

# “Brief Introduction to Honeybees and Community Led Wild Honeybee Management in Bara”



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Programme



### From the project

## “Management of Wild Honeybee Colonies for Biodiversity Conservation, Improving Crop Yield and Hive Products in Inner Terai of Nepal”

### Biodiversity Conservation

First edition: September 2013  
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Cover page:

1. A beneficiary selling her organic vegetables
2. Integrated pest management - farmer field school (IPM-FFS) for winter vegetables
3. Display of organic compost and vegetables
4. A honeycomb at a closer look
5. Forest conservation rally
6. Program Manager distributing the prize for the best actor during IPM-FFS
7. Awareness raising through street drama



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## **Global Environment Facility** **Small Grants Programme** **साना अनुदान कार्यक्रम**

Aside from many direct benefits from honeybee, their important role in pollination makes them very special in the ecosystem. Thus conserving bees is always a pious work.

I would like to thank Mr Bharat Bahadur Khadka and MRC team for successfully completing the Bee Conservation Project and publishing this very important book.

This book consists of two chapters. The first chapter briefly introduces the honeybees and their importance whereas the second chapter describes achievements, process and lessons from the project implemented in the Bara District.

We conserve what we love, we love what we understand and we understand what we know. In this regard, this book will enhance our understanding and love for honeybees which will ultimately be helpful in conserving honeybees. Since the book deals with both the theory and community led conservation practice, it will be a very good reference material for academicians, students, development practitioners and general audience to understand, love and conserve honeybee.

Last but not the least; I would also like thank Mr Vivek Dhar Sharma for critically reviewing the book.

Gopal Raj Sherchan  
National Co-ordinator  
UNDP GEF Small Grants Programme

## Acknowledgements



The bee population in world has reduced significantly and no wonder, we are to be blamed. Our behaviors such as application of pesticides in agriculture farm, illicit tree felling, forest encroachment, human induced forest fire and unscientific honey harvesting are major causes of honeybee population decline.

As such engaging local community in conserving bee is a very challenging task. Our challenges lie in altering the human behaviors- stopping the pesticide use, preventing forest encroachment, illicit felling and forest fire and preparing farmers for scientific bee keeping.

With the financial support from GEF SGP of UNDP, the wild honeybee conservation project was implemented in Bara from January 2012 to June 2013. During 18 months of project tenure, we tried to unfold these challenges one by one and successfully demonstrated that conserving wild honeybee by engaging local people is indeed possible.

We would like to express our sincere gratitude to GEF/SGP of UNDP for offering us the opportunity to implement this project. Moreover, we would like to extend our warm regards to Mr Vijaya Singh, Assistant Country Director, UNDP, Mr. Gopal Raj Sherchan, National Coordinator and Mr. Vivek Dhar Sharma, National Program Assistant, for their valuable guidance throughout the project. Our sincere thanks are also due to DDC, DADO, DFO, DSCO, range post, police post, Sahajnath collaborative forest management committee, agriculture information collection center, Madhuwan; and Haraiya and Karaiya VDCs of Bara for their invaluable support during the project period. We shall always remain grateful to the continued gracious support from GIZ/STPP and OFID.

In this book, we briefly try to explain project achievements, approaches, lessons learned and future course of action for the conservation of bees. This book also consists of brief introduction to honeybee which provides insight and significance of honeybee conservation. As such this book would serve as important reference material for development practitioners, students, academician and general public.

We would like to express our sincere thank to Mr Tirtha Raj Panthi, Program Coordinator, in preparing this book. Likewise, we would also like to thank Mr Vivek Dhar Sharma for critically reviewing the book and providing photographs and Ms Maneesha Rajbhandari for her valuable support during designing this book. Thanks are also due to Mr Amit Khanal and Ms Kitty Shrestha for photographs.

Last but not the least, we would like to express our gratitude to entire MRC family including Mr Ram Bahadur Magrati, Ms Gita Bhusal, Ms Lilu Magar, Mr Suresh Chaudhary and Mr Mangal Shaha for their hardwork and dedication for making this a successful project.

Bharat Bahadur Khadka  
Chief Executive Officer  
MRC Nepal

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## Acronyms

<b>CBD</b>	Convention on Biological Diversity
<b>CEO</b>	Chief Executive Officer
<b>DADO</b>	District Agriculture Development Office
<b>DFO</b>	District Forest Office
<b>DSCO</b>	District Soil Conservation Office
<b>FM</b>	Frequency Modulation
<b>GBC</b>	Gandaki Bee Concern
<b>GEF</b>	Global Environment Facility
<b>GESI</b>	Gender Equity and Social Inclusion
<b>GIZ</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH/ German Society for International Cooperation
<b>gm</b>	Gram
<b>ha</b>	Hectare
<b>IGAs</b>	Income Generation Activities
<b>kg</b>	Kilogram
<b>L</b>	Litre
<b>m</b>	Metre
<b>m<sup>2</sup></b>	Square metre
<b>MoAD</b>	Ministry of Agricultural Development
<b>MRC</b>	Multi-dimensional Resource Center
<b>I/NGOs</b>	International/Non Governmental Organization
<b>NRs</b>	Nepalese Rupees
<b>OFID</b>	The OPEC Fund for International Development
<b>OPEC</b>	Organization of the Petroleum Exporting Countries
<b>PRA</b>	Participatory Rural Appraisal
<b>RRA</b>	Rapid Rural Appraisal
<b>SGP</b>	Small Grants Programme
<b>STPP</b>	Support of Measures to Strengthen the Peace Process
<b>SWC</b>	Social Welfare Council
<b>UNDP</b>	United Nations Development Programme
<b>VDCs</b>	Village Development Committees

# Chapter I

## Introduction to honeybees and their products



## 1.1 The honeybees

The honeybees are wonderful creation of nature. The division of labor in their colony, hard work and loyalty to the colony have made them successful in their quest of survival and propagate their future progeny. In a single bee colony, three members of bees are present

Queen bee: the biggest and the only fertile female in the honeycomb that can reproduce

Drones: fertile male bees in the honeycomb capable of reproduction

Worker bee: sterile female bees not capable for reproduction

### Nepalese native honeybees and their combs

Out of the nine world wide recognized species of honeybees, eight live in Asia. Among them, five species – *Apis dorsata* Feb. (giant honeybee, wild, and distributed in Terai), *Apis cerana* Feb. (Asiatic honeybee or the eastern honeybee, domesticated as well as wild, and distributed throughout the country,) – are economically important and found in Nepal. Likewise, *Apis florea* Feb. (the little honeybee or red dwarf honeybee, wild, and distributed in lower as well as mid hills), *Apis laboriosa* Smith (the rock honeybee or Himalayan honeybee, wild, and distributed above 1,000 ), and *Apis mellifera* Lin. (western honeybee or European honeybee, domesticated) are also economically important and found in Nepal. Except *A. mellifera* Lin., other four species are native to Nepal.



