

ENVIRONMENT OUR RESPONSIBILITY

A Training Manual for Community Based
Natural Resource Management



The Energy and Resource Institute



GLOBAL MARCH

Against Child Labour
Contra el Trabajo Infantil
Contre le Travail des Enfants

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Contents

1 Introduction	5
2 Learning about natural resources and their role in our lives	7
3 Sustainable use of natural resources	22
4 Integrated natural resource management	41
5 Engaging with the Government	44
6 Conclusion: thinking about our relationship with natural resources	51
7 Annexure	53





Introduction

Natural resource management refers to the management of resources such as land, water, trees, and air to ensure their continued availability for current and future generations. Community-based natural resource management refers to the process of involving local communities in the management of these resources with the objective of both conserving the environment but also ensuring socio-economic development of local communities.

This training manual seeks to equip trainers, working in a rural context, with information and skills to carry out activities related to community-based natural resource management. These activities range from raising awareness about natural resource depletion, to facilitating discussions surrounding equitable use of natural resources, to approaching government and other agencies to ensure that local communities benefit from resource use in the area.

Organizations involved in creating the manual

Global March Against Child Labour: Global March is an international coalition of civil society organizations which seeks to work towards ending child labour, slavery, and trafficking. It also seeks to ensure access to free and good quality education for all children. It works towards ensuring rights for all children, especially the right to education and the right to be free from economic exploitation.

Bachpan Bachao Andolan: BBA is a movement working for the rights of children in India. In particular, it works towards ending child labour, bonded labour, and human trafficking, through measures for prevention, protection, and rehabilitation.

The Energy and Resources Institute: TERI is a policy research organization which conducts research and outreach in the fields of energy, environment, and sustainable development, including natural resource management.

Overview of the project

This training manual has been created under a project, 'Ensuring Sustainability at the Village Level', sponsored by Global March, which seeks to raise awareness about rights and responsibilities of local communities surrounding natural resource use.

The project takes forward Global March's current engagement in 27 villages spread across the states of Jharkhand, Karnataka, and Rajasthan. In these villages, Global March has been working with BBA on its child-friendly village intervention, 'Bal Mitra Gram' to end child labour and promote education, through a rights-based approach. One of the objectives of this project is to facilitate the creation and strengthening of grassroots structures which will effectively address issues relating to child labour and illiteracy.



TERI carried out field work in the three states and has developed this manual for Global March and BBA based on our interaction with the communities in each of these villages and discussions with other stakeholders. The co-operation and support of Global March and BBA staff in carrying out the research and through the process of creating the manual is much appreciated.

The manual will be developed further based on feedback from trainers using it.

Objectives of the manual

The objective of this manual is to help trainers conduct exercises with communities, especially the youth, so that communities are able to start thinking about their relationship with nature, more broadly, and natural resources, in particular.

There are three key outcomes which trainers should focus on achieving,

- First, ensuring the community members understand the limited nature of natural resources and learn solutions to address natural resource depletion;
- Second, provoking discussion amongst community members on existing social and political dynamics which surround natural resource use; and,
- Third, raising awareness about both rights and responsibilities surrounding natural resource use

While the manual provides information on the natural resource issues, and how to address these using technical solutions; through activities, trainers could try to generate discussion on how institutions such as caste, class, and gender might influence a person's access to natural resources. This would, in turn, allow communities to start

thinking about their rights and responsibilities towards natural resources.

Who can use the manual?

Field staff of BBA who wish to raise awareness about key natural resource issues and the link between livelihoods and sustainable use of natural resources.

Youth groups (Yuva Mandals) to raise awareness among their peers as well as the wider community on these issues.

Other stakeholders of BBA such as Mahila Mandals (women's groups) and Bal Panchayats (children's parliament).

Layout of the manual

There are four key sections:

- The first section outlines information on natural resources such as land, water, and forests
- The second section outlines methods to use these natural resources sustainably to ensure livelihood security
- The third section briefly discusses integrated natural resource management
- The fourth section outlines key schemes of the government through which communities can implement some of the solutions suggested in the manual

Activities are provided to help trainers generate discussions on the dynamics of natural resource use and rights and responsibilities surrounding natural resource use. Field staff can adapt the activities to different natural resources. For example, if role plays are provided as an activity to raise awareness about water conservation, they can also be used to raise awareness about other issues such as deforestation, waste management, etc.





Learning about natural resources and their role in our lives



Image: Imagining a future without trees



MODULE 1: What are natural resources?



Image: Key natural resources

In this module we will learn:

- What are natural resources?
- What are renewable and non-renewable natural resources?
- How are natural resources useful to us?
- What is natural resource management?
- What is community-based natural resource management?

What are natural resources?

Natural resources include resources such as land, water, forests, livestock, fossil fuels, minerals, etc., which are available in nature and can be used by people for productive purposes.

For example, water is used for growing crops; forest products like *amla* can be used as food, or sold in the market; wood from forests can be used to make houses, and stones can be used to make roads or houses.

These resources may be renewable or non-renewable.

What are renewable and non-renewable natural resources?

Renewable resources are those that can be replaced at a relatively quicker pace, while non-renewable resources take thousands of years to form, and are therefore often used at a much faster rate than they can be replaced, making their use unsustainable.

Resources such as sunlight, water, air, and plants are considered renewable, while fossil fuels (such as coal and oil) and minerals (such as mica, or certain types of stones) are considered non-renewable.

However, even resources such as water, air, and forests can be used at rate that does not allow for their replenishment.

For example, high levels of air pollution, deforestation, and high levels of groundwater extraction can deplete resources which are normally categorized as renewable such as air, forests, and water, respectively.

Why are natural resources useful to us?

Sustainable livelihoods: Many livelihoods, especially in rural areas, are dependent on natural resources such as water, soil, and trees. For example, more than half the



Image: Discussing the importance of natural resource

population of India is made up of farmers who depend on water and soil for healthy crop production. There are many families which depend on forests for fuel wood, fodder, and even other forest produce such as fruits and leaves.

Food security: As mentioned above, crop production depends on water and soil and without adequate amount of water or good quality soil, our crop production can fall. For farmers who sell in the market, this can decrease their incomes from their land. Farmers who produce largely to feed their families may not even have enough to feed themselves and their families if there is degradation of natural resources such as water and soil.

Health: Poor quality water and air can cause several diseases which are easily preventable. Diseases not only affect the quality of our life, they mean we have less time for other activities such as work. They also require us to spend more money on doctor's fees.

For all of the reasons provided above, it is important to use natural resources sustainably, knowing that future generations will also depend on them for their livelihood and food security. In the next modules, we will explore our relationship with natural resources further.

What is natural resource management ?

Natural resource management refers to the management of resources such as land, water, trees, and air to ensure their continued availability for current and future generations.

For example, as you are aware, our forests have been used for generations because our ancestors did not over-use forest resources and allowed trees to regenerate naturally. However, in recent years, trees are being cut at a much faster rate than they can regenerate, through a process called deforestation. This is for several reasons such as increased demand from outside markets for timber and other forest produce, and even within our own communities due to increasing population.

Deforestation has led to a situation where in parts of the country, there aren't enough trees left for fodder or fuel wood or to get enough income from selling forest produce. If this is the case today, imagine a situation where some years down the line, our children may have even less to survive on.

Therefore, sustainable natural resources management means using natural resources in a way that we meet our needs as well as the needs of future generations.

What is community-based natural resource management?

Community-based natural resource management refers to the process of involving local communities in the management of these resources with the objective of both conserving the environment but also ensuring socio-economic development of local communities.



ACTIVITIES

Interactive discussion: Understanding 'community' and 'common land'

Objectives: Discussing what the term community means to participants

Participants: Yuva Mandal, Mahila Mandal

Process:

- Ask participants what they think of when they hear the term 'community'
 - For example, do they think of the people from the same village, same religion, or same caste?
 - Does their perception of community change when they go to another village or to the city?
- Sum up key points raised and point out how the entire village forms the community and not just particular castes or other groups
- Ask participants who should benefit from common land.
 - For example, should all community members benefit, or just land owners, or people from a particular caste?
- Sum up key points raised and point out how benefits should accrue to all community members and not just one group of people
- Ask participants who should be responsible for the development and management of common lands
 - For example, should the Panchayat or State Government or land owners be responsible?
 - Conclude by summarizing key positions and outline the important role of the community as a whole in managing its natural resources

Outcomes: Generating a discussion on the terms community and common land

Time required: 2 hours

Materials required: Chart paper and pens

Natural resource mapping

Objectives: To help communities understand the key natural resources they currently have access to and any changes which have happened over time in the availability of these resources

Participants: Mahila Mandal, Yuva Mandal, Bal Panchayat

Process:

- Explain the concept of natural resources
- Provide participants with chart paper and pens
- Ask them to map out major natural resources in their village such as ponds, rivers, forests, agricultural land, etc.



- Discuss any changes which have happened in the availability of these resources over time
- Discuss what participants would like their ideal village to look like in terms of natural resources
- The map can be put up at a central place in the village such as the school

Outcomes: Increase awareness of natural resources and changes which occur to them over time

Time required: 2–3 hours

Materials required: Chart paper, pens, and pencils

Role play: Socio-economic and political dynamics of resource use

Objective: To understand the differences in access to natural resource based on institutions such as caste, class, gender, etc.

Participants: Members of Mahila Mandal, Yuva Mandal, and Bal Panchayat, as well as any other community members

Process:

- Make chits with storylines for plays specifically related to socio-economic and political dynamics around resource use. Some examples include:
 - A lower caste boy takes his cattle grazing and strays into the priest's land
 - A local business has been set up by a politically powerful local family but it is causing pollution in the surrounding water and air
 - The local official in charge of implementing MGNREGA is demanding bribes to make job cards
 - Two brothers are forced to drop out of school when their families ask them to join them in mica collection / collection of forest products / stone quarrying
- These are indicative examples; please include *locally relevant* examples in the chits
- Divide the group into two or more smaller groups, depending on the number of participants so that each group has at least five participants
- Each group will pick a chit and will create a play based on the theme they have picked
- Groups can further pick chits consisting of different roles they can enact in the play
- This will help them see the perspective of individuals who are from different backgrounds

Outcomes: Raising awareness about various socio-economic and political dimensions of resource use

Time required: 3 hours



MODULE 2: Learning about water resources

In this module we will learn:

1. What are the major uses of water?
2. What are different sources of water?
3. What is the water cycle?
4. What causes depletion and contamination of water?
5. How am I affected by scarcity of water?

