium in vegetables and crops, and Phytophthora in peas.	
Dichlorvos	Insecticide	Ib (Highly hazardous)	Organophosphate[4] widely used as an insecticide to control household pests, in public health, and protecting stored product from insects.	Weakness, headache, uncomfortable chest, blurred vision, salivation, sweating, nausea, vomiting, diarrhea, abdominal cramps, eye and skin irritation, pupil constriction, eye pain, runny nose, wheezing, laryngospasm, anorexia, muscle fasciculation, paralysis, dizziness, ataxia, convulsions, low blood pressure and cardiac arrhythmias. It is also known to have an impact on DNA growth and interfere with the human nervous system.[5]
Chlorpyriphos	Insecticide	II (Moderately Hazardous)	Organophosphate used as an insecticide to kill insects and worms. It is used on crops, animals, and buildings.	Higher doses may lead to acute toxicity. It may lead to: neurological disorder, persistent developmental disorders and autoimmune disorders. Exposure during pregnancy may harm the mental development of children.[6]
Furadan (Carbofuran)	Insecticide	Highly Hazadous	Highly toxic carbamate pesticides used to control insects in potatoes, corn and soybeans.	Exposure to carbofuran can cause weakness, sweating, nausea and vomiting, abdominal pain and blurred vision. Higher level affectes nervous system and can cause muscle twitchnig, loss of coordination and cause breathing to stop.

Type of chemicals	Classification	WHO class	Type	Potential Health Hazard
Endosufan/Thiodan		II (according to WHO) but highly hazardous, banned in Nepal	Persistent Organic Pollutant (pop)	Categorized as most toxic pesticides responsible fatal poisoning across the world. Endosulfan can cause reproductive and developmental damage in both animals and humans. It is acutely neurotoxic to both insects and mammals, including humans. Symptoms of poisoning include hyperactivity, tremors, convulsions, lack of coordination, staggering, difficulty breathing, nausea and vomiting, diarrhoea, and in severe cases, unconsciousness. Doses as low as 35 mg/kg have been documented to cause death in humans, and many cases of sub-lethal poisoning have resulted in permanent brain damage.[7,8,9]
Dimethoate (Rogar)		II (Moderately Hazardous)	Controls Bean fly, Thrips, Bollworm, Mites, Whitefly, Aphids, Diamondback moth and Bagrada bug on French Beans, Tomatoes, Potatoes and Cabbages.[10 11]	Toxic swallowed or comes in contact with the skin and eyes. Can causes eye irritation and prolonged or repeated exposure to this chemical can cause damage to organs. Can cause excessive salivation, sweating, rhinorrhea, tearing, muscle twitching, weakness, tremor, incoordination, headache, dizziness, nausea, vomiting, abdominal cramps, respiratory depression, tightness in chest, wheezing, productive cough, blurred or dark vision. In severe cases, it can cause seizures, incontinence, respiratory depression, and loss of consciousness.[12]

1 O.López-FernándezE.Pose-JuanR.Rial-OteroJ.Simal-Gándara (2017). Effects of hydrochemistry variables on the half-life of mancozeb and on the hazard index associated to the sum of mancozeb and ethylenethiourea. Environment Research. Volume 154, April 2017, Pages 253-260. Elsevier

2 http://pmep.cce.cornell.edu/profiles/extoxnet/haloxyfop-methylparathion/mancozeb-ext.html

3 Information source: https://indofilcc.com/business-area/agricultural-chemicals/fungicides/indofil-m-45/

4 Organophosphates are used in agriculture, the home, gardens, and veterinary practice as insecticides that damages an enzyme in the host insect called acetylcholinesterase.

5 https://en.wikipedia.org/wiki/Dichlorvos

6 https://en.wikipedia.org/wiki/Chlorpyrifos

7 https://www.webmedcentral.com/article_view/2617

8 http://www.scielo.br/scielo.php?pid=S0100-40422016000800987&script=sci_abstract

9 https://en.wikipedia.org/wiki/Endosulfan

10 https://www.clemson.edu/extension/publications/entomology/fruit-vegetable/insect-pests-of-beans-and-southern-peas-fv08.html

11 Mwangi, F. N. (2015). evaluation of botanical pesticides and coloured sticky insect traps for management of insect pests (thrips, whiteflies andaphids) in french beans (phaseolus vulgaris l.). A Thesis Submitted In Partial Fulfillment for Master of Science Degree in Crop Protection of the University of Nairobi, Department of Plant Science

12 https://www.pesticides.news/2017-12-05-dimethoate-toxicity-side-effects-diseases-and-environmental-impacts.html

Annex 3 :Gender and Social Inclusion Matrix

Project Name	Reduction of Harmful Pesticides for Land Improvement											
Activities	Beneficiary Type	NOs of infrastructure	Hill Dalit		Hill Janajati		Hill Other		Total		Youth (15-29 Yrs)	
			M	F	M	F	M	F	M	F	M	F
District level Orientation programme.	DAG		1	0	2	0	15	5	18	5	2	0
VDC level orientation programme.			3	2	7	5	45	22	55	29	4	6
Group Formation			3	3	10	8	27	49	60	40	13	17
Training about, its matters.			3	3	10	8	27	49	60	40	13	17
Capacity building training			3	3	10	8	27	49	60	40	13	17
Cow shed improvement programme		100	3	3	10	8	27	49	60	40	13	17
M-ICS construction		100	0	0	16	2	67	8	83	10	25	3
Organic vegetable farming training to the groups			3	3	10	8	37	19	50	30	10	18
Vegetable Seed support			3	3	10	8	37	19	50	30	10	18
Mushroom farming training to the groups			0	0	4	1	12	3	16	4	14	3
Plastic Ponds, construction		20	0	1	2	0	12	5	14	6	3	1
Plastic tunnel for vegetable production		80	3	3	10	8	37	19	50	30	10	18
Thatch home construction for mushroom		20	0	0	4	1	12	3	16	4	14	3
Providing seed of mushroom to 20 people.			0	0	4	1	12	3	16	4	14	3