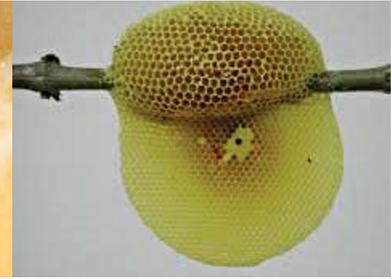
*A. dorsata*  
सिँगुस (खाग मौरी)



Comb of *dorsata*



*A. florea*  
कठ्यौरी वा भिँगौरी मौरी



Comb of *florae*



*A. mellifera*  
युरोपियन मौरी



Comb of *mellifera*



*A. cerana*  
स्थानिय मुढेघार मौरी



Comb of *cerana*



*A. laboriosa*  
भिर मौरी



Comb of *laboriosa*

### Production scenario of honeybees

The average annual productivity of *A. dorsata* Feb., *A. cerana* Feb., *A. florea* Feb., *A. laboriosa* Smith, and *A. mellifera* Lin. is 5-50 kg, 8-15 kg, 1-5 kg, 20-100 kg, and 20-50 kg of honey per hive per year respectively (GBC). Honey produced from *A. florea* has been used in traditional medicine and is considered superior in quality. The presence of higher amount of glucose oxidase - the enzyme responsible for its antibiotic activity - has scientifically proved its medicinal value. Owing to its paucity and medicinal importance, the price reaches up to NRs 5,000 per kg.

### 1.2 Advantages of honeybees

Honeybees offer direct and indirect advantages:

### Direct advantages

Direct advantages are those type of advantages which are achieved directly from the bees namely

- |                          |               |             |
|--------------------------|---------------|-------------|
| • Honey                  | • Royal jelly | • Propolis  |
| • Wax                    | • Pollen      | • Bee venom |
| • Queen bee and beehives |               |             |

### Honey

Honey is a sweet food made by bees using nectar from flowers. It typically contains 17% sugar (dextrose, sucrose, maltose); 80% acids (gluconic, malic formic, amino acids etc); 0.57% proteins; 0.26% minerals; 0.17% vitamins; and 2% others. The composition of honey varies according to the types of flowers.



### Use

- Hemoglobin increment (buckwheat honey is more suitable)
- Reduces stomach ulcer (peptic ulcer) and skin ulcer
- Dressing in wound
- Reduces body fatness
- Treatment for common cold and the headache (mix with ginger in equal amount and cook)
- Reduces high blood pressure
- Controls diarrhea and provide immediate relief
- Increases disease resistance capacity
- Useful for the treatment of Candida disease of women in their reproductive organ
- Even safer to patients of diabetes

## Wax

Glands under the abdomen of bees secrete a wax, which they use to construct the honeycomb. The wax is recovered as a by-product when the honey is harvested and refined. It contains a high proportion of wax ester (35 to 80%).



### Use

- Candle and ornaments
- Lip balm
- Cosmetics and medicinal creams
- Foundation for new honeycomb hives
- Slippage prevention for belts in vacuum cleaners, sewing machines etc
- Waterproof shoes, fishing lines
- Beard and mustache wax
- Grafting wax
- Crayons
- Sealing on jams and jellies
- Lubricants for doors, windows, tools etc
- Wax for skin, toboggans, bow strings
- Creates a freely moving surface on iron and frying pans
- Furniture polish
- Soap making
- Reconstructive surgery
- Leather waterproofing
- “Lost-wax” method of casting
- Embalming procedures
- Dental procedures
- Polish
- Wood filler
- Tack cloth
- Glass etching

## Royal jelly

Royal jelly is a milky secretion produced by worker honeybees. It typically contains about 60% to 70% water, 12% to 15% proteins, 10 to 16% sugars, 3 to 6% fats, and 2 to 3% vitamins, salts, and amino acids. Its composition varies as per topography and climate. There is very little scientific information available about the effects of royal jelly in people. It is used as a general health tonic, for fighting the effects of aging, and boosting the immune system. Some people apply royal jelly directly to the skin as a tonic or to the scalp to encourage hair growth.



## Use

- Asthma
- Pancreatitis
- Bone fractures
- Menopausal symptoms
- High cholesterol
- Hay fever
- Sleep troubles (insomnia)
- Kidney disease
- Skin disorders
- Liver disease
- Premenstrual syndrome (PMS)
- Stomach ulcers

## Pollen

Pollen, in the form of beebread, is the honeybees' main source of protein and it provides fats/lipids, minerals, and vitamins. It is most nutritionally variable food source for young honeybees. Typically, it contains water (7-16 %); crude protein (6-30 %); ether extract (1-14 %); carbohydrates including reducing sugars (19-41 %), non-reducing sugars (0-9 %), starch (0-11 %); lipids (5 %); ash (1-6 %); and unknown (22-36 %). Pollen from different floral sources has different quantities of each component. The importance of pollen is as follows:



Pollen

## Use

- Growth and development of body (Because of high protein)
- Useful for against mal-nutrition
- Can be used in poultry feed
- Medicines for hydrocil treatment
- Controls the over growth of prostate gland
- Reduces the constipation and increases appetites
- Useful for hey-fever
- Helps to maintain blood pressure
- Useful for allergy related diseases
- Useful for the growth and development of honeybees
- Can be used in chocklets
- Ornamental (cream, powder, shampoo, soap, and perfumes)
- Controls nervous, hypertension, and endocrine system related diseases
- Increases the level of hemoglobin in the blood
- Increases the disease resistance capacity

## Propolis

Propolis, a natural resin produced by honeybees, that displays strong antimicrobial activity, has been used as a chemotherapeutic agent since ancient times. It contains about 200 different types of compounds.