What are the major uses of water?

People use water for drinking, sanitation, for agricultural activities, and in industries. Animals also need water to survive. In India for example, the majority of the water usage is related to agricultural activities (irrigation).

In recent years, the demand for water has been increasing. Firstly, in some areas, agricultural practices such as flood irrigation, or increased dependence on water due to use of chemical fertilizers can increase dependence on water. Secondly, as more and more industries are being set up to manufacture products, the demand for water is



Image: Raising awareness about water contamination



growing. For example, if a new factory is set up in your area, it may need water to make its products. Finally, as the population of cities increases, there is more demand for water from cities. This puts pressure on the total water resources in the country.

What are different water sources?

There are two major types of water sources—(i) surface water sources such as rivers and ponds which are available on the surface, and (ii) groundwater water sources such as wells which are found below the ground.

What is the water cycle?

Have you ever wondered where the rain comes from? The water cycle helps explain the movement of water on, below, and above the surface of the earth. Since it is a cycle, it has no origin but involves continuous movement. For example, as can be seen in the illustration below, water falls in the form of rain, when it is heated by the sun, water from the surface (in lakes, rivers, etc.) evaporates in the form of water vapour, water vapour condenses back into water in the sky where the temperature is cooler and then falls in the form of rain!

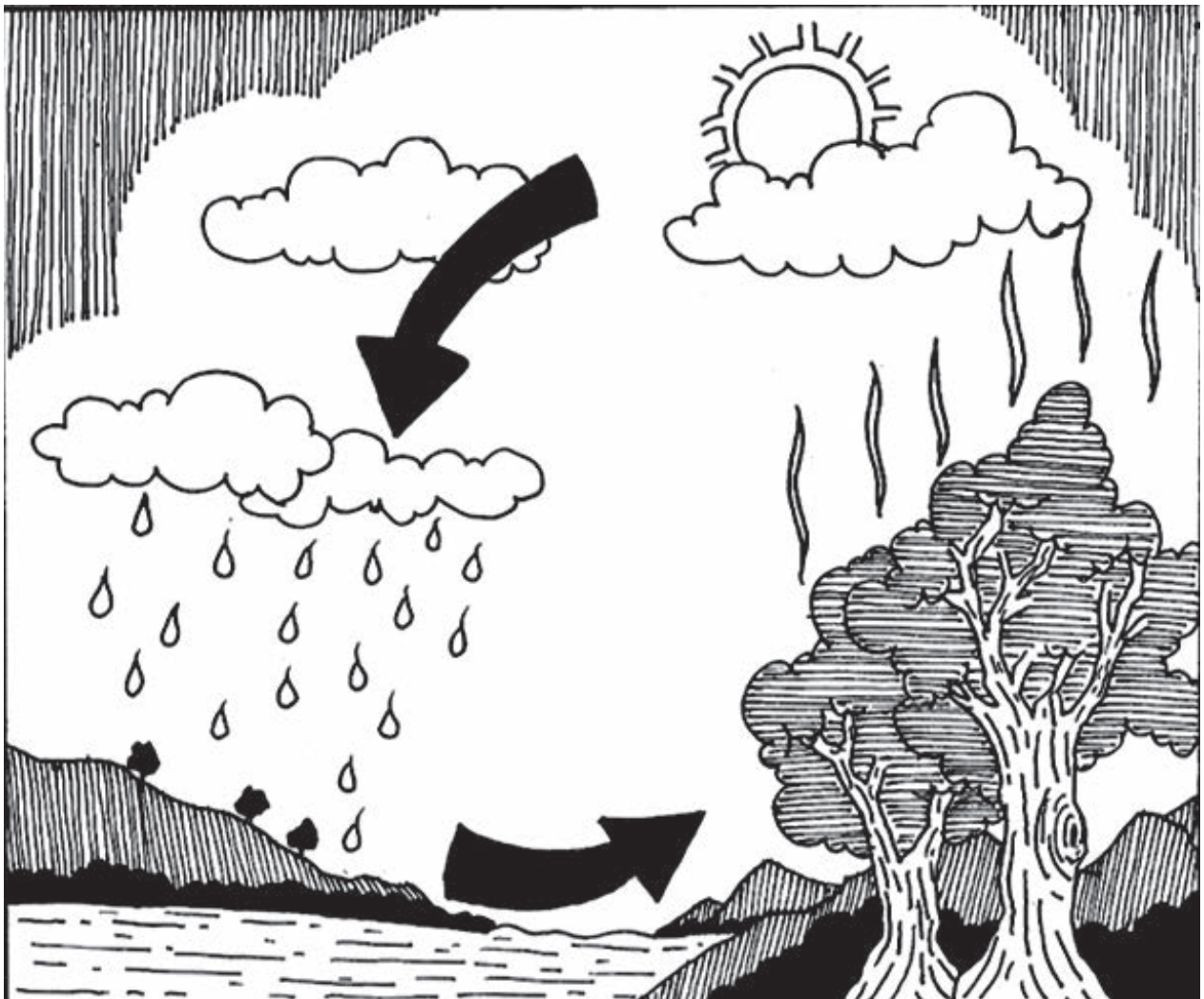


Image: The water table

What causes depletion of water?

The amount of water available for each person in India is decreasing because of a substantive increase in the population. For example, while 1,816 cubic meters of water was available to each person in 2001, it reduced to 1,545 cubic meters per person in 2011.

The major reasons for depletion of water in India are— (i) inefficient water usage in agriculture; (ii) increasing demand for water from industries; (iii) increasing demand for water from urban areas; (iv) increase in population; and (v) release of sewage, waste water, and chemicals into water bodies by industries and urban municipalities. Thus, even if water is available, it may not be safe to drink as it may be contaminated and there may not be enough water treatment facilities to make it safe to drink.

What causes contamination of water?

The major reasons for contamination of water could be— (i) use of chemical fertilizers and pesticides which seep into the ground and contaminate water under the ground; (ii) when drilling is done too deep and the chemicals in the ground mix with the water which is extracted thereafter for use; and (iii) the release of untreated or partially treated waste water by industries into rivers and other water sources.

Certain contaminants, such as fluoride, may be naturally high in some states such as Rajasthan. Other examples of contaminants include arsenic, lead, or petrochemicals. In India, common contaminants include fluoride and arsenic.

What are the key impacts of water contamination?

Different kinds of contaminants have a different impact on human health. For example, excess fluoride can cause dental problems, damage to the spinal cord, and bone damage. Lead can affect the central nervous system. Similarly, arsenic can cause liver and nervous system damage.

How am I affected by scarcity of water?

As mentioned earlier, water is an important natural resource because firstly, safe drinking water is essential to survival of mankind. Consuming contaminated water can cause various diseases, especially water-related diseases and can even lead to death. Secondly, water is essential if we want our crops to grow well and in a healthy manner. Finally, water is important if we want industries to be established near our villages to produce goods and provide employment to community members.



ACTIVITIES

Role play: Socio-economic and political dynamics of water use

Objective: To understand the key issues surrounding water use

Participants: Members of Mahila Mandal, Yuva Mandal, and Bal Panchayat, as well as any other community members

Process:

- Make chits with storylines for plays specifically related to socio-economic and political dynamics around water use. Some examples include:
 - Two lower caste women are caught using water from a well which is meant for upper caste use
 - A poor farmer's family discusses how they will get water for their field without money to install a deep tube well. Their rich neighbors on the other hand can afford to dig deeper for groundwater
- These are indicative examples; please include *locally relevant* examples in the chits
- Divide the group into two or more smaller groups, depending on the number of participants so that each group has at least five participants
- Each group will pick a chit and will create a play based on the theme they have picked
- Groups can further pick chits consisting of different roles they can enact in the play to help them understand perspectives of those from other backgrounds

Outcomes: Raising awareness about various socio-economic and political dimensions of water use

Time required: 3 hours



MODULE 3: Learning about land resources

In this module we will learn:

1. What are land resources?
2. What is soil erosion and what causes soil erosion?
3. How am I impacted by soil erosion?

Land covers about one-fifth of the earth's area. Soil, forms a surface layer and covers most of the land. Soil allows plants to grow. The nature of different types of soil is determined by features such as the ability to hold water, the various kinds of nutrients, its texture, etc.

There are many types of soils which are categorized on the basis of their colour, texture, composition, or structure. In addition, soil is made up of several layers called soil horizons.



Image: Discussing the importance of trees



What is soil erosion?

The top layers of the soil usually contain important nutrients which are needed by plants to grow. Soil erosion refers to the gradual wearing away of the top layer of soil either by natural factors, such as wind, or man-made factors such as farming or construction.

What causes soil erosion?

Soil erosion can be caused by natural or man-made factors. The key natural factors include rainfall, run-off, rivers and streams, flood, and wind. Some man-made factors include agricultural practices such as tilling the land, using chemical fertilizers, mono-cropping, and the

use of surface irrigation. Other man-made factors include deforestation, construction of roads, and urbanization.

How am I impacted by soil erosion?

The major impacts of soil erosion include a decline in the productivity of land, siltation of water bodies, worsening of floods, and desertification. Farmers are most immediately impacted by soil erosion as their incomes are reduced due to a decline in crop production. However, eventually, as food production becomes lower, food availability for other segments of the populations will decrease as well.

ACTIVITIES

Role play: negotiating common property use

Objective: To understand the differences in access to natural resource based on institutions such as caste, class, gender, etc.

Participants: Members of Mahila Mandal, and Yuva Mandal as well as any other community members

Process:

- Divide the group into two or more smaller groups, depending on the number of participants so that each group has at least five participants
- Make chits identifying key stakeholders such as farmers, goat herders, women, youth, low caste, upper caste, farmers with small landholdings, farmers with large landholding, etc.
- Tell each participant he or she must represent the interest of the stakeholder assigned to him or her and ensure that the best possible outcome is achieved for the stakeholder as well as the community as a whole
- Each group will pick chits and members will negotiate use of common property resources such as grazing lands, forests, water bodies, etc.
- At the end, each group will present how they have decided to manage common property resources
- Discuss any differences in the outcomes that each group has arrived at and why this is the case
- Conclude with the importance of sharing common property resources as equitably as possible

Outcomes: Raising awareness about how different stakeholders must negotiate for the use of common property resources

Time required: 3 hours



MODULE 4: Learning about forest resources

In this module we will learn:

- 1. What are forest resources?**
- 2. Why are forest resources important?**
- 3. What causes depletion of forest resources?**
- 4. How am I affected by deforestation?**

What are forest resources?