### Use

- Stomach ulcer reduction
- Dental problems reduction
- Bronchitis
- Diabetes
- Strengthen blood vessels
- Fungal diseases
- Heart disease and anemia
- Fired wound
- Tonsil
- Intestine swollen
- Rheumatism
- Dermal problems

## Bee venom

Bee venom is made by bees. This is the poison that makes bee stings painful. Bee venom is use to make medicine. It consists of enzymes, peptides, and biogenic amines.



### Use

- Given as a shot for rheumatoid arthritis, nerve pain (neuralgia), multiple sclerosis (MS) and body pain
- Useful for HIV/AIDS
- Can be used respiratory problem, cardio-vascular related diseases (high blood pressure, heart problems, diabetes etc.), lung TB, fever, lever diseases, eye disease (glucomiya), addicts (alcohol, drug) etc.
- Bee venom therapy for chronic pain, joint pain, fired wound, fibromyalgia, post-herpetic, kidney weakly functioning, fatigue etc
- Increases disease resistance capacity

Besides these direct uses, farmers can also directly earn from selling their queen and hives in premium price, increase job opportunity by utilizing unproductive time.

#### *Indirect advantages*

There are many indirect advantages in addition to direct advantages. They are:

- Increase crop yield and quality many folds through assured pollination
- Conserve biodiversity and improve environment
- Provide food security

### **1.3 Importance of wild honeybees on pollination and biodiversity conservation**

#### *Why pollinators are essential in crop pollination?*

Honeybees contribute 60 - 68% parts in pollination of plants, therefore, 40 - 140 folds more benefit from pollination than that of honey and other bee products can be achieved (Neupane, 2006). Honeybees contribute to pollination of following nature of plants:

- Dioecious flower (male and female flowers developed in different part of the same plant) – cucumber, pumpkin, bottle gourd, sponge gourd, snake gourd
- Dioecious plant (because of male and female flowers in different plants) – papaya, khajur

- Protogyne or protoandry (maturity of male and female flowers at different time) – Beyer (*Ziziphus*), plum
- Sexual incompatibility (cannot pollinate within same species) – apple, pear
- Pin flower (male flowers lie below the female flowers)- in different plants
- Hercogamy (a condition in which structural obstacles within a flower make self-pollination impossible)

The role of honeybees on pollination and biodiversity conservation is by far the most important biological services and makes them so special. Having bees in a neighborhood can increase cereal, legumes, fruits, and vegetable yields substantially, without any additional work for the beekeeper. The monetary value of the crops increased by honeybee pollination is more than three times higher than the value of honey they produce. It never cannot compete with plants and animals in term of food but increases the crop productivity by pollination and finally help to ensure food security. Therefore, honeybees are very important insects for us from the food security and biodiversity conservation.

Native bees are actually more effective pollinators than other honeybee -- two to three times better -- because honeybees are more interested in the nectar but the wild, native bees are mostly interested in pollen collection (news cornel 2011). Likewise, benefit/cost ratio of beekeeping is higher as compared to other agricultural components because raw materials for honey are free of cost and some equipment can be locally made.



Honeybees are efficient crop pollinators

Honeybees are the most efficient pollinators of several agricultural, horticultural, silvicultural, forage and fodder, and wild plants because of their following characteristics.

It has been established through research that, installation of 3-5 bee colonies of *A. cerana* per acre the increase in seed yield in sunflower by 79%, mustard by 55%, niger by 33%, sesamum by 15%, safflower by 64%, cotton by 18%, litchi by 20%, coconut by 40%, and gourd crops by 20% (Mohapatra et al.).

Honeybees are efficient pollinators and superior to other insect pollinators because:

- Domesticated insect and can be used for pollination as per our requirement
- Honeybees can thrive well in wide range of climate/weather
- Laborious nature and high visiting efficiency
- Having tiny hairy structure in the body that helps to hold pollen
- Visiting at same type of plant till the availability of nectar
- Strong communication mechanism

#### 1.4 Major bee flora found in Nepal

Agronomical, horticultural, agro-forestry, and forestry plants are might be the forage for honeybees. Common bee flora found in Nepal as follows (Annex I).

#### 1.5 Status of honeybees in Nepal

More than 50,000 Nepalese households are involved in beekeeping, rearing 125,000 beehives and producing about 1,100 t of honey per year

(MoAC, 2009/010). In which, 29.86% of honey produced from *A. cerana* Feb., 39.19% from wild and 33.93% from *A. mellifera* Lin. *A. dorsata* Feb., can be considered as organic since the honey harvested from forests of remote areas in Nepal, where usage of pesticides and agro-chemicals are considerably less.

There is rich tradition of beekeeping in different villages of Nepal, which is associated with genetic diversity of *A. cerana* Feb., availability of bee forage plants and a wealth of indigenous knowledge associated with wild honeybee harvesting. Although, Nepalese people have been rearing honeybees for many years, the scientific and commercial approach to bee keeping has been in practice fairly a decade ago. Therefore, modern commercial bee keeping is still in nascent stage.

Realizing the importance of honey in both national and international markets, Nepal government has recognized honey as an important high-value product and accorded priority for its development.



Colonies of *Apis dorsata* Feb. on tree

# Chapter II

## Project description



## 2.1 Project Brief

### *Management of Wild Honeybee Colonies for Biodiversity Conservation, Improving Crop Yield and Hive Products in Inner Terai of Nepal*

Project No.	NEP/SGP/CORE/BD/11/03
GEF-Focal area and operation programme	Sustainable forest management, also contribute to prevention of land degradation
Project location	Haraiya- 1 & 6, and Karaiya -8, Bara
Project duration	January 2012 to June 2013 (18 months)
Total project cost:	NRs 4,879,517
GEF-SGP:	US\$ 33,440 (NRs 2,931,640)
Total beneficiaries	
<ul style="list-style-type: none"> <li>• 204 households; 165 female (81%) and 39 male (19%)</li> <li>• Total population 1072 (female: 515 and male: 557)</li> <li>• <i>Ethnic composition: Dalit 29 (14%), Janajati 124 (61%), and others 51 (25%) including Brahmin/Chettri</i></li> </ul>	

**Map of Nepal showing project district**



### Project objective

To conserve wild honeybee by local communities and improve their livelihoods

### Rationale

The role of honeybee in pollination is very significant because of their efficiency in pollination. With pollination from honeybee, the rate of increase in crop yield has been estimated to range from 30 to as high as 3000 percent (Reddy, 1980). Wild honeybee *A. dorsata* Feb. is native and natural pollinators of several cultivated and wild plants in Asia (Atwal, 1970, Maun and Gurudip, 1983, Singh, 2000) including the Siwalic range of Nepal. Their nesting sites are tall trees, buildings and water towers with available food resources (Hadorn, 1984). They are good honey collector (Thakar and Tonapi, 1961).

The biodiversity of various crop plants including the wild flora in the Siwalics of Nepal is because

of the role of *A. dorsata* Feb. through cross pollination. However, the colony population of this pollinator is severely decreasing year after year (Pokhrel, 2010). The immigration rate and the period of stay of the *A. dorsata* colonies have been decreased seriously in Bara (Pokhrel, 2010). That is why pollination has been hampered, crop productivity decreased and botanical biodiversity in the Siwalics threatened. There have been reported 225 different plants species are being visited by *A. dorsata* for pollination in Bara District (Pokhrel, 2005).

CBD recognized agriculture biodiversity through pollinators as a fundamental issue for food security as the plants are dependent to diverse pollinates among which bees are the most important. In the indo-Malayan region, the coconut yield in has been decreased by 30% and mustard yield by 40% from decreasing the pollinators' population.

Nepal is a home for 5 different species of wild honeybees due to varied ecozone, topography and

diverse floral species. Keeping and/or conservation of wild honeybees is easy for farmers as they do not require much care like sugar feeding, disease control and migration. Thus, if managed properly, beekeeping can be developed as a low-input but high yield enterprise. Owing to the possibility of branding as organic honey, it has huge national and international markets.

Conserving bee also helped in conserving trees as the bee-farmers also retain many honey bearing trees both for food and shelter.

The Madhuban (literally means forest with plenty of honeybee) area in Bara provides ample pasture area for honeybees and managed under Sahajanath collaborative forest. The forest is spread over

2058 ha with 17,525 household beneficiaries. Likewise, the project VDCs- Haraiya and Karaiya have agriculture area of 1680 ha and 893 ha respectively (Sahajnath 2069 BS) indicating the potential of expansion of bee keeping.

But unfortunately, the population of honeybee is decreasing as natural pasture (forest) is decreasing due to illegal harvesting, encroachment and forest fire. This can be easily seen in the pictorial transect drawn from north East West highway (North) to settlement (South) Likewise, excessive use of chemical pesticide in agriculture, unscientific honey harvesting and lack of knowledge about the role of honeybees on crop productivity have equally contribute to the decline of honeybees.



Forest fire displaces the honeybees



Use of pesticide in farms also kills honeybees



Traditional practice: removing honey comb for honey extraction



Illicit felling: loss of bee habitat

### Anthropogenic threats to honeybees

## 2.2 Project working approach

In order to launch the project, a series of strategic activities were undertaken.

- *Project inception workshop:* In order to stage the project, project inception workshop was organized in Simara Bara. This has opened up opportunities to partner with district line agencies such as district forest office, district soil conservation office, district agriculture office and Sahajnath collaborative forest users group.
- *Awareness and beneficiary selection:* A series of interaction meetings were organized to aware local people regarding the pollination role of bee and crop yield. Groups were formed for their active participation which has also eased beneficiary selection. A community trail plot was also established so that farmers understood and actually saw the increased crop yield due to honeybee pollination.
- *Wild honeybee conservation and domestication:* For the honeybee conservation, with active collaboration with Sahajnatha collaborative forest 20 ha forest was demarcated for honeybee conservation where forest bee flora were planted. Likewise, bee-keeping training was also conducted and beehives (both modern and traditional bee hives) were distributed to beneficiaries for domestication of wild honeybees.
- *Organic farming:* Organic farming was initiated to reduce the harmful effects of chemical pesticides to honeybee. The activities included were training on organic farming, compost and bio-pesticide making and conducting farmers field school for both winter and summer crop. This has not only contributed to conservation honeybees but also helped communities to generate steady income.
- *Resource mobilization and market linkage for commercialization:* During the course of project implementation, MRC Nepal was able to mobilize resources from different district line agencies and other donors such as GIZ and OFID. The market for honey and organic vegetable produced by the farmers were ensured as small vendors often purchased these products directly from the farms of the farmers.
- *Project activity demonstration and review:* At the local level, project activities were highlighted through local dramas and via different local newspapers, whereas at the national level, the interventions were highlighted through UNDP Nepal Newsletter and GEF/SGP publications to reach to the wider audience. At the end of the project, a district level project review workshop was organized.
- *Gender and social inclusion:* The project was carefully planned to incorporate gender and social inclusion issues. First, activities such as organic farming in small scale and bee-keeping are less labour intensive. Second, in order to train the women members on organic farming, farmers field schools for both summer and winter vegetables were organized every Saturday for three months each. These practical trainings were very effective as women members could freely participate in their leisure time. Third, female team leader and accountant belonging to ethnic caste were deputed so that gender communication barrier could be overcome.

## 2.3 Major activities and achievements

### 2.3.1 Forming the farmers' group

The project formed 10 farmers- groups having 204 member households with 1072 members (Annex 1). Out of 204 households, 165 were women (81%) and 39 were men (19%) and the total female and

male population were 515 and 557 respectively. Ethnical composition of the groups were: 29 Dalit (14%), 124 Janajati (61%), and 51 others including Brahmin/Chetri (25%).

Out of 10 groups, four groups had been registered with District Agriculture Development Office and had cumulative saving of NRs 171,588 (Annex 2).

### 2.3.2 Demonstrating the pollination role of honeybee in mustard

A community led demonstration plots to demonstrate effective and efficient honeybee's pollination role were set in mustard farm of a local farmer in Haraiya-6, Bara.

#### Methodology

To develop awareness among the farmers of project area about the importance of native bee *Apis cerena*, a participatory action research was carried out. Two pollination demonstration plots were set in mustard farm during mustard flowering period (17 December 2012 to 12 February 2013). In both plots, two sub-plots of (5m×3m×4.5m) -- one with honeybee and another without honeybee -- were set. These plots were covered with net. Farmers participated in every activity of the participatory action research which included plot setting, covering with nets and yield measurement.