Forests mainly consist of trees but also include smaller plants and even animals. Forests give us many products that we use in our everyday lives. For example, we get fuel wood and fodder from forests. We sometimes depend on forests for food. We also get some income from sale of forest products such as timber or fruits.

The kinds of trees found in forests vary from region to region, but some common trees found in India include Banyan (the national tree of India), Neem, Peepal, Arjuna, Sal, Gulmohar, and Ashoka.

Why are trees and other forest resources important?

Fuel wood and fodder—Timber is an important source of energy for cooking and heating. Forests are also a source of fodder for livestock.

Economic benefits—Forest resources can provide livelihood opportunities to forest dwellers and those who live around forests by providing them with fruits, essential oils, etc., in addition to timber.

Purification of air—Forests are often called ‘the lungs of the earth’ because trees produce oxygen, the gas which we need to survive on earth.

They are home to many animals and plants—Forests are home to thousands of types of animals and plants. Nearly half of the animal and plant species on the earth live in forests.

Prevention and control of soil erosion and increase in soil fertility—Forests help improve the quality of soil in many ways. The roots help hold the soil in place and check soil erosion. Leaves and dead plants add nutrients to the soil on decomposing. Also, the layer of leaves on the ground prevents water from simply passing over the ground and allows the water to slowly seep into the ground.

Flood control—Trees help absorb excess water on the ground in case of flooding and help reduce loss of soil.

Trees can promote rainfall—Very large forests can influence weather patterns and cause rainfall in areas around them.

What causes the depletion of forest resources - why do people cut trees?

Some of the major reasons that trees are cut include—(a) to be used for fuel wood or fodder; (b) to make products from timber such as houses, furniture, paper, etc.; (c) to make land available for farming or grazing; (d) to make room for human settlement and urbanization (these include making space for shelter, industries, and roads); and (e) to make room for activities such as mining.

How am I affected by deforestation?

Deforestation affects us in many ways. Firstly, those who depend on forests for their livelihoods start earning less as forests resources are reduced. Secondly, many plants and animal species become endangered as a result of the loss of their habitat. It is estimated that 50 to 100 species of animals are lost each day in the world, as a result of destruction of their habitat.

Thirdly, soil erosion can occur as the soil dries up because the soil gets exposed to the sun’s heat. This can cause loss of nutrients and organic matter. It also makes it easier for water to erode the soil when the water passes over it.

Finally, loss of trees can reduce the amount of water absorbed in the soil. This is because roots and leaves on the ground help absorb the water into the soil and add to the water level under the ground.



ACTIVITIES

1. Booklet about local varieties of plants, animals, and trees, and their uses

Objectives: To understand the importance of the forest resources

Participants: Bal Panchayat, Yuva Mandal, Mahila Mandal

Process:

- Divide participants into groups, with members of different ages in each group
- Ask participants to list out key forest resources and their uses
- Compile the list and make a booklet about local resources, with pictures, stories, and poems by community members
- Also include a list of resources which were available earlier but are no longer available or are available but in less quantity
- This can be shared with local organizations and local government functionaries of the forest department

Time required: 2–3 hours

Materials required: Paper, pens, and pencils



MODULE 5: Air as a natural resource

In this module we will learn about the composition of air, its uses, and air pollution.

What is air made up of?

Air is a mixture of gases, water vapour, and dust particles. It consists of nitrogen, oxygen, carbon dioxide, other gases like helium and hydrogen, water vapour, and dust particles.

What are the uses of different gases?

The most important use of air for humans and animals is for breathing. We need oxygen to survive. Even air that is classified as clean has other gases and dust particles. However, beyond a point if there are many dust particles or certain gases which are not safe to breath in high

quantity, the air is termed as polluted and can become harmful, leading to diseases such as asthma.

What causes air pollution?

Air pollution is caused due to the presence of pollutants in the air. These are substances that cause harmful changes in the air. It can be caused by both human and natural actions. Natural events causing air pollution include wind erosion, volcanic eruptions, forest fires, etc. Human activities which can cause pollution include burning of fire wood, emissions from factories, mines, and quarries, and emissions from vehicles.

How am I impacted by air pollution?

There are two important effects of air pollution. Firstly, it can cause respiratory diseases such as asthma which make it difficult to breathe. Secondly, it can cause acid rain, that is, rain which contains chemicals and so is harmful for any object that it comes in contact with such as soil, buildings, etc.

ACTIVITIES

Drawing competition

Objectives: Create awareness, especially among children, on the causes of air pollution

Participants: Bal Panchayat, Yuva Mandal

Process:

- Provide participants materials and ask them to draw pictures relating to the theme of air pollution
- These pictures can be put up in the school

Outcomes: Raising awareness about various issues linked to air pollution

Time required: 2 hours

Materials required: sheets, color pencils, and crayons



3



Sustainable use of natural resources



Image: It is possible to regenerate forests



MODULE 6: Sustainable use of water

In this module we will learn about ways to conserve water, including:

1. Rainwater harvesting
2. Water efficient agricultural practices such as drip irrigation, sprinkler irrigation, and irrigation scheduling
3. Using water wisely at home
4. Institutional responses at the community level

Rainwater harvesting

India receives approximately 1,170 mm of rainwater each year. However, most of this amount is received during the monsoon, which is only 3–4 months (June to September). If rainwater can be stored at this time, it can help us meet some of our water needs in other months as well. This storage of rainwater is known as rainwater harvesting.

Some common rainwater harvesting structures include:

- *Bandhs*: Earthen embankments between 5 to 10 feet built on streams.



Image: Benefits of sustainable water practices





Image: A johad

- *Johads*: Crescent shaped embankments which, unlike bandhs do not allow water to overflow.
- *Medhbandis*: Short earthen embankments, between 2 to 3 feet, constructed at the boundaries of fields
- *Anicuts*: Cemented embankments

Water efficient agricultural practices

Water efficient agricultural practices refer to those practices which reduce the amount of water used while maintaining the benefits that the water provides. Therefore, even after adopting these practices, crop production should remain at the same level or reach an even higher level.

Some benefits of adopting water efficient agricultural practices include:

- Maintaining or increasing agricultural production
- Reduction in polluted run-off to streams, rivers, and ground water aquifers
- Less energy required for pumping water either from the surface or the ground
- Less vulnerability to drought

In addition, the water which is saved can be used for other purposes, such as for livestock or for household purposes such as sanitation. Some common methods to ensure water efficiency in agriculture include:





Image: Discussing the benefits of sustainable agricultural practices

Becoming aware of water needs of different crops

Farmers know that some crops require more water for the entire production period than others. Table 1, as detailed in the Annexure, at the end of the manual, provides information on the amount of water needed for certain crops for an entire production period.

If you know that there is going to be water scarcity in a year, you can choose to plant crops which consume less water but also allow you to maintain the amount of income you make from agricultural production on your land.

Drip irrigation

Drip irrigation involves delivering water directly to the roots of a crop. Some studies show that using drip

irrigation can save up to 80 per cent of water depending on crop and soil types, and can even increase crop yields.

Under this system, pipes are placed on the surface (or sometimes below the surface) and water is discharged from small emitters in the pipes directly to the core root area of the crop. Unlike other forms of irrigation where the entire soil in the farm is watered, in this case only the part closest to the root is watered.

The initial cost of installing the system can be quite high, so generally those crops which also return high yields can be considered for drip irrigation. However, in certain parts of India, scientists have developed local low cost drip irrigation systems which can cost less than conventional drip systems.

Another issue to consider is that drip irrigation is more suited for widely spaced crops which are planted in



rows such as horticultural crops (tomatoes), plantation crops (bananas) or crops such as cotton, sugarcane, etc. It may not be suited for cereals which are planted close together. It is important to speak to a local expert to understand whether drip irrigation is suitable for the crop you would like to grow, and the soil that your farm contains.

If the adoption of the practice leads to an increase in the irrigated area, or shift to water-intensive crops then the overall benefit of drip irrigation may not be felt by the community, as the pressure on water resources will either stay the same or will increase. The following table outlines the main advantages and disadvantages of drip irrigation.

Advantages and disadvantages of drip irrigation	
Advantages	Disadvantages
Efficient use of water	Initial cost of installation are high
Weeds do not grow as water is applied very close to the roots of the crops	Lifetime of tubes can be shortened as a result of high exposure to the sun
Leaching is reduced and fertilizer and nutrient loss is minimized	Clean water is required, as unfiltered water may cause clogging
Soil erosion is relatively less than flood irrigation	Requires some level of training before use
Crop yields are seen to grow as a result of improved use of water and fertilizers	

Sprinkler irrigation

Sprinkler irrigation also involves laying pipes on the surface. Small holes are made in the pipe and sprinklers are attached to these. The water is then pumped through the pipes at high pressure, causing the water to sprinkle out like rainwater.

Unlike drip irrigation, this method can be used even if crops are planted closely, as is the case with cereals. Table 2, as detailed in the Annexure, at the end of the

manual, shows changes in water use and yield after the installation of sprinkler systems.

Irrigation scheduling

Irrigation scheduling means deciding when and how much water to use while watering crops. In that sense, almost all farmers have some schedule of watering the crops. However, farmers can further develop their schedule based on the water content at the root of the crop, the amount of water consumed by the crop since it was last irrigated, and the stage of development of the crop.

In order to create a water efficient irrigation schedule, it is useful to have the following information:

- Amount of water demanded by the crop at different stages of growth
- Moisture content of soil and the capacity of the soil to absorb water
- Weather conditions

While information on the first two will be available with local agriculture or natural resource experts, the government often provides updates on weather conditions through mobile phones.

Using water wisely at home

You can take small steps such as ensuring that you use less water while washing utensils, or carrying out other household functions.