Field trial to demonstrate pollination role of the honeybees

#### Result and conclusion

It was observed that mustard yield in plot with honey bee was increased by over 55%. Likewise average number of pod and mustard grain inside the pod were increased by over 44 and 50% respectively (Table 1). With this result demonstration, the farmers easily understood the important pollination role of native honeybee which subsequently helped in increase in productivity.

### 2.3.3 Promoting the organic farming

Two farmer field schools (FFSs) for summer and winter crop were conducted in Haraiya, Bara for 16 weeks. Every Saturday morning, 58 farmers participated in the school for two hours (Annex 4). The participants were selected in the basis of their interest, their commitment to become organic farmers and serve as master farmer for dissemination and imparting knowledge to other farmers.

Table 1. Comparison of mustard yield in demo plots with and without honeybee (Field trail 2013)

Sn	Particular	Plot with honeybee	Plot without honeybee	% increase in plot with honeybee
1	Mustard yield (Kg/ ha)	350	225	55.6
2	Mean number of siliqua (pod) per plant	53	36.6	44.8
3	Average number of grain per pod	27	17.95	50.4



Pheromone trap



Field plots for farmers' field school

### Summer farmers field school

A total of 30 farmers (3 from each group) had participated in the school where they learned to cultivate five summer vegetable crops namely bottle gourd, bitter gourd, sponge gourd, okra and bean.

For practical learning, a 170 m<sup>2</sup> land was divided in two plots- one for demonstration of IPM and another for farmer's traditional method. Both the plots were again divided in 5 sub plots. In each sub plot a single selected crop was cultivated.

### Winter farmers field school

A total of 28 farmers (3 each from eight groups and 2 from remaining 2 groups) had participated in the school where they learned to cultivate five winter vegetable crops namely cauliflower, cabbage, tomato, chilly, and radish. Similar to that of summer school, a 170 m<sup>2</sup> land was divided in two plots- one for demonstration of IPM and another

for farmer's traditional method. Both the plots were again divided in 5 sub plots. In each sub plot a single selected crop was cultivated.

In the IPM based FFS training, participants learned to identify insect pest, manage pest in integrated way which include all mechanical, cultural, biological practices, preparation and application of *Jivatu*, *Gitimal* and pheromone trap.

Likewise, two events with two day long fresh vegetable production and management training benefitting 49 beneficiaries were also conducted in Haraiya, Bara.

After the training on organic farming, 178 direct beneficiaries prepared and applied *Jivatu*, *Gitimal*, pheromone trap and other organic products, which helped in reducing agri chemicals by 80%.

The 204 households had expanded organic vegetable farm to 16.88 ha from initial 2.32 ha. Out of 204 beneficiaries, 26 households had

- 26 beneficiaries shifted to commercial vegetable farming, and 61 to semi-commercial
- Application of agri-chemicals: Reduced by 80%
- Vegetable farming area increased: 14.56 ha
- Total vegetable production increased: 23,000 kg
- Productivity increased: 9792 kg/ha/yr
- Economic improvement (based on productivity of vegetables): NRs 220,321/ha/yr
- Average income

After intervention: NRs 35,544 per Kattha (336 m<sup>2</sup>) per year and before intervention: about NRs 4,444 per Kattha per year



A beneficiary selling her organic vegetables in the market

initiated commercial farming whereas 61 families were engaged in semi-commercial farming. The remaining 117 households had produced organic vegetables for self-consumption only. While assessing economically, the 204 families have produced 240,310 kg of fresh vegetables worth NRs 5,406,975 within a year. The farmers have experience of earning NRs 3,427,380 by selling 152,328 kg of vegetable. The crop intensity has also increased to 3 rotation in a year from one to two rotation per annum. As such the average annual income has sharply increased to NRs 35,543 per *Kattha* (equivalent to NRs 710,860 per ha) from NRs 5,000 per *Kattha* (equivalent to NRs 100,000 per ha).

### 2.3.4 Domesticating the wild honeybee

A three day training on beekeeping was conducted at Haraiya 6, Bara where 31 farmers participated (Annex 4). After the training, 18 log hives and 6 modern hives were distributed to the participants.

At present, 65 households have started to rear wild honeybee (*A. cerana* Feb.) in 182 hives (176 log hive and six modern hive). Within 18 months, they had produced 1820 kg of honey which worth NRs 1,274,000. It was seen that the maximum production of honey from log hive and modern hive was 15 kg and 20 kg per year respectively. One quarter of the honey produced was sold to market at the rate of NRs 700 per kg and earned NRs 318,500.

### 2.3.5 Conserving the wild honeybees

With the active collaboration from Sahajna collaborative forest, the project sensitized members on the national forest policies, rules, regulations. They were also sensitized to initiate stall-feeding and prevent forest grazing, reducing the number of unproductive livestock and control forest fire. Moreover, the project helped to develop trained firefighters for checking the forest fire. A 20 ha plot inside the Sahajna Collaborative Forest was demarcated for wild honey bee conservation.

#### Box 1: Organic farming changed my life: Bishnu Maya

Mrs. Bishnu Maya Shrestha, 36 years aged, with four member of family, lived in Haraiya -6, Bara, had to tackle with vulnerability of food insecurity and penury. Besides, she was very worried because her husband had returned home empty handed from Malaysia within three months because of his ill health. Then, her family was facing vicious circle of debt.

She was involved in the group under the project and achieved skills and inputs on organic farming. Aftermath, she started organic vegetable farming. In her 672 m<sup>2</sup> farm land, she had planted sponge gourd, bitter gourd, okra, cucumber. Within short period of time (18 months) she earned about NRs 114,920 (equivalent to US \$1149.13 @ 100). She had paid NRs 50,000 debt from her earnings and remaining was utilized for education of her children, culture celebration, and clothing. Earlier she used to earn Rs 25,000 from same farm, where she used to cultivate cereal crop.

“I had never expected such a yield and income from my land”, she expressed her happiness at the time of monitoring visit made from UNDP/GEF/SGP and MRC team. “It was my turning point for my future”, she further added with gratitude.



Different bee flora such as *Eucalyptus* spp. (Masala: Eucalyptus), *Shorea robusta* (Sal tree), *Bombax ceiba* (Simal: Bombax), *Melia azadarach* (Bakaino: Persian lilac), *Litchi chinensis* and other fruit trees were planted. The demarcation had also helped in germination of other seedlings.

The project created awareness through media, rally, street drama, floor discussion, pamphlets, workshop, interaction programmes on conservation of wild honeybees. As such, it was seen that firewood collection from the forest has been reduced by 30%. The demo plot to show the pollination role of bee had also helped to enhance local awareness on conserving wild honeybee.



Bee conservation demo plot in sahajpath collaborative forest



Community preparation for forest fire control



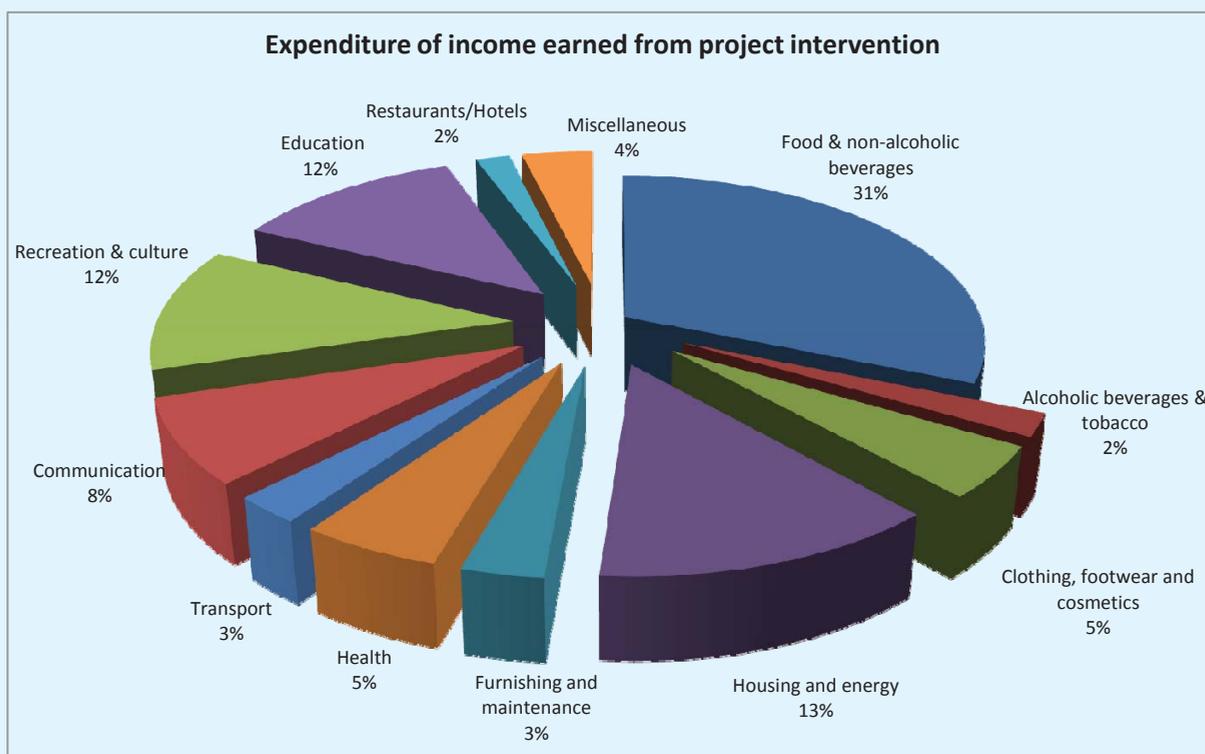
Awareness rally at Haraiya-6, Bara



Street drama during closing of farmers' field school

## Box 2: Investing the earnings

In total, the community had experience of earning NRs 3,745,880 from both organic farming and beekeeping (Annex 5). At end of the project, the project carried out sample survey on expenditure on earning from the project intervention. It was revealed that, beneficiaries have utilized their chunk of earnings (31 %) for food followed by housing and energy (i.e. 13%). The income from the project contributed significantly for children's education (i.e. 12%). Likewise, rise in communication expenditure (8 % from 3.2% prior to project intervention) revealed public interest in communication means.



### 2.3.6 Co-funding and resource mobilisation

The project was able to generate a total cofunding of NRs 1,947,877 of which NRs 1,370,767 in cash and remaining NRs 570,110. MRC Nepal has

successfully secure funding from OFID which contributed significantly in cash cofunding (Table 2).

Table 2. Cofunding partners of the project

S.N.	Name of organisation	Activities	Cost NRs		Remarks
			Cash	Kind	
1	District Forest Office, Bara	For IGA and forest mgmt.	136,000	225,060	Cash providing for transplanting and fencing and seedling providing (President Siwalics conservation programme)
2	District Soil Conservation Office, Bara	Honeybee pasture management	0	62,750	Providing 502 seedlings ( Pasaha watershed area conservation programme)
3	Sahajmath Collaborative Forest Management Committee, Madhuwan, Bara	Awareness raising	13,250	13,500	Media broadcasting as well as tea and snacks for awareness raising, log hive purchasing, seedling providing
4	OFID	Organic vegetable production	1,200,000	0	2 VDCs
5	Community		21,517	275,800	FFS, contribution, and training
<b>Total</b>			<b>1,370,767</b>	<b>577,110</b>	
<b>Grand-total</b>			<b>1,947,877</b>		

### 2.3.7 Replicating and scaling up project initiatives

With the gracious support from the various donors, project initiatives such as organic farming, beekeeping have been replicated in 159 ha benefitting 3,009 more households (Table 3). With funding support from DFID, MRC Nepal is replicating organic farming in river bed cultivation covering 263 households in Haraiya and Karaiya, 629 hhs in neighboring VDCs of Bara, and 1307 hhs in Makawanpur and Chitwan districts. Likewise, with financial support from GIZ/STPP, MRC Nepal

is also implementing organic farming in eight districts covering 810 households. Furthermore, beneficiaries started spatial and varietal diversification/ expansion in organic vegetable farming. Farmers who had started organic vegetable farming in just 10 Dhur (167.8 sq m) had expanded to one *Kattha* of land (1692.52 sq m). Likewise, some farmers had started to cultivate more than five vegetable crops.

Likewise, GIZ/STPP supported project in Chitwan, MRC Nepal has supported 18 hhs for bee keeping . They now have 87 improved hives.