You can also ensure that any leakages in pipes are fixed, and hand pumps are repaired at the earliest so that water is not wasted.

Basic methods for purifying drinking water

1. **Boiling:** Boiling water is a simple and quick method of treating water. Water can be boiled for 1 – 3 minutes after it has started to boil. However, the disadvantages of boiling water include the fact energy is required to boil water; and there is a



risk of increasing the concentration of heavy metal contaminants in the water.

2. **Chemical treatment:** Chemicals such as Iodine and Chlorine can disinfect water and remove bacteria or viruses. Approximately 10mg of Chlorine must be added per litre of water for at least 30 minutes. Iodine is a solid black crystal which can be dissolved in water to form a saturated solution and then added to the water which needs purification. Approximately 0.5 to 1 mg of Iodine must be added per litre of water for at least 20 minutes.

3. **Sand filters:** Sand filters can be used to treat water. Very simply, sand filters consist of layers of sand and stones (of different sizes), in a plastic or concrete container, through which water passes and is filtered. To build a sand filter you would need a container, a pipe, a plate, and sand of different sizes. More information on construction of a sand filter is given below:

- Buy a plastic or concrete container with a tightly fitted lid at the top
- Place a steel plate with holes at the end to allow water to be even distributed into the filter
- Place a layer of gravel of larger size, and then gravel of smaller size at the bottom of the container.
- Above the smaller sized gravel is a layer of fine sand.
- All materials are washed and dried and then placed in the container.
- Water is then poured in from the top and gradually filters through and seeps out of the pipe.
- For more information on size of components the Annexure at the end of the manual.

Institutional responses at the community level

Water Users Association

In some states of the country, governments allow for the formation of an association of all water users in

an area. This association works together to carry out functions like:

- Giving suggestions on how to improve the current irrigation system
- Preparing a warabandi schedule (wherein water is distributed by rotation between various users for irrigation purposes) before each irrigation season
- Regulating the use of water among different water users
- Monitoring the amount of water available for irrigation
- Resolving conflicts related to water use

While some Water Users Associations are registered, informal associations can also be created to carry out these functions. These associations can be modeled along the lines of Yuva Mandals or Mahila Mandals but have membership of at least one member from each family in the village. BBA field staff can conduct regular meetings and discuss major issues and outline recommendations suggested by the group. These recommendations can be sent to the Gram Panchayat as well as officials at the block level.

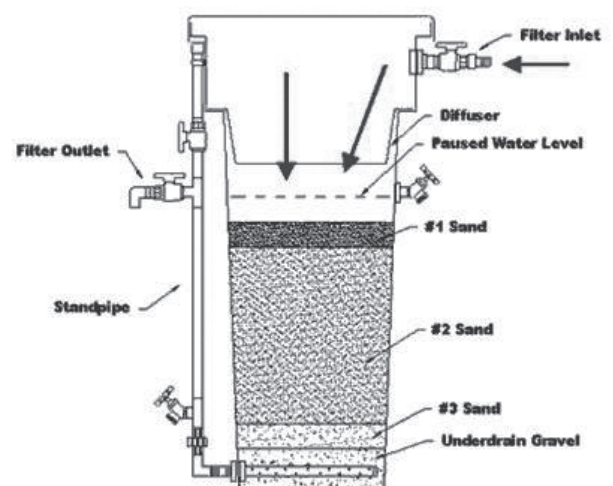


Image: Basic sand filter





Image: Discussing the benefits of sustainable water use practices

ACTIVITIES

Role play: Creating a charter for sustainable water use in the village

Objectives: Outline a charter for water conservation methods which the village can adopt

Participants: Yuva Mandal, Mahila Mandal, other community members

Process:

- Divide the participants into smaller groups of at least five members each
- These groups will form mock Water User Associations, and each member will be assigned a role such as Chairperson, Member-Secretary, Accountant, etc.
- Have each of these groups have a mock meeting with a prepared agenda as the 'script' for the role play
- The agenda could have issues such as addressing groundwater depletion, water contamination, and equitable access to water
- Have each of the groups prepare a 'minutes of the meeting' and make a presentation on their minutes
- They can then combine their solutions and collectively make a charter for practices they can follow in their everyday lives
- This charter can be put up in a central place such as the school
- Their recommendations can also be sent to Panchayat and block level officials

Outcomes: Increased awareness about sustainable water use and an outline of concrete steps which can be taken by community members to practice these.

Time required: 2–4 hours

Materials required: Chart paper, pens

Drawing competition

Objectives: Create awareness, especially among children, on the importance of conserving water

Participants: Bal Panchayat, Yuva Mandal

Process:

- Provide participants materials and ask them to draw pictures relating to the theme of water conservation
- These pictures can be put up in the school

Outcomes: Raising awareness about various issues linked to water usage and conservation

Time required: 2 hours

Materials required: Sheets, color pencils, and crayons



MODULE 7: Soil conservation practices

In this module we will learn about soil conservation practices such as:

- 1. Composting**
- 2. Organic and bio-fertilizers**
- 3. Planting cover crops**
- 4. Multi-cropping and crop rotation**

Land degradation can affect agricultural production, reduce availability of fodder on grazing lands, and also impact forest resources. Since the damage caused by soil erosion can be irreversible, it is advisable to take measures to conserve soil and prevent soil erosion. Some major practices to prevent soil erosion and improve the quality of the soil include:

Composting

Compost is decayed organic matter (made of dead plants or animals and their waste). Traditionally, farmers have added compost to soil to ensure the health of the soil. The difference between fertilizers and compost very simply is that while fertilizers feed the crops, compost feeds the soil.

Therefore compost and fertilizers should be used together.

For example, fertilizers add ingredients to the soil which meet the nutrient requirements of plants. However, fertilizers may prevent the growth of small microbes needed for soil health, leading to a gradual decline in soil fertility. Chemical fertilizers have a greater negative impact than organic fertilizers.

Composting helps improve soil fertility by adding nutrients to the soil; it helps retain moisture in the soil and can even help improve resistance to diseases in some plants such as tomatoes.

Organic and bio-fertilizers

There are two broad types of fertilizers—(i) organic and (ii) inorganic. Organic fertilizers are made from natural sources such as plant and animals while inorganic fertilizers are man-made.

The advantages and disadvantages of using organic and inorganic or chemical fertilizers have been outlined in the table below.

Planting cover crops

Cover crops are crops which are planted in addition to the main crop to cover the empty spaces in the field.

Advantages and disadvantages of organic fertilizers

Advantages	Disadvantages
They don't just add nutrients to plants; they also help improve soil fertility.	Micro-organisms are needed to breakdown organic fertilizers. These need warmth and moisture to work.
Since they release nutrients slowly, there is no danger of over fertilization of plants.	They release their nutrients very slowly, so you may not see results immediately.
There is little risk of build-up of chemical toxins which can be harmful for plants. They are biodegradable and environment friendly.	The amount of nutrients in these fertilizers is unknown and may be less than chemical fertilizers.
They can be made at home from organic waste.	They may be expensive to buy in the market.



Advantages and disadvantages of inorganic or chemical fertilizers	
Advantages	Disadvantages
Since nutrients are immediately available, improvement in plant health can occur shortly after application.	In the long run, they can cause damage to the soil because they do not contain decaying matter necessary for soil health. They do not replace many elements in the soil which become depleted because of repeated planting.
Information on nutrients contained in them is easily available.	There is danger of over fertilization, which can kill the plants and upset the ecosystem.
They are inexpensive.	They can leach away from plants and therefore may require additional applications. Over application can lead to a build-up of toxins such as arsenic, cadmium, and uranium in the soil.

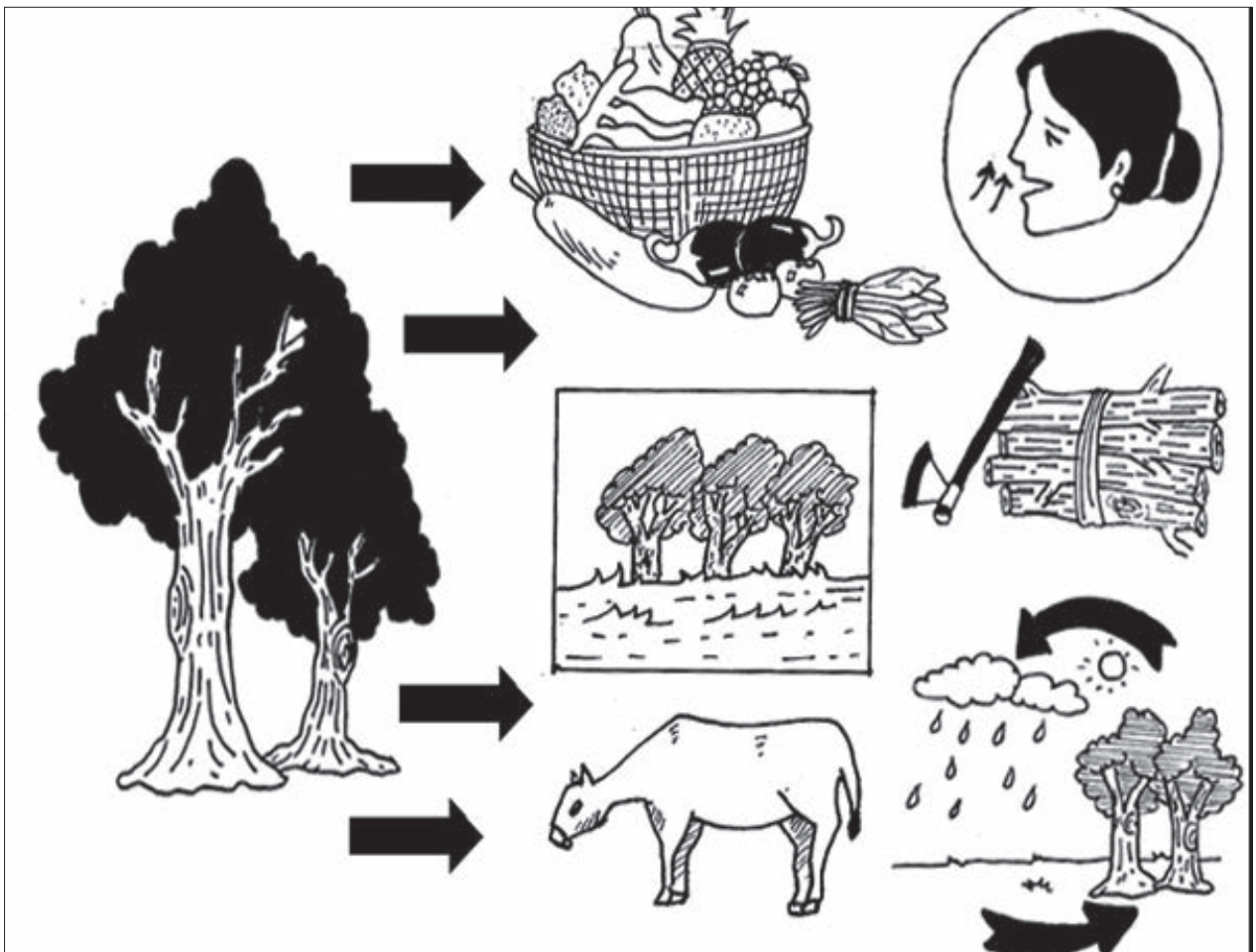


Image: The many benefits of forests

Cover crops are beneficial for the following reasons:

- They can protect the soil surface from erosion due to wind or water
- Certain cover crops may stop the growth of weeds



- They can encourage the growth of beneficial insect population
- Certain leguminous cover crops such as alfalfa can take nitrogen from the air and make it available to the plant

Multi-cropping and crop rotation

Multi-cropping refers to planting two or more crops in the same field, as against monoculture which entails planting just one crop in a field. The following table outlines the advantages and disadvantages of multi-cropping.

Crop rotation refers to planting different crops successively on the same field. Different crops can be planted in succession either immediately after each other or different crops can be planted after two or three years. Some benefits of crop rotation include:

- Improved control of weeds—Planting different types of crops one after the other can control the development of weed species. Cover crops also assist with this.
- Control of pests and plant diseases—Certain pests and plant diseases attack some crops and not others. For example, if rice is rotated with leguminous plants, then the rice stem borer (a pest which attacks rice crops) will not get the opportunity to increase in numbers.

- Improved soil fertility—Different crops require different nutrients from the soil. When different crops are planted in succession, they use up specific nutrients allowing other nutrients to build up again. Planting the same crop continuously can lead to the depletion of the key nutrients that the soil requires.
- Improve organic content of soil—Some crops or plants (such as soyabean, sweet potato, and vegetables) will also return plant residues to the soil and therefore increase the organic content of the soil.

Different crops can be planted when land is left fallow (that is, when nothing is grown on it for a short period) as well. For example, in parts of India, farmers leave the land fallow after the kharif or rainy season rice crop. Legumes can be grown during this time, as they are rich in nutrients and also allow for nitrogen fixation to the soil which improves the quality of soil.

Improving productivity of grazing lands

Some ways to improve the productivity of grazing lands include reseeding of grasses, introduction of leguminous plants, and rotational grazing. Reseeding very simply means sowing an area with seed (usually grass seed) again.

Introduction of leguminous plants can improve soil quality as leguminous plants fix nitrogen from the air to the soil.

Advantages and disadvantages of multi-cropping

Advantages	Disadvantages
Can lead to increased bio-diversity by providing a habitat to insects and plants which may not thrive in single crop environments.	Care has to be taken while choosing crops to ensure that competition between chosen crops does not lead to crop damage. This requires training (not required in case of monoculture) which small and marginal farmers may not have access to.
Pest management becomes easier as certain pests may only attack particular types of crops, while others in the same field remain unharmed.	It is possible that pests may spread from one crop to another, depending on the type of crops planted.
May lead to increased nutrition, as farmers can plant crops which provide a range of nutrients instead of just one crop.	Farmers may be reluctant to try new varieties of crops which they are not familiar with.
Acts as a protection against the risk of crop failure in case of abnormal weather conditions if two different types of crops are planted.	



Rotational grazing refers to managing the area where livestock graze, and usually means alternating between different grazing areas from time to time.

Forests are an incredibly rich source of natural resources, but millions of hectares are destroyed every year to meet the increasing demand for paper, wood, and other products.

ACTIVITIES

Role play: Creating a charter for sustainable agricultural practices in the village

Objectives: Create a charter for water and soil conservation methods which farmers can adopt in their farming practices

Participants: Yuva Mandal, Mahila Mandal, other community members who are farmers

Process:

- Divide the participants into smaller groups of at least five members each
- Assign each member of the group the role of a key stakeholder such as farmer with small landholding, farmer with a large landholding, landless laborer, woman farmer, Sarpanch, etc.
- Have each of these groups have a mock meeting of a farmer's association with a prepared agenda as the 'script' for the role play
- The agenda could have issues such as addressing water depletion, soil erosion, organic farming, drip irrigation etc.
- Have each of the groups prepare a 'minutes of the meeting' and make a presentation on their minutes.
- They can then combine their solutions and collectively make a charter for practices they can follow in their everyday lives
- This charter can be put up in a central place such as the school
- Their recommendations can also be sent to Panchayat and block level officials

Outcomes: Increase awareness about sustainable agricultural practices and an outline of concrete steps which can be taken by community members to practice these.

Time required: 2 – 4 hours

Materials required: Chart paper and pens



MODULE 8: Sustainable use of forest resources

In this module we will learn about forest conservation practices such as:

1. Afforestation
2. Forest management committees
3. Agro-forestry
4. Alternatives to wood burning stoves
5. Developing nurseries

Sustainable forestry refers to using forest resources in such a way that our needs are met but the health of the forest is preserved so that it can continue to provide us and future generations with resources for our lives and livelihoods. Therefore, it seeks to strike a balance between the demand for the forest's natural resources and the vitality of the forest.

As mentioned earlier, there are many benefits of living around healthy forests such as continued livelihoods, conservation of habitats of other animals and plants, improved quality of the air we breathe, and improved quality of the soil. Some steps that communities can take to preserve their forests are outlined next.

Afforestation

The community can work together with the local government and other organizations such as schools, self-help groups, and non-governmental organizations working in the area to start localized tree planting campaigns.

Key stakeholders such as children, youth, women, and elderly members of the households can be involved. These organizations can conduct tree planting programmes on occasions such as Republic Day, Independence Day, festivals (Holi, Diwali, Eid, Ganesh Puja, etc.) and World Day Against Child Labour with the objective of improving environmental and economic outcomes.

Local forest management committees

Strengthening *Van Samitis* or forest committees to regulate use of timber and non-timber forest produce as well as to overlook and monitor the collection of fuel wood can help communities manage forest resources sustainably. When people need wood for constructing or repairing their houses, they can take permission from the *Samiti* and use timber responsibly.

In addition, the *Samiti* can charge fines to those who misuse the forest. *Samitis* can also raise awareness about the importance of forests and point out which trees are more important for water conservation. Spreading awareness among the local people about the importance and strong connection between forests, agriculture, climate, and their livelihood is crucial in making any forest management policy effective.

Van Samitis may also play the role of mediators in case of conflict surrounding the use of forest resources.

Agro-forestry

Agro-forestry refers to a land management practice where trees or shrubs are planted on agricultural land or grazing land. The purpose of this practice is to improve soil health, but also to increase incomes of farmers.

There are two major types of agro-forestry:

- Planting trees on grazing land—The trees provide timber, fruits, and other tree produce and also provide shelter for livestock.
- Crops between rows of trees—These crops provide income while trees mature. The entire system can provide fruits (from trees) and grain, herbs, and fodder (from crops). In addition, trees can provide shade, if required for the crops which are planted.

Stall feeding

It is the process in which grazing is not done in fields and forest areas. Instead livestock owners get fodder for the



livestock from the forests and feed them at the home. It can be an effective method to check overgrazing as well as deforestation.

Alternatives to wood burning stoves

Efficient alternative fuel wood sources such as gas connections or solar *chullahs* can be promoted in order to reduce the dependence on forests as a source of fuel wood.

Developing nurseries

Non-agricultural land can be used to build a nursery with fruit-bearing trees as well as trees which serve as a good source of fodder. This nursery can be managed by the community itself. This will improve the green cover in the village as well as serve as fodder for animals and reduce dependence on forests as a source of minor forest produce and fodder.



Image: Discussing creating a nursery

ACTIVITIES

Stakeholder enactment: Working together to conserve forest resources

Objectives: To understand the role of different stakeholders in the management of forest resources

Participants: Yuva Mandal, Mahila Mandal, Bal Panchayat, other community members

Process:

- Divide the participants into smaller groups of at least five members each
- Assign a role of a stakeholder to each participant
 - Examples include community members (women, children, youth, elders, men) who cut trees, outsiders who cut trees, forest guards, Panchayat members, BBA staff, local government officials, etc.
- These participants can enact a play in which community members must try to negotiate the use of forest resource amongst each other, and through the play they can outline steps to ensure sustainable use of forest resources

Outcomes: Increased awareness about the role of different stakeholders, especially the role of the community in the sustainable use of forest resources

Time required: 1–2 hours

Create a nursery

Objectives: To create a nursery where trees or shrubs can be grown to provide alternative sources of fodder for animals as well as fruits for the community

Participants: Yuva Mandal, Bal Panchayat, Mahila Mandal, other community members

Process:

- Ask community members to identify a common piece of land which is not being used
- Ask them to plant locally available trees and shrubs which can provide them with fodder and fruits
- Ask community members to write down rules about taking care of the nursery, the use of fodder and fruit from the nursery, fines for excessive cutting of trees, and rules relating to resolving any conflicts which may arise
- Ask the head of each household to sign this charter for the use of the nursery
- Appoint monitors of this nursery from members of Yuva Mandal

Outcomes: Increased availability of fodder and fruits which could mean less time spent by women on foraging for these, healthier livestock, and decreased deforestation



MODULE 9: Waste management

In this module we will learn about waste management practices such as:

1. Composting
2. Using treated wastewater
3. Waste segregation and recycling

If solid and liquid waste is managed properly, it can be a resource to generate income and livelihood. Some low cost waste management practices which can be adopted by communities are outlined below.