Table 3. Detail of organic farming replicated

SN	Project name	District	Coverage hhs	Area (ha)	Remarks
1	OPEC/OFID	Bara	263 (Haraiya: 199, Karaiya: 64) and 629 from 4 VDCs	17.6 42.14	Application of bio-pesticides instead of chemical pesticides
2	OPEC/OFID	Chitwan and Makawanpur	1,307	87.5	„
3	GIZ/STPP	Chitwan, Sunsari, Nawalparasi, Kapilbastu, Dang, Banke, Bardiya, Kailali, Surkhet	810	54.27	
	Total	11 districts	3,009	159.41	

### 2.3.8 Knowledge management and project visibility

Detail curricula of farmers' field school and bee keeping have been developed which had helped in replicating them in various districts. Other knowledge products included flyers on making of organic pesticides and Jivatu and project reports. Two successful project case studies had been highlighted in UNDP Nepal Annual report 2012 and website. Occasion media coverage via daily local newspaper and FM radio has not only helped in disseminating project activity but also enhanced project visibility. Likewise, awareness activities such as joint door to door visits, street dramas, conservation songs, inception and review workshop had also enhanced the visibility of the project.

### 2.3.9 Exit and sustainability

The project had convened three main activities- conserving bee pasture in wild, domesticating the wild honeybee and organic farming to reduce the mortality of wild honeybee due to pesticide. The project had ensured sustainability measures for these activities which paved in safe exit of the project.

- The collaboration with Sahajnath collaborative forest has ensured the protection of demo plot for wild honey bee. In the plot, many bee floras were planted and protected.
- The project had provided training on both wild honeybee keeping and organic farming which were instrumental in engaging 65 and 204 households in bee-keeping and organic farming respectively. By linking and selling wild honey and organic vegetables in the market, the beneficiaries were able to earn NRs 3,745,880. It was assumed that they would continue these activities, as they have started to earn more than what they used to earn. Thus linking with market was one of the interventions in sustaining beekeeping and organic farming.

- Prior to initiating project activities, 10 famers groups with 204 members were formed. They also carried out saving and credit initiatives ensuring their continuity. The project also supported in institutional building of these farming groups. Four groups were registered with DADO and rest were federated to two groups as conservation groups. These two federated groups will continue their conservation support to district forest office, Bara and Sahajnath collaborative forest management committee.
- During the course of initiating Farmers Field School, only 58 participants were selected. One of the prerequisites was that these master farmers should also train other 3 fellow group members. All the 204 had initiated organic farming indicating that this important prerequisite was fulfilled. This was also taken as a good indicator of sustainability of organic farming initiatives.
- Although the project was phased out in June 2013, MRC Nepal has continued their activities with the support from OFID fund. This would also help in consolidating the project activities.



Farmers' group registered with DADO

### 2.3.10 Lesson learnt and recommendation

By integrating organic farming with beekeeping and linking with market, the farmers had experienced the steady rise in income. This ensured symbiosis in honey bee conservation and organic vegetable farmers.

Organic farming in small scale and beekeeping are not labour intensive work. As such the project was able to increase women's participation significantly (81% women participation). It was observed that there was no any additional burden to 165 women beneficiaries due to organic farming and beekeeping, rather they were empowered through the income they had earned.

Out of 204 organic farmers, a significant number of farmers (117 farmers) were still confined to farming for domestic use only. It was further revealed that most of these farmers were squatters and project did not encourage them in farming activities in encroached forest land. On the other hand, their participation has helped in reducing the pressure in the forest.

The demonstration plot in mustard field with and without honeybee has been found very effective to sensitise the local people regarding the role of honey bee in pollination and subsequently in increase in productivity.

After the bee keeping training, 6 improved bee hives were supported. Likewise, additional 176 log bee hives have been promoted. But the farmers preferred improved bee hive to log hive as the production was more in former hive. As the improved bee hive is costly, a local technician or carpenter could be trained so that such improved bee hive could locally be manufactured. This would also create a new enterprise in the village.

Honey is the cheapest product of honeybee. If we could also harvest other bee products such as royal jelly, wax, pollens, propolis and honey venom, a whole lot of enterprise could be created. These initiatives could also mobilise the private institutions. Private institution could be mobilized for these initiatives.

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# Annexure

## Annex I: Common bee flora found in Nepal

Nepali name	Common name	Scientific name
<b>Agronomical plants</b>		
फापर	Buckwheat	<i>Fagopyrum esculentum</i>
आलस	Niger	<i>Guizotia abyssinica</i>
तोरी	Mustard	<i>Brassica campestris</i>
रहर	Pegeon pea	<i>Cajanus cajan</i>
सूर्यमुखि	Sunflower	<i>Helianthus annus</i>
तील	Sesame	<i>Sesamum indicum</i>
<b>Horticultural plants</b>		
धनिया	Coriander	<i>Coriandrum sativum</i>
शितलचिनी	Drumstick	<i>Moringa oleifera</i>
अमिला फलफूल	Citrus	<i>Citrus sps</i>
लिची	Litchi	<i>Litchi chinensis</i>
नरिवल	Coconut	<i>Cocos nucifera</i>
अम्बा	Guava	<i>Psedium guajava</i>
बयर	Ber	<i>Zigipus sps</i>
जामुन	Jamun/Java plum	<i>Syzygium cumini</i>
चुत्रो	Indian barberry/ Tree turmeric	<i>Berberis aristata</i>
ऐंसेलु	Wild raspberry	<i>Fragaria sps</i>
कटुस	Chestnut	<i>Castanopsis indica</i>
च्यूरी	Indian butter nut trees	<i>Aesandra butyracea</i>
कल्कीफूल	Bottlebrush	<i>Callistemon spp.</i>
लालीगुराँस	Tree rhododendron	<i>Rhododendron arborium</i>
अमला	Amla	<i>Phyllanthus emblica</i>
ईम्ली	Tamarind	<i>Tamarindus indica</i>
काजु	Cashew nut	<i>Anacardium occidentale</i>
<b>Agro-forestry plants</b>		
मसला	Eucalyptus	<i>Eucalyptus sps</i>
बेल	Stone apple	<i>Aegle marmelos</i>
ढेंचा	Sesbania	<i>Sesbania sps</i>
खयर	Acacia	<i>Acacia sps</i>
राजबृक्ष	Bengali	<i>Cassia sps</i>
शिरिस	Lebbeck/ Woman's tongues	<i>Albizia lebbeck</i>
<b>Forest plants</b>		
साल	Sal tree	<i>Shorea robusta</i>
सिसौ	Sissoo	<i>Dalbergia sissoo</i>
उत्तीस	Nepal alder	<i>Alnus nepalensis</i>
सिमल	Bombax	<i>Bombax ceiba</i>
टीक	Teak	<i>Tectona grandis</i>
महुवा	Mahuwa	<i>Madhuka longifolia</i>
पँलास	Parrot tree	<i>Butea monosperma</i>
पड्के	Persian silk tree/ pink silk tree	<i>Albezia julibrissin</i>
बनमारा	Bitter bush	<i>Eupatorium odoratum</i>
रुधिलो	Bengal pogostemon	<i>Pogostemon benghalensis</i>