Composting

Composting can be practiced for treatment of solid waste. In rural areas, compared to urban ones, land availability is often not a constraint. This presents options for reuse of



Image: Raising awareness about the harmful effects of burning plastic



waste, such as composting of biodegradable material, which can be used in kitchen gardens, agricultural fields, and so on.

Use of treated wastewater

Treated wastewater can be used for non-drinking uses such as watering the kitchen garden, and in agricultural fields.

Segregation of waste and recycling

Recyclable solid wastes could be collected separately from residential houses through sensitization and motivation. Recyclable items could be sold to generate revenue. Groups like self-help groups, Mahila Mandals, and Bal Panchayats, could participate and engage in recycling activities such as recycling of paper, cloth, metal, and glass to develop home decorative items.

Plastics, if collected, segregated, and shredded as per norms, can be used in road construction.

Awareness generation

Raising awareness about adverse health and environmental effects of burning waste can be an important way of reducing pollution in rural areas. Community members can be made aware of environment-friendly practices and their costs. For example, they can be told about the cost of modification of their houses to route all the wastewater through septic tanks.

Monitoring by Gram Panchayat

At the Gram Panchayat level, monitoring of solid and liquid waste management can be undertaken by Panchayat members or ward members in different wards or hamlets of a Panchayat.

ACTIVITIES

Sanitation drive

Objectives: Clean the neighbourhood

Participants: Yuva Mandal, Mahila Mandal, Bal Panchayat, other community members

Process:

- Invite all stakeholder groups along with other community members to undertake a sanitation drive
- This drive can be performed days such as Republic Day (26 January), Independence Day (15 August), Environment Day (5 June), Gandhi Jayanti (2 October), Earth Day (22 April), or whenever feasible
- Ask members to also segregate the waste that is picked up and explain to them the difference between biodegradable and non-biodegradable waste.

Outcomes: Increased cleanliness, increased awareness about waste segregation

Time required: 2–4 hours



MODULE 10: Ensuring clean air

In this module we will learn about methods to minimize air pollution, including:

1. Appropriate waste disposal
2. Reducing air pollution around stone crushing units

The quality of air can have a significant impact on health. One of the first steps which should be taken at the community level is to increase awareness about the link between poor quality of air and respiratory diseases. Alongside this, awareness should also be raised about causes of pollution and how activities such as burning of fire wood, burning of plastic waste, and working in stone quarries and stone crushing units can lead to long-term health impact.



Image: Discussing the inter-relatedness of natural resources

Waste disposal

Communities should be made aware that burning of plastic (and other waste) can be harmful for the environment. Instead, ideally waste should be segregated and local rag pickers can collect reusable waste.

Reducing air pollution around stone crushing units

Some simple suggestions which can be given by local communities to unit owners and the government such as:

- Dust suppression through heavy dust sprinklers/road watering trucks could be done.
- Dust extraction facilities could be created for the crushing units. This involves removing harmful dust particles through vacuums, filters, pipes, etc.

- It is also important to raise awareness about simple protective methods to prevent the occurrence of breathing problems such as wearing masks while inside the site.
- The transportation of the minerals should be properly covered and leak proof.
- For addressing noise pollution, there could be made provision of ear plugs and ear muffs to reduce noise level exposure and noise abatement paddings could be used in the fixed plant installations.
- Unit timings can also be regulated to ensure that stone crushing does not happen at inconvenient times such as night time..

ACTIVITIES

Make a charter of demands for the local industries / businesses which cause air pollution

Objectives: Present local industries with simple steps which can be taken to address air pollution

Participants: Yuva Mandal

Process:

- Help participants identify simple steps which can be taken by industrial units (such as stone quarries or stone crushing units) to reduce pollution
- Make a charter of these steps with names of all community members who wish to be included
- Present this to local industries or business and local government officials

Outcomes: Increased interaction with local industries to present their demands and work towards more sustainable practices in these industries

Time required: varies, preparation of charter will require 2–4 hours

Materials required: Paper, pen





Integrated natural resource management

In this module we will learn about:

1. Integrated natural resource management
2. Integrated watershed management

What is integrated natural resource management?

Any community-based solutions to natural resource issues must recognize the inter-relatedness of resources such as water, land, forests, and air. For example, in order to address low soil productivity, communities should ideally look beyond merely constructing rainwater harvesting structures to improve water resources, but must also identify low water intensity agricultural methods, appropriate fertilizers and pesticides, plant trees around fields, etc.

What is integrated watershed management?

A watershed is an area of land which contains a number of streams, all of which drain into the same body of water. Watershed management, therefore, refers to creating and implementing policies or practices to ensure adequate availability of water in a watershed.

Integrated watershed management refers to creating and implementing policies which ensure sustainable use of water as well as other natural resources (soil, trees, air, etc.) in a watershed. Common practices include rainwater harvesting, afforestation, and soil conservation methods.

While the central government implements policies such as the Integrated Watershed Management Programme; at the local level, communities can carry out participatory natural resource mapping and with the assistance of local organizations design village-level watershed management programmes.



ACTIVITIES

Passing the parcel: Outlining solutions to natural resources problems

Objectives: To identify solutions to key natural resource issues

Participants: Members of Mahila Mandal, Yuva Mandal, and Bal Panchayat, as well as any other community members

Process:

- Make a list of chits with key natural resources problems such as water scarcity, water contamination, deforestation, human-animal conflict, air pollution, etc. You can add any local problems which you feel are relevant
- Place the chits in a box or a container
- Make participants sit in a circle
- Pick a song or a stanza from a song and ask everyone to sing
- Ask participants to keep passing the box as the song is being sung. As soon as the song ends, the person holding the box should pick a chit
- The person should then list at least one reason why the problem occurs and at least one solution that they can think of to the problem
- The trainer can note down all the reasons and solutions on a chart paper
- This chart can be put up at a central location or can be used by the youth group to develop a more concrete plan for implementation of the solutions

Outcomes: Raising awareness about solutions to natural resource issues

Time required: 1 – 2 hours

Materials required: Chart paper and pens

Making a Seasonality Map (adapted from IPPE Manual, MGNREGA)

Objectives: To help the community understand the seasonal changes in livelihood. For example, during certain seasons there may be greater access to livelihood through collection of non-timber forest produce, while in other seasons the dependence of agriculture may be greater.

Participants: Yuva Mandal, Mahila Mandal, Bal Panchayat

Process:

- Explain the concept of a seasonal calendar of livelihoods. Provide participants with a chart paper and pens
- Ask them to map out major livelihood options in their village such as agriculture, collection of forest produce, MGNREGA, other wage employment, etc.



- Discuss the seasonal variations in livelihood options available to the community. Make a list of alternative livelihoods which they could engage in during seasons when livelihood options are extremely limited

Example of a seasonal livelihood calendar

Livelihood / month	Agriculture	Wage employment	Migration	MGNREGA	Forest produce
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					
January					
February					

Source: *Manual for Intensive Participatory Planning Exercises for MGNREGA, Government of India 2014*

Outcomes: Increased awareness of seasonality of livelihoods and alternative livelihood options

Materials required: Chart paper, pens, pencils

Time required: 2–3 hours





Engaging with the Government

In this module we will learn about:

Key schemes of the central government relating to the solutions identified in the manual, with more detailed information on MGNREGA, and using local area development funds, and schemes related to drip irrigation.

Key schemes pertaining to natural resource management

Several of the solutions outlined in this manual can be implemented by community members without support from the government. However, there are certain schemes of the government (both central and state) which have provisions through which some solutions can be implemented. The table below outlines objectives and relevant officials at the village and block level for some key schemes.

Scheme	Ministry	Objectives	Possible community level activities	Local level official(s)
Mahatma Gandhi National Rural Employment Guarantee Scheme	Ministry of Rural Development	<ul style="list-style-type: none"> - Provide wage employment - Create rural infrastructure 	<ul style="list-style-type: none"> - Water conservation and water harvesting - Afforestation - Irrigation facilities - Horticulture plantation - Land development 	Secretary / Gram Sevak Sarpanch and Gram Panchayat Programme Officer Block Development Officer District Programme Coordinator
Pradhan Mantri Krishi Sinchai Yojana (Har Khet Ko Pani component)	Ministry of Agriculture and Farmers' Welfare	<ul style="list-style-type: none"> - Increase access to irrigation, especially micro-irrigation - Repair, restoration and renovation of water bodies - Groundwater development 	<ul style="list-style-type: none"> - Minor irrigation structures - Water harvesting structures - Repair of water bodies and traditional water storage systems 	Secretary / Gram Sevak Sarpanch Gram Panchayat Block Development Officer



Scheme	Ministry	Objectives	Possible community level activities	Local level official(s)
Pradhan Mantri Krishi Sinchai Yojana (Per Drop More Crop component)	Ministry of Agriculture and Farmers' Welfare	<ul style="list-style-type: none"> - Promoting precision irrigation techniques like drip and sprinkler irrigation - Creating micro-irrigation structure like tube wells and dug wells - Water lifting sets like diesel and solar hand pump sets 	<ul style="list-style-type: none"> - Precision irrigation like drip and sprinkler irrigation - Creation of micro-irrigation structures where it is not permitted under other components of PMKSY or MGNREGA - Water lifting devices like diesel / electric / solar pump sets 	Secretary / Gram Sevak Sarpanch Gram Panchayat Block Development Officer
Pradhan Mantri Krishi Sinchai Yojana (Watershed Management component)	Ministry of Rural Development	<ul style="list-style-type: none"> - Improved soil and moisture conservation - Rainwater harvesting - Renovation of traditional water bodies 	<ul style="list-style-type: none"> - Water harvesting structures like check dams, nala bunds, farm ponds, and tanks - Afforestation, horticulture - Rainfall management through bunding, trenching, levelling, mulching, etc. 	Secretary / Gram Sevak Sarpanch Gram Panchayat Block Development Officer
National Afforestation Programme	Ministry of Environment, Forest and Climate Change	<ul style="list-style-type: none"> - Increase forest cover - Improve ecosystem services fuel wood, fodder, and timber - Improve forest-based livelihoods - Participatory forest management 	<ul style="list-style-type: none"> - Afforestation - Agro-forestry - Participatory micro-planning, implementation and monitoring of projects - Marketing forest produce 	Joint Forest Management Committee / Eco Development Committee Secretary / Gram Sevak Sarpanch Gram Panchayat
National Rural Drinking Water Programme	Ministry of Drinking Water and Sanitation	<ul style="list-style-type: none"> - Provide rural people with clean water for domestic purposes, including drinking, cooking, and other domestic needs 	<ul style="list-style-type: none"> - Preparation of village water security plan - Testing of drinking water sources for contamination - Constructing and maintaining water sources, especially piped water supply 	Gram Panchayat / Village Water and Sanitation Committee Secretary / Gram Sevak Block Development Officer
Rashtriya Krishi Vikas Yojana	Ministry of Agriculture and Farmers' Welfare	<ul style="list-style-type: none"> - Improve agricultural production and productivity 	<ul style="list-style-type: none"> - Animal husbandry and fisheries development - Minor irrigation projects - Agricultural marketing - Water conservation and harvesting - Production of organic fertilizers at the village level, vermicomposting - Training on organic farming 	Secretary / Gram Sevak Sarpanch Gram Panchayat / Gram Sabha Block Development Officer



Natural resource management under MGREGA

One of the schemes which finances watershed development projects is the Mahatma Gandhi National Rural Employment Scheme (MGNREGS).