### Annex 2: Details of farmers' group

Name of VDC	No. of groups	Dalit		Janajati		Others		Total		Grand total
		F	M	F	M	F	M	F	M	
Haraiya	7	23	3	55	14	43	4	121	21	142
Karaiya	3	1	2	26	16	16	1	43	19	62
Total	10	24	5	81	30	59	5	164	40	204

(M: male 19% and F: female 81%; Janajati: 54.41%, Dalit: 14.21%, Others:31.37%)

### Annex 3: Group savings

Sn	Name of group	Address	Savings (NRs)
1	Unnatishil agriculture group (registered)	Haraiya -6, Nayabasti, Bara	48,850
2	Pratibha agriculture group (registered)	Haraiya -6, Milanchock, Bara	15,620
3	Buddha Women	Haraiya -6, Buddhanagar, Bara	8,450
4	Bandevi AG	Haraiya -6, Baraltol, Bara	11,520
5	Chetanshil (registered)	Haraiya -6, Ekatanagar, Bara	5,630
6	Shrijanshil	Haraiya -1, Namunatol, Bara	9,530
7	Hariyalia AG (registered)	Haraiya -1, Pipaldada, Bara	16,613
8	Sahajnath	Karaiya -8, Katgaun, Bara	12,350
9	Jagriti Women AG	Karaiya -8, Jungletol, Bara	25,500
10	Brahma Baba	Karaiya -8, Beluwa, Bara	17,525
Total savings (NRs) (up to June 2013)			<b>171,588</b>

### Annex 4: Income and savings from the project

Particulars	Unit	No./ Quantity	Per unit rate (NRs)	Total value worth (NRs)	Total income from selling
Income from vegetable farming	kg	230000	22.5	5,175,000	3,427,380
Income from honey	kg	1820	700	1,274,000	318,500
Savings from chemical pesticides procurement	hhs	204	650	132,600	
Savings from chemical fertilizers procurement		204	550	112,200	
Health benefit (204 total beneficiaries) (1 yr, because impact was seen after 6 months)	No.	204	470	95,880	
Minimization of wood extraction (direct beneficiaries)(1 yr, because impact was seen after 6 months)	Cycle	18360	475	8,721,000	
Total income				15,510,680	3,745,880

Note: in case of wood extraction, 90 cycles per day by the direct beneficiaries in 90 days in one year

### Annex 5: Capacity enhancement

SN	Activities	Place	Date	Beneficiaries					Total
				Gender		Ethnicity			
				M	F	JJ	D	O	
<b>Capacity building</b>									
1	Farmers' field school/ IPM	H-6, Bara	Jan 20 –Jun 14, 2012	4	26	19	1	10	30
		H-6, Bara	Aug 18-Dec 01, 2012	4	24	8	3	17	28
2	Fresh vegetable production	H-6	May 19 -20, 2012	2	28	14	6	10	30
		H-6	Sep 05-06, 2012	4	15	5	1	13	19
3	Vermi-composting	H-6	March 30-31, 2013	2	22	11	0	13	24
4	Bee keeping and mgmt training	H-6	Mar 11-13, 2012	12	19	19	1	11	31
5	Candle production for income generation	H-6	Aug 10, 2012	0	20	8	2	10	20
6	Plantation and protection	H-1	Aug 01, 2012	0	24	5	4	15	24
<b>Total</b>				<b>28</b>	<b>178</b>	<b>89</b>	<b>18</b>	<b>99</b>	<b>206</b>
<b>Awareness rising</b>									
7	Minimizing chemical pesticides for biodiversity and honeybee conservation	H-6	Apr 15, 2012	16	5	12	1	8	21
8	Joint door to door program	H-6	Apr 21, 2012	2	12	11	1	2	14
9	Collaborative forest awareness raising workshop	H-6	May 16, 2012	20	10	16	2	12	30
		Rastriya School Kakadi, Bara	May 21, 2012	31	4	23	3	9	35
		Parsauna	May 24, 2012	42	13	50	1	4	55
<b>Total</b>				<b>111</b>	<b>44</b>	<b>112</b>	<b>8</b>	<b>35</b>	<b>155</b>

H: Haraiya, F: female, M: male, JJ: Janajati, D: Dalit, O: others



## Introduction to MRC Nepal

Multi-dimensional Resource Center Nepal (MRC Nepal) is an alliance of multidisciplinary professionals working in the field of development. It is a member based, non-governmental, non-profit oriented and social development organization that has been committed to excellence in sustainable community development since last 15 years. MRC Nepal started its work as pilot since 1998 but it is registered at the District Administrative Office, Kathmandu in 2002 and affiliated to the Social Welfare Council (SWC), Nepal. The organization aims at reducing poverty of rural communities through integrated and sustainable development interventions. Since its humble beginning in 2002, MRC Nepal transformed itself into one of the paramount national level development organizations in Nepal. The MRC Nepal has well deserved recognition as professional and results oriented organization is largely due to the commitment of its exceptional human resources, technical competency, holistic and sustainable community development, and empowerment approach.

Over the past 15 years, it has applied and implemented several project modules in more than 20 projects in 15 districts facilitating and supporting around 50,000 households for livelihood promotion, land management, and environmental conservation through campaign, advocacy, awareness rising, input support, capacity enhancement, and follow up. MRC Nepal focuses on the needs of the poor, marginalized, and deprived community with prioritizing *Dalits*, *Janajatis*, women and children. It formulate its programs by maximizing the community participation in which the participation of women is compulsorily emphasized. After the conduction and accomplishment of different tools like participatory rural appraisal (PRA), rapid rural appraisal (RRA), household survey, interaction with stakeholders, it implants project activities focusing on gender equity and social inclusion (GESI).



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