MGNREGS is a scheme under the Mahatma Gandhi National Rural Employment Guarantee Act, 2005 (MGNREGA), which is a law enacted to guarantee wage employment to rural population.

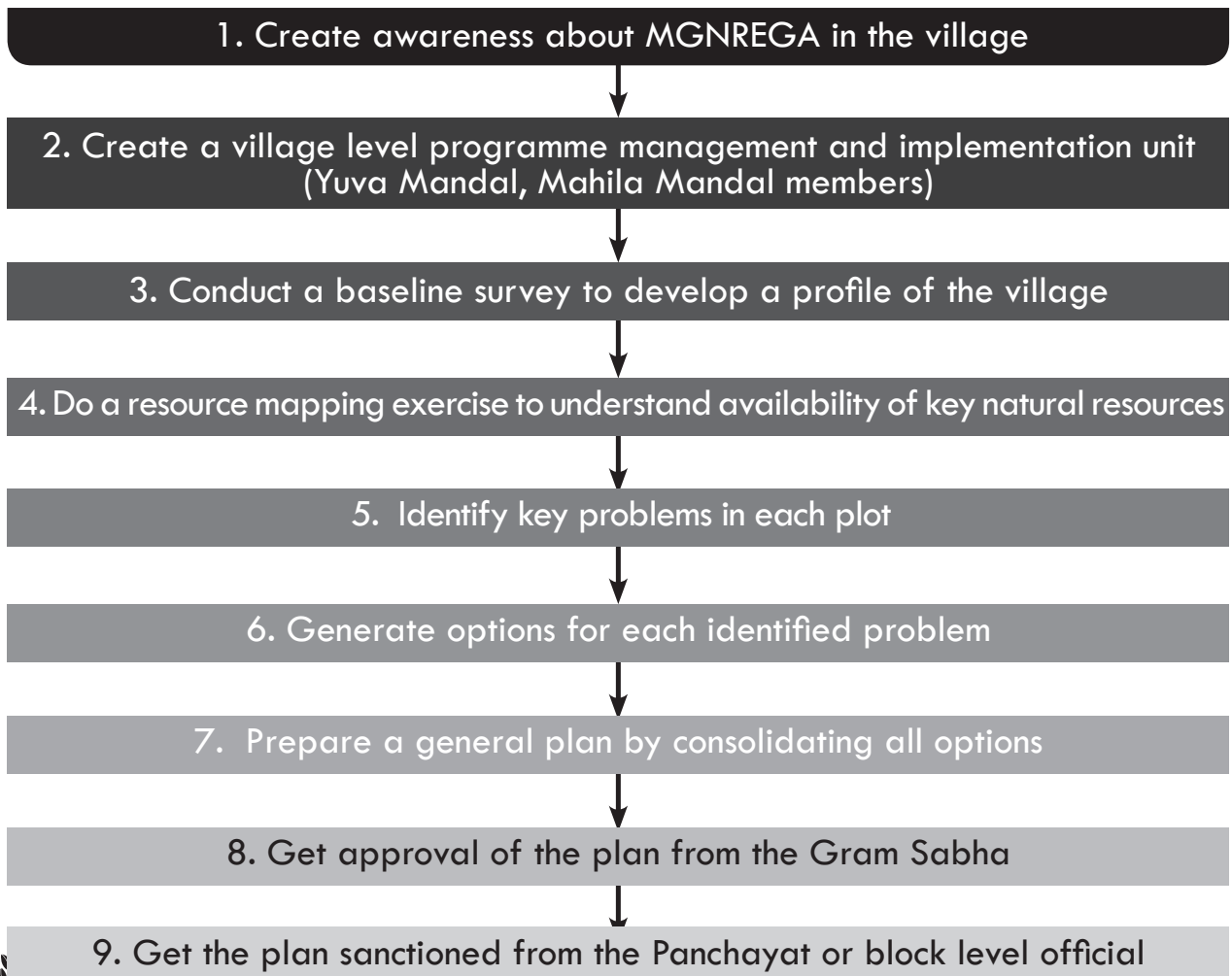
The key features of MGNREGS include:

- Legal right to work for 100 days guaranteed to each rural household
- Employment must be provided within 15 days of

being asked or an unemployment allowance should be given

- The Gram Sabha should recommend the projects which are to be taken up, and at least 50 per cent of them should be carried out by them
- Facilities such as drinking water, first aid, and crèches should be provided at all work-sites

The following flow chart presents the main steps which can be taken for watershed management under MGNREGA. The flow chart has been adapted from 'Implementing Integrated Natural Resource Management Programmes under the National Rural Employment Guarantee Act, 2005,' Ministry of Rural Development, Government of India, (<http://nrega.nic.in/2pradan%20inrm-mnual.pdf>)



Brief explanation of key steps:

- 1 **Raising awareness about MGNREGA:** This can be done by calling a meeting of the Gram Sabha, and outlining the objectives, features, and benefits of the scheme.
- 2 **Creating a village level programme management and implementation unit (programme unit):** This can be formed with members of Yuva Mandals and Mahila Mandals. This unit will be responsible for creating plans for projects under MGNREGA and getting them sanctioned by the Gram Panchayat. It could also be responsible for resolving any conflicts and maintaining links with government departments.
- 3 **Conducting a baseline survey and develop a village profile:** Baseline information is collected to measure the impact of the exercise. It helps us understand and analyze the impact of the exercise. Some members of the programme unit can conduct a survey of the village and develop a village profile with information details of land owners, crops grown, key problems, and the options under MGNREGA to address those problems. The information can be entered in the table below.

Information can also be collected on key natural resources such as: (i) production of key crops including cereals, oil seeds, pulses, vegetables, etc.; (ii) quantity of livestock; (iii) groundwater levels; (iv) total irrigated area; and (v) income and expenditure of the families

The information collected before the exercise can be compared with information collected on the same topics after the exercise to understand the impact

of the exercise. In addition, information on labour availability can be collected to understand the number of men and women available to work on MGNREGA projects at different times in the year.

To collect this information, members of the programme unit can either call a meeting of community members, or go from house to house and enter this information. Members can also use this as an opportunity to raise awareness about MGNREGA and key entitlements under the Act.

- 4 **Conducting a resource mapping exercise:** A resource mapping exercise can be conducted. This involves: (i) outlining the village boundary lines; (ii) drawing different types of lands using various colours; (iii) identifying plots of land owned by different community members and assigning numbers to each of the plots; (iv) identifying common properties like grazing land or forest land; and (v) identifying key water sources in the village.
- 5 **Identifying key problems in each plot:** Next, members of the programme unit can meet with landowners and identify key problems in their land, as well as problems in the common property of the village. Members can then visit the sites of the plots and verify these problems. Details such as type of soil, water holding capacity, vegetation, slope of the land, and irrigation requirements can be noted for each of the plots (or common areas) where problems are identified.
- 6 **Generating options:** Programme unit members can visit each plot and discuss possible options to address the key problems which are identified. Once

No.	Name of owner	Category (APL / BPL)	Size of land holding	Crops grown			Irrigation			Problems	Options generated	Remarks
				Kharif	Rabi	Other	Kharif	Rabi	Other			
1.												
2.												





Image: A discussion on natural resource conservation

a number of options are identified, they can discuss the possible costs and benefits of each option and eventually select one through consensus.

- 7 Preparing a general plan and budget:** Those options which are most cost-effective and acceptable to community members can be consolidated and included in a general plan for the village. This can be done by calling members of the community for a meeting and discussing all options. Ensure that all members are involved at this stage, especially traditionally marginalized groups like women and the landless. At this point, the order in which the

activities should be carried out and the timeline for the activities should be outlined. A budget for the activities (with details of labour and material required for each project) should be given along with the plan.

- 8 Getting approval from the Gram Sabha:** A meeting of the Gram Sabha can be called in which members of the programme unit can outline the plan, provide any clarifications required, and resolve any disagreements among community members. Approval can be formalized by obtaining members' signatures or thumb impressions in the meeting register.



- 9 **Obtaining sanction from district officials:** Finally, after obtaining the approval of the Gram Sabha, the general plan and budget can be forwarded to the Block Development Officer or relevant district level officials.

Using MP and MLA local area development funds

Members of Parliament (MPs) and Members of Legislative Assemblies (MLAs) are given a certain amount of money to carry out development-related projects, including construction of drinking water facilities, provision of irrigation facilities, electrification, health, education, among others.

While guidelines for use of MLA funds vary from state to state, MPs can use the letter provided at the end of the manual to get works sanctioned. As you can see, they would need information such as—(a) nature of work; (b) location; and (c) approximate cost. Any communication with them should include these three details.

The sector name and work codes are provided in the guidelines for the scheme, which are available online at: <http://164.100.129.134/mplads/En/2010-mplads-guidelines.aspx>.

Government subsidies for drip irrigation: On Farm Water Management / More Crop Per Drop (Pradhan Mantri Kirishi Sinchayee Yojana)

The On Farm Water Management Scheme (now More Crop Per Drop) provided monetary assistance to farmers who wanted to install drip and sprinkler irrigation.

Last year, the government modified the scheme to include it under a new larger scheme, the Pradhan Mantri Krishi Sinchayee Yojana. However the changes in the scheme have not been mentioned yet.

Some features of the earlier On Farm Water Management Scheme are given below:

- Money was provided to subsidize the cost of drip and sprinkler irrigation up to 5 hectares.
- In addition, the scheme was supposed to raise awareness among stakeholders through training programmes and workshops.
- The amount of subsidy varied across states as well as categories of farmers (for example, small and marginal farmers received a slightly higher amount of monetary assistance). More details on the amount of subsidies given can be found in the tables below.
- Monetary assistance to set up a drip or sprinkler irrigation system could only be availed once in 10 years.

Tables with more information on subsidies and costs are provided in the Annexure at the end of the document. This amount may change from time to time.



ACTIVITIES

Interactive discussion: evaluating the effectiveness of participatory groups

Objectives: Evaluate the effectiveness of any participatory groups which exist in the village (for example, a forest committee or a water use association)

Participants: Yuva Mandal, Mahila Mandal

Process:

- First have the group identify key features of a successful participatory group such as:
 - Common interests
 - Clear objectives
 - There is a charter with rules and regulations and members follow this charter as far as possible
 - Regular meetings
 - Participation by all members
 - Any others identified by the participants
- Have group members fill out forms checking either yes or no to each of these criteria.
 - If the answer is 'yes' members can explain why they feel the criterion is met
 - If the answer is 'no' they can suggest ways to improve the functioning of the group
- Conclude by summarizing the suggestions and start to make an action plan by listing people responsible to ensuring that the changes are made. Also list the time that each activity will take to be done.

Outcomes: Increased awareness about the manner in which participatory groups should function, and discussion about how to improve their functioning

Time required: 2 – 3 hours

Materials: Chart paper and pen





Conclusion: Thinking about our relationship with natural resources

This manual is intended to help trainers raise awareness about the importance of natural resources in our lives and help generate discussion on the rights and responsibilities of local communities towards their natural resources.

Some issues come up frequently in discussions around natural resource use, and it is helpful for trainers to be aware of these. The key issues are listed below.

Access to natural resources: Caste, class, and gender dimensions

You may have noticed that individuals from certain communities have different access to natural resources. As a trainer, you could think about differential access along caste, class, and gender lines. For example, you may observe that certain castes have greater access to water sources, while others may not be allowed to use those water sources. This may be changing in recent times, but there may be new ways in which certain castes access natural resources differently.

In addition, women and men may have different responsibilities relating to water access and consequently they may be affected differently by depletion of natural resources. For example, women are often responsible for fetching fodder and fuel wood. So deforestation may lead to a situation where they have to walk much longer distances to fetch these.

Understanding the link between natural resources and poverty levels

Another issue to consider is how existing inequity in access to natural resources can contribute to perpetuating the cycle of poverty for certain households. An important resource in this regard is land, but even inequality in access to water (whether through a hand pump or tube well) can contribute to perpetuating poverty for some households in the community.

In fact, one aspect to consider is how the collective income of the entire community changes as natural resources are depleting, and within this, if the incomes of certain households change more than others. You can take this further and even study if a change in income affects members of the same family differently. For example, you can try and understand whether girls are the first to drop out of school when there is a decline in the income of the family.

Our changing relationship with natural resources

As a trainer, you should be aware of the impact of the establishment of new industries on the availability of natural resources such as water, land, and air. You can discuss benefits that the establishment of industries, in nearby areas, brings to the community such as



employment, with possible disadvantages such as lower availability of water, water contamination, and air pollution.

Rights and responsibilities towards natural resources

It is important for local communities to be aware of their rights over their local resources, for them to be able to engage with other actors such as governments, civil society organizations, industrialists, etc., to ensure that their access to natural resources and livelihoods is not compromised.

This could range from asking local government officials to ensure that hand pumps are working, to asking local businesses to modify practices which are harmful to the environment. Communities should also be able to ask for benefits which are due to them under various schemes of the government. Youth groups can play an important role in gathering communities together to help them develop their collective demands.

Taking this further, discussions can also be facilitated around if (and why) communities should have access to clean air, clean and plentiful water, forests, and forests products even if their livelihoods are not dependent on them.

At the same time, communities should understand their responsibilities towards natural resources, especially resources which belong to the community as a whole, such as grazing lands, forests, or groundwater. For example, when one farmer extracts groundwater, it affects the entire aquifer (where groundwater is stored). Unsustainable extraction leads to decreased availability of groundwater for the entire group of farmers dependent on that particular aquifer. Trainers can help communities think about how their activities have an impact on the wider availability of natural resources for the entire community.





Annexure

Crop	Water requirement (mm)
Rice	900-2500
Wheat	450-650
Sorghum	450-650
Maize	500-800
Sugarcane	1500-2500
Groundnut	500-700
Cotton	700-1300
Soybean	450-700
Tobacco	400-600
Tomato	600-800
Potato	500-700
Onion	350-550
Chillies	500
Sunflower	350-500
Castor	500
Bean	300-500
Cabbage	380-500
Pea	350-500
Banana	1200-2200
Citrus	900-1200
Pineapple	700-1000
Gingelly	350-400
Ragi	400-450
Grape	500-1200

Source: <http://agropedia.iitk.ac.in/content/water-requirement-different-crops> (accessed April 2016)

Crops	% water saved	% increase in yield
Bajra	56	19
Barley	56	16
Bhindi	28	23
Cabbage	40	3
Cauliflower	35	12
Chillies	24	33
Cotton	50	36
Garlic	6	28
Gram	57	69
Groundnut	40	20
Jowar	34	55
Maize	36	41
Onion	23	33
Potato	4	46
Sunflower	20	33
Wheat	24	35

Source: http://agritech.tnau.ac.in/agricultural_engineering/spring_irrigation.pdf (accessed May 2016)



Table 3: Sample size specification of components for sand filter

Component	Specification
Height of filter	100 cm
Diffuser plate thickness	0.45 mm
Size of holes in plate	3 mm
Spaces between holes	25 mm
Fine sand layer	Size: 0.7 mm, height: 550 mm
Smaller gravel for separating layer	Size: 6 mm, height: 50 mm
Larger gravel for drainage layer	Size: 12 mm, height: 50 mm

Source: Sarvanan and Gobinath (2015)

Table 4: Subsidies provided for drip irrigation (in 2014) (% of installation cost)

Type of irrigation	Subsidies provided by the government in north eastern and hill states		Subsidies provided by the government in other states	
	Small and marginal	Others	Small and marginal	Others
Drip irrigation*	60%	45%	45%	35%
Sprinkler irrigation**	60%	45%	45%	35%

Note: * For wide spaced and close spaced irrigation systems

**For micro, mini, portable, semi-permanent, and large volume irrigation systems

Source: National Mission for Sustainable Agriculture Guidelines (2014-15).

Table 5: Approximate cost of drip irrigation (in 2014)

Lateral Spacing (metres)	Amount (in Rupees)				
	1 ha	2 ha	3 ha	4 ha	5 ha
Wide spaced crops					
More than 8m	23,500	38,100	59,000	74,100	94,200
4 – 8 m	33,900	58,100	89,300	1,13,200	1,42,400
Less than 4 m	58,400	1,08,000	1,61,800	2,20,600	2,71,500
Closed spaced crops					
1.2 – 2 m	85,400	1,61,300	2,43,400	3,32,800	4,12,800
Less than 1.2 m	1,00,000	1,93,500	2,92,100	3,99,400	4,95,400

Source: National Mission for Sustainable Agriculture Guidelines (2014-15)



Sample letter for project sanction under MPLADS

संसद सदस्य स्थानीय क्षेत्र विकास योजना दिशा-निर्देश

अनुबंध – III

संसद सदस्य द्वारा उपयुक्त कार्यों की अनुशंसा हेतु फार्मेट
(अनुशंसा संसद के पत्र शीर्ष ही की जाए)

स्थान:.....दिनांक:.....

प्रेषक

नाम

संसद सदस्य (लोक सभा/राज्य सभा)

पता

सेवा में

जिला प्राधिकारी

(जिलाधीश/उपायुक्त/जिला मजिस्ट्रेट/नगर निगम आयुक्त/जिला योजना समिति के सीईओ)

विषय: एमपीलैड्स स्कीम के अंतर्गत कार्यों की अनुशंसा।

महोदय,

मैं अनुशंसा करता हूँ कि एमपीलैड्स निधि से नीचे दी गई प्राथमिकता के अनुसार निम्नलिखित कार्यों की कृपया संवीक्षा करें तथा मंजूरी दें। प्राथमिकता सं..... में कार्य और..... उस क्षेत्र के विकास के लिए हैं, जिनमें क्रमशः अनुसूचित जाति और अनुसूचित जनजाति के लोग बसे हुए हैं।

प्राथमिकता सं.	कार्य का स्वरूप (क्षेत्र का नाम तथा कार्य का कोड)*	स्थान	लागत लगभग (रूपये लाख में)
1			
2			
3			
4			
5			
6			
7			
8			
9			

*कृपया दिशा-निर्देश के अनुबंध- IV उ. को देखें।

(यदि संसद अपने अधिकार से अधिक कार्य की अनुशंसा करता है तो प्राथमिकता सूची में पृष्ठि हो सकती है।)

2. उपर्युक्त कार्यों की कृपया संवीक्षा की जाए और इस पत्र की प्राप्ति के 75 दिन के अंदर तकनीकी, वित्तीय और प्रशासनिक मंजूरी जारी की जाए। मंजूरी वाले कार्यों को एमपीलैड्स दिशा निर्देश के प्रावधानों के अनुसार शीघ्र पूर्ण किया जाए। कृपया मुझे मंजूरी और कार्य के कार्यान्वयन में हुई प्रगति की सूचना दें। यदि कोई अनुशंसित कार्य न होने लायक/अस्वीकृत पाया जाता है तो इसके लिए 45 दिनों के भीतर मुझे अवगत कराया जाए। यदि मंजूरी में 75 दिन से अधिक विलंब होता है तो इसके लिए कारणों से भी मुझे अवगत कराया जाए।

भवदीय,

(संसद के हस्ताक्षर